UNCERTAIN GROUND

Emerging Challenges in Land Warfare

By Paul Scharre

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New American
Security

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Introduction

The U.S. ground forces are at a critical juncture. With the end of two long wars, the ground forces are transitioning away from a period of sustained large-scale counterinsurgencies and preparing for future conflicts. The shape of that future, however, is far from certain. The Army, Marine Corps, and Special Operations Command face a diverse array of challenges. From a resurgent Russia to a chaotic Middle East to a rising China, the evolving security environment presents a myriad array of possible challenges. Any number of these could involve the commitment of U.S. ground troops, potentially in large numbers and for operations that could be far different from the counterinsurgency wars the U.S. military has fought for the past decade-plus. At the same time, the scope and character of possible ground operations has evolved beyond easy characterizations between counterinsurgency vs. traditional warfare, unconventional vs. conventional, irregular vs. regular. Non-state actors possess increasingly advanced weapons, such as anti-tank guided missiles (ATGMs), man-portable air defense systems (MANPADS), and low-cost commercially available drones. These will allow them to contest U.S. forces for control of terrain and impose heavy costs on militaries advancing into these low-end anti-access/area denial environments. Nation-states have also adapted their tactics, relying on "gray zone" or hybrid approaches that use proxies, deniable operations, propaganda, and cyber attacks to achieve their objectives without overt military aggression.

The battlespace in which U.S. forces find themselves is also evolving. The rapid diffusion of information technology connects and empowers civilian populations, upending traditional relationships between people and authority. Ubiquitous smartphones mean that every citizen can be a global reporter, the node of an ad hoc network, the leader of a spontaneous flash mob, or the symbol for a cause. In future ground operations, U.S. forces are likely to find themselves in an environment where the location and disposition of U.S. troops is known to anyone interested and where every action – and inaction – of U.S. servicemembers is broadcast in real time.

Many aspects of ground warfare are not likely to change, however. Information will not strip away the fog of war. Technology will not reduce warfare to a riskless engineering exercise. In fact, quite the opposite: Advances in more lethal weaponry are likely to make war more bloody, not less. The rapid pace of commercially-driven innovation is likely to further erode the U.S. military's technological advantages in ground warfare.

In this environment, strategic agility will be key to success. The U.S. military needs ground forces that can rapidly adapt to changing events on the ground, troops who understand the strategic ramifications of their actions, and acquisition processes that equip them with the right tools for each mission and environment.

U.S. Army

In the same way that the guerrilla tactics used against U.S. forces in Iraq and Afghanistan were not new, strategies of tomorrow's adversaries may resemble those of the past. Rangers from Headquarters and Headquarters Company, 3rd Battalion, 75th Ranger Regiment and a multi-purpose canine pause during a nighttime combat mission in Afghanistan.

The Enduring Utility of Land Power

Even as U.S. troops remain in Afghanistan and have redeployed to Iraq, in Washington Iraq and Afghanistan syndrome has already set in. The Pentagon has moved swiftly to cut the Army, reducing active duty end-strength by at least 20 percent from a wartime peak of 570,000 down to 440,000-450,000.[1] These end-strength levels may merely be a waypoint toward further cuts, however, if budget pressures continue. Internal Department of Defense (DoD) planning options have included figures as low as 380,000, far below the pre-9/11 level of 490,000 active duty soldiers.[2]

Yet a range of plausible contingencies could call upon the nation to deploy boots on the ground, and potentially in large numbers. These include deterring and defeating Russian or North Korean aggression; countering terrorism; securing loose weapons of mass destruction (WMD), including from the collapse of WMD-armed states; aiding

partners in countering insurgency and internal instability; and responding to crises abroad. Some of these would require large-scale, prolonged troop commitments, and planners must prepare for multiple overlapping contingencies.

Complicating these challenges is the reality that different contingencies represent qualitatively different operational problems. As Army Chief of Staff General Mark Milley has stated, "As America, we have no luxury of a single opponent. We have to be able to fight guerillas and terrorists all the way up through nation-state militaries."[3] Training and equipping a force for these diverse challenges is not a simple task. The U.S. experience in Iraq and Afghanistan shattered the naïve belief in "lesser includeds," that a military prepared for nation-state war could succeed in "operations other than war." Yet remnants of this flawed paradigm persist in

the language used to describe ground warfare. Irregular … unconventional … hybrid … asymmetric – these are adjectives U.S. strategists all too frequently apply to warfare that does not play to U.S. strengths. Yet military planners should always expect adversaries to avoid U.S. strengths and capitalize on U.S. weaknesses. Such is the nature of warfare. Irregular, unconventional, hybrid, and asymmetric war are not special kinds of war distinct from the "right" way to fight. They are war. As Iraq and Afghanistan demonstrated, militaries discount them at their peril.

Adversaries have a broad array of potential strategies at their disposal to accomplish their political aims, from terrorism to insurgency to combined-arms maneuver warfare. Just as the guerrilla tactics U.S. forces faced in Iraq and Afghanistan were not new but ages old, many of the strategies adversaries use on the battlefields of tomorrow may look like the challenges of yesterday. Whether it is Russian forces in the Ukraine or Islamic State militants in Iraq, seizing terrain by direct force remains an effective tool for would-be aggressors, and one the U.S. military must be prepared to counter. Threats to U.S. interests can come from instability and disorder or from enemies attempting to create or extend an unfavorable order. The U.S. military must be prepared to address both kinds of threats; to seize, control, and defend terrain; and to build a favorable security order conducive to American interests.

As they prepare for these challenges, U.S. ground forces must be mindful of important ways in which the operating environment for ground forces is changing: the increasing momentum of human interactions; the democratization of war; and increasing lethality in ground combat.

The Increasing Momentum of Human Interactions

While wars may be fought with bullets and bombs, they are fought by people in a violent clash of wills. A confluence of factors – urbanization, globalization, resource stresses, and information technology – is increasing the volume and speed of human interactions. The result is a shift not only in the physical landscape of war but, even more importantly, the social landscape in which war occurs.

Urbanization

Urban warfare is likely to be a larger component of future wars for the simple reason that there are more people on the planet living in denser urban areas than ever before. The Earth's population is expected to grow from 7.3 billion today to over 9 billion by 2040. Not only is the total population growing, it is becoming increasingly urbanized. The majority of people today live in urban areas; by 2040, two-thirds of all people will live in cities, many of which will be located in coastal areas. The number of "megacities" with populations over 10 million is expected to rise dramatically from 23 today to 37 by 2025, a 60 percent increase in just 10 years.[4] (To get a sense of scale of the challenge of military operations in megacities, Baghdad has a population of "only" 6.5 million.)

Not all military operations will be conducted in urban areas. Remote regions, like the mountains of Afghanistan, the deserts of Somalia or Yemen, or the jungles of Central Africa, will continue to be attractive hiding places for insurgents and terrorists looking for safe havens. Many of the challenges of disorder will continue to come from disconnected regions of the globe that are not integrated with the global political economy. However, key terrain increasingly will be urbanized and the scale of cities will be larger, making preparing for urban operations an essential component of military readiness.[5]

U.S. Marine Corps, Gunnery Sgt. Rome M. Lazarus

With terrain becoming increasingly urbanized, preparing for operations in such an environment will be a critical component of military readiness. Here, Marines with tank platoon, Battalion Landing Team 2nd Battalion, 1st Marine Regiment, 11th Marine Expeditionary Unit, fire the M256 smoothbore gun of an M1A1 Abrams tanks on static targets during Realistic Urban Training Marine Expeditionary Unit Exercise 14-1 at Fort Hunter Liggett, California, in March 2014.

Globalization, Resource Stresses, and Migration

Just as the number of people living in cities is increasing, the interaction between people around the globe is growing as well. Conflicts or humanitarian crises in one region can quickly spill across borders, sometimes with far-reaching dramatic effects, as we see today in the impact of the Syrian civil war across Europe.

While broad global trends in well-being are positive, with increasing health and declining global poverty and rates of violence, specific conflicts still may cause dramatic human suffering.[6] Most of the population growth and urbanization will happen in less developed areas, further taxing populations and economies that are already under stress. Environment stresses, resource scarcity, state

collapse, or wars may exacerbate these challenges. The effects of these destabilizing influences may be felt across borders and even across oceans through transnational terrorist or criminal networks, refugees, or media images of human suffering, all of which may spur a desire for intervention. Even if military tools are inadequate to address the root causes of these problems, U.S. ground forces nevertheless may find themselves conducting military operations in areas beset by many of these challenges.

Non-Traditional Media

These increases in the physical interactions between people are overlaid with a new digital infrastructure that connects people in ways never before possible in human history. A mere 25 years ago, information flows in human societies were

relatively centralized, even in democracies. In the United States, television viewers could get their nightly news from CBS's Dan Rather, NBC's Tom Brokaw, or ABC's Peter Jennings. Print options were slightly larger, but still confined to only a handful of truly national newspapers and magazines. Today, the traditional fourth estate has been replaced with a sprawling jungle of articles, blog and wall posts, tweets, photos, and viral videos. Anyone with access to the internet can spread his or her message, and ordinary people can become famous (or infamous) overnight. The result can be a dizzying pace of information, with governments struggling to keep up as decisionmakers are whipsawed by the crisis of the day.

THIS DEMOCRATIZATION OF INFORMATION DRAMATICALLY CHANGES THE SOCIAL LANDSCAPE IN WHICH CONFLICT OCCURS.

This democratization of information dramatically changes the social landscape in which conflict occurs.[7] War depends upon two or more social groups in opposition – an "us" vs. "them." In the new media landscape, any digitally connected person can now shape the narrative of a conflict. The next viral movement is only a hashtag away. The intangible nature of social identity and conflict narratives makes it tempting to dismiss them as a secondary consideration in war. The U.S. military has long treated information operations (previously called psychological operations) as a marginal concern. But this would be a mistake. Social identity is the engine that fuels conflict. Bullets do not fire on their own. Tanks and bombs are merely tools; wars are fought by people.

The Human Terrain is Key Terrain in Ground Warfare

The increasing momentum of human interaction has important implications for ground combat. Ground wars of all types – offensive, defensive, and stability operations – increasingly will be fought among the people, physically and digitally.

A central lesson from the U.S. experiences in Iraq and Afghanistan is the peril of ignoring the human dimension of conflict. The U.S. military entered Afghanistan and Iraq well-practiced at out-maneuvering and destroying enemy military formations and performed those tasks admirably. It was less prepared, however, for the struggle to win the support of the people living on the ground it had ostensibly conquered. Yet the physical and human terrains are intimately linked in land warfare. As Army Chief of Staff General Mark Milley stated recently:

> War is an act of politics where one side tries to impose its political will on the other, and politics is all about people, and people live on the ground. We may wish it were otherwise, but it is not. Wars are ultimately decided on the ground where people live.[8]

To divorce ground combat from the people – including civilians – among whom armies fight is to ignore the fundamental *raison d' être* for land warfare. While militaries may occasionally perform short-duration raids on land to capture high-value individuals or seize loose WMD, most ground campaigns will be fought to change the political end state of a piece of territory and its occupants. Establishing a favorable political order conducive to American interests is effectively impossible without the support of the people living on the ground. This is not to suggest that the violent aspects of warfare somehow do not matter – far from it. It is violence that separates war from other means of political conflict. Rather, it is the acknowledgment that war is a contest between people, not hardware. The tools of war – tanks, missiles, bullets, etc. – are important, but destroying them alone does not necessarily result in victory.

Acknowledging this reality, that the destruction of the enemy's military capabilities is a necessary prerequisite to a political end but not an end in itself, means that violence in war must be modulated first and foremost to support the war's desired political end state. Battles fought successfully against enemy hardware but bungled in the human domain could easily undermine the

long-term aims of the conflict. Pacifying and securing the local population is not the same as persuading them to support a political settlement, although it may be a necessary step toward doing so.

THE DESTRUCTION OF THE ENEMY'S MILITARY CAPABILITIES IS A NECESSARY PREREQUISITE TO A POLITICAL END BUT NOT AN END IN ITSELF.

Yet American military thinking often gives the human domain of conflict short shrift. The recent strategy document *Strategic Landpower: Winning the Clash of Wills,* published jointly by the Army, Marine Corps, and Special Operations Command, states:

> War is inarguably the toughest of physical challenges, and we therefore tend to focus on the clash and lose sight of the will. In fact, the neglect or misjudgment of population-centric considerations in U.S. strategic calculations is easily documented. Time and again, the U.S. has undertaken to engage in conflict without fully considering the physical, cultural, and social environments that comprise what some have called the "human domain."[9]

In all ground operations, the U.S. military must think equally about the human dimension of conflict as it does the kinetic aspects of destroying enemy forces.[10] Terrain cannot be effectively controlled until the people living on that terrain have agreed — admittedly reluctantly if they have been defeated in combat — to the future political order. Consideration of the human dimension of conflict cannot be something that is deferred to a later phase of fighting or relegated to a second-tier status. It must be integral to campaign planning and execution from the beginning. As the physical and digital landscape in which people interact evolves, the U.S. military's ability to operate in that space must continue to evolve as well.

a deeper point: Information technology has fundamentally altered public transparency over police behavior.[11]

The same dynamic will exist in military operations. While there have been incidents in recent conflicts, such as Koran burning or urinating on corpses that have had wider ramifications, the day-to-day interactions between U.S. troops on the ground and host nation populations have been relatively localized to that home or village. A world where every action and inaction of Soldiers and Marines on the ground is recorded and spread via social media is a radically different social environment. A misstep that previously might have inflamed a village now could inflame a country. One negative interaction can easily overshadow tens of thousands of positive interactions; a perceived slight or disrespect toward one person can become a symbol of perceived U.S. attitudes toward an entire population. In a world where information spreads virally and organically over social media, the U.S. military could find itself caught flatfooted by one mistake by a private on the ground that changes a population's attitude overnight toward the U.S. military's presence.

Radical transparency will also force the U.S. military to rethink operational security practices for forces operating among populations. The standard practice of troops publicly displaying nametags and unit patches on military operations poses a significant force protection risk in a world where so much personal information is available online. As hacktivists have "doxxed" police and security officials (including the CIA director) by publicly releasing personal information, such as their home address, phone number, and names of family members, U.S. troops similarly could be at risk.[12] Special operations forces have long operated under the assumption that personal identifying information is a hazard, exposing them to potential reprisals from terrorists, a common-sense force protection measure that conventional forces should adopt.

Connectivity Levels the Playing Field

Smartphones in the hands of everyday citizens not only empower people to share information, but also to take action. People can easily organize in ad hoc social movements and networks in ways that would have been far more difficult in a pre-digital era. Smartphones and social media have been key catalysts in empowering citizens in protest movements in the Arab Spring, various "color revolutions" around the globe, and protests in the United Kingdom and the United States.

In some cases, technology can give protestors an information advantage even over governments. In 2011, London rioters used decentralized communication over BlackBerry messenger networks to share information about police barricades, allowing them to circumvent police checkpoints and loot unprotected areas. Communication and coordination among rioters was entirely decentralized and organic, giving them more accurate real-time information about changing events on the ground than the police. Police were further challenged in that there was no central communications node to shut down without taking down the entire London BlackBerry network.[13]

MILITARIES WILL BE HARD PRESSED TO HIDE THEIR MOVEMENTS IN A WORLD OF RADICAL TRANSPARENCY.

Similarly, ad hoc networks of likeminded individuals could swarm military forces, disrupting their movements via digitally-empowered "smart mobs" on landing zones or roads. Unarmed mobs could incite military forces to respond, all the while filming their actions for broadcast. Militaries will be hard pressed to hide their movements in a world of radical transparency, and greater connectivity will enable enemies to rapidly organize to attack U.S. forces.

States also have access to information technology tools and can use them to significant effect.

U.S. ground forces have enjoyed sanctuary from air attacks, but that could change with the proliferation of drones. Marine MV-22B Ospreys from Special-Purpose Marine Air-Ground Task Force Crisis Response-Africa departed Mihail Kogălniceanu Air Base, Romania, with a platoon of Marines from the Black Sea Rotational Force to support a multilateral training exercise during Platinum Eagle 15 in May 2015.

States can deploy surveillance tools to harness the vast amounts of data created from digital communications as well as location data from GPS devices. The old surveillance problem of a lack of information has been replaced by a new problem, however: sifting through the deluge of data to find relevant information about specific threats. States also can leverage information technology and social media for propaganda purposes. Russia has reportedly deployed Twitter bots to swamp social media with pro-Russian propaganda.[14]

In general, states will likely continue to have access to more powerful tools for gathering data and spreading their message than non-state groups or individuals. However, these technologies increase state capabilities only marginally, while the connectivity afforded by social media increases the capabilities of non-state groups significantly.[15] In terms of relative power, non-state groups and individuals gain more from the widespread availability of information technology.

The Democratization of Destruction

In addition to more capable tools for organizing and spreading information, non-state groups and even individuals are gaining access to increasingly capable tools of destruction.[16] Advanced military-grade weapons are proliferating outside state control at an increasing rate, spurred by state sponsorship of non-state actors or by state collapse, such as in Libya or Syria. Tens of thousands of extremely lethal ATGMs now litter the Middle East and North Africa, and have been widely used by Syrian rebels. Increasingly sophisticated rocket propelled grenades (RPGs), heavy machine guns, and MANPADS are similarly making their way into the hands of non-state actors.

Improvised weapons are becoming increasingly dangerous as emerging technologies open up new

avenues for delivery. Improvised explosive devices (IEDs) took a heavy toll on U.S. forces in Iraq and Afghanistan. Propane, fertilizer, and homemade explosives were used for IEDs, in addition to repurposed artillery and mortar shells. On rare occasions, Iraqi insurgents used industrial chlorine as a crude chemical weapon, although with limited effectiveness.[17] Emerging drone and ground robotic technologies, however, are expanding the means by which improvised weapons can deliver devastating attacks. U.S. troops have had to contend with a world where IEDs lay in hiding, waiting to be detonated by the enemy or triggered by victims. In the future, IEDs will come looking for U.S. forces.

The widespread proliferation of drones places aerial surveillance and limited attack capabilities in the hands of less sophisticated states, non-state groups, and even individuals.[18] Over 90 countries and non-state groups already have drones, and 30 countries have or are developing armed variants.[19] Pakistan, Iraq, and Nigeria have joined the ranks of states possessing armed drones. Hezbollah, Hamas, the Islamic State, and various Libyan rebel groups all have access to unarmed drones, and Hamas has released video footage of what appears to be an armed drone. Low-cost drones have been used on all sides of the Ukrainian conflict for surveillance, battle damage assessment, and spotting for indirect fires.[20]

IN THE FUTURE, IEDS WILL COME LOOKING FOR U.S. FORCES.

Equipped with explosives, drones could act as flying IEDs, swarming U.S. forces and bases from the air. GPS-guided drones could fly entirely autonomously, without need for communication with human controllers, eliminating communications jamming as a countermeasure. While such drones would still be susceptible to GPS jamming, drones that used inertial navigation or visual guidance would not. Off-the-shelf image recognition software could be used to guide a swarm of autonomous drones against well-known landmarks, such

as government buildings or public spaces.[21] Because these drones could operate entirely autonomously, they dramatically expand the destructive capabilities of small groups or even a single "lone wolf" attacker.

Swarming drone attacks could take away the sanctuary from air attacks that U.S. ground troops have enjoyed for over a generation. Even if American aircraft still dominate at 30,000–60,000 feet, at the level of the grunt on the ground, the era of American air superiority may be coming to an end.

AT THE LEVEL OF THE GRUNT ON THE GROUND, THE ERA OF AMERICAN AIR SUPERIORITY MAY BE COMING TO AN END.

Ground robots, while not as sophisticated or widely proliferated as drones, also are already in the hands of non-state actors. Iraqi Shiite militias have reportedly deployed ground robots equipped with cameras and light machine guns.[22] Enemies could use swarms of self-driving cars laden with explosives to launch precisely-timed waves of attacks against U.S. bases, without requiring suicide bombers.

These increases in destructive capabilities are augmented by commercially available tools to contest the electromagnetic spectrum and cyberspace. Anyone can purchase low-cost radio and GPS jammers online.[23] Individuals and criminal networks already employ computer malware. The most capable cyber tools are likely to still come from states, but once those tools are out in the open, anyone can pick apart and reverse-engineer the software. While Stuxnet had a specific target, its source code is now widely available, an open-source weapon that provides a blueprint for others on how to conduct similar attacks.

Information technology can also enhance destructive capabilities indirectly by sharing tactics, ideology, and even financing. Syrian rebels have uploaded scores of videos of attacks online, both as

propaganda and as a template for other attackers. The Boston Marathon bombers allegedly learned how to make bombs from the al Qaeda online magazine *Inspire*.[24] The Ukrainian government has crowd-sourced funding for do-it-yourself drones.[25] Globally, the Islamic State operates even more decentralized than al Qaeda, less a network than a movement that is intended to inspire lone wolf attackers in countries around the globe. These events may point to a trend in the atomization of conflict. As Western governments have become more effective in disrupting terrorist networks, decentralized movements may be on the rise. Israel has seen a recent spike in what appear to be lone wolf attacks on Israeli soldiers and citizens, perhaps inspired in part by media attention of like-minded attacks but not centrally organized.

In the future, information technology could enable not only the spread of ideas but also destructive capabilities directly through 3D printing. 3D print-ers have already been used to build functioning homemade firearms, including plastic guns that can evade metal detectors. While these guns currently are not as reliable as industrially-built firearms, over time their effectiveness could improve through better designs, materials, and more precise 3D printers.

Less-Capable Actors May Achieve Temporary Overmatch against U.S. Forces

Together, the democratization of information and destructive capabilities will empower less capable states, non-state actors, and even individuals to contest U.S. forces on land, in the air, in the elec-tromagnetic spectrum, and in cyberspace. U.S. forces will still have advantages in technology and training, but a more level playing field will mean more opportunities for non-state groups to achieve temporary overmatch against U.S. forces. This may increase the potential frequency and lethality of attacks like those U.S. forces faced in Wanat, COP Keating, Camp Bastion, and elsewhere, where insurgents were able to temporarily overwhelm U.S. forces and cause significant casualties.

Non-state groups may even have the upper hand in the influence domain, the evolving landscape of traditional and social media that is used to influence public opinion. U.S. military forces will be hard-pressed to even fully track the deluge of information on social media, much less digest it and deploy effective counter-messaging. The Boston Police Department, for example, is still sifting through Twitter messages sent immediately after the Boston marathon bombings to see if there is information that could have been used to help find the bombers earlier.[26] This task will be even harder in foreign countries where U.S. forces have to navigate not only unique hardware and software infrastructure, but also foreign languages, cultures, social networks, and informal power structures. Automated data processing tools may help some-what, but are not nearly sophisticated enough to be able to parse human language, especially internet shorthand and slang, for meaning to understand message content.

Addressing the Full Spectrum of Potential Threats

While many of these changes in warfare empower non-state groups, this does not mean that they are the only threats U.S. ground forces should prepare for. Major nation-states will still be able to field larger numbers of forces with more modern-ized equipment, trained to a higher standard, and operating cohesively in larger units. Russia in par-ticular is modernizing its military forces with more sophisticated tanks, fires, and electronic warfare capabilities. The threat posed from sophisticated nation-state militaries is significant and requires serious attention.

The key concept isn't that threats from non-state groups (sometimes operating with state spon-sorship) are more dangerous than those from nation-states, but rather that non-state groups can still employ significant lethality on the battlefield and are a qualitatively different threat. U.S. forces cannot afford a return to the pre-9/11 era when training and equipping focused principally on nation-states, with other threats considered lesser includeds. U.S. forces will need to train across the full spectrum of challenges.

This is particularly important because nation-states can "play down" the spectrum of conflict. Russia is effectively using proxies and exploiting "gray

U.S. ground forces will need to update their tactics and train to prepare against a modernized Russian military, as many mid- and junior grade officers and NCOs lack experience in large-scale combined arms maneuver warfare and fires. Here, Marines with India Battery, Battalion Landing Team 3rd Battalion, 1st Marine Regiment, 15th Marine Expeditionary Unit, prepare to receive a fire mission during MEU Exercise 14 aboard Camp Pendleton, California, in November 2014.

zones" of conflict in the Ukraine today. It is well within their means to adopt the guerrilla tactics of well-armed non-state groups if it is useful. This means that even in a conflict against a nation-state, enemies will still be able to employ significant lethality after the U.S. military has destroyed major military combat capabilities. The U.S. military will need to be prepared to defeat these threats. After seizing ground and destroying the enemy's major military units, U.S. forces cannot simply call "ENDEX" (end of exercise). The unfortunate reality is that, in many conflicts, seizing ground may be the equivalent of merely grabbing hold of the hornet's nest.

> IN MANY CONFLICTS, SEIZING GROUND MAY BE THE EQUIVALENT OF MERELY GRABBING HOLD OF THE HORNET'S NEST.

Increasing Lethality in Ground Combat

The increasing momentum of human interactions and the democratization of war will change the future operating environment in significant ways. These changes are already unfolding based on technology that exists today and is rapidly proliferating around the globe. Emerging technologies point to an even larger paradigm shift in ground warfare on the horizon, however. The era of precision-guided weapons, which has enabled the tremendous effectiveness of U.S. airpower, is now proliferating in a number of ways. New actors are gaining access to precision-guided weapons, and the technology itself is expanding into new areas of ground combat. The result could be dramatic increases in the lethality of ground combat that the U.S. military must begin to prepare for now.

Disruptive Change in War

On the morning of July 1, 1916, 11 divisions of British troops marched toward Germans entrenched north of the Somme in France, hoping to break the German lines. By the day's end, 20,000 British men lay dead, their largest single-day loss in the war. Sixty percent of all British officers in the advance were killed. Their deaths resulted from a mismatch in tactics and technology. The British were still employing infantry tactics from a previous era, but the invention of the machine gun had changed the rules of the game. While the British had used an early machine gun, the Maxim gun, to great effect in colonial wars around the world, they had not yet faced an adversary equipped with machine guns as well. Their tactics were outdated and ineffective, and the result was slaughter. This single day mirrored the larger pattern of the Battle of the Somme and World War I as a whole. New technologies such as machine guns and railroads changed the rules of the game in ways that militaries were unprepared for, and the result was a protracted, bloody stalemate.

Ground War Inside Anti-Access Areas

While much of DoD's focus on A2/AD capabilities is oriented toward China, where the United States would have to project power into a largely maritime environment, Russian A2/AD capabilities are likely to pose a more urgent threat. From Crimea to the eastern Ukraine to Syria, Russia has grown increasingly assertive, a declining nation desperate to show it remains a Great Power. Russian military capabilities remain potent, however, and countering them will require reinvestment in ground force modernization and warfighting concepts.

THE SLOW, DELIBERATE "PEEL THE ONION" APPROACH THAT DOD HAS ADOPTED THUS FAR TO COUNTER A2/AD CAPABILITIES IS INADEQUATE IN EUROPE.

A war fought against Russian A2/AD capabilities would be fundamentally different than one fought against China, because the dominant domain of warfare in Europe will be on the ground. This changes the counter-A2/AD problem in a number of ways. First, defeating aggression on the ground is harder than defeating an amphibious invasion. Russia does not have to load its army onto vulnerable transport ships to invade its neighbors. Second, speed would be of the essence in mounting an effective defense. The slow, deliberate "peel the onion" approach that DoD has adopted thus far to counter A2/AD capabilities is inadequate in Europe, where it would risk ceding ground to an aggressor, who could then seek a negotiated solution with redrawn borders.

The United States must therefore be prepared to defeat aggression on the ground within range of an adversary's still-extant A2/AD capabilities. This is a dramatic shift for U.S. ground forces, who have fought for half a century under the protective umbrella of U.S. airpower. In ground combat inside A2/AD areas, however, U.S. ground forces could find themselves fighting within range of an enemy's missiles that threaten U.S. aircraft and bases. Yet ground forces will still need to halt an enemy's advance, even while operating with reduced air cover and potentially subject to enemy air attacks.

U.S. Army, Staff Sgt. Teddy Wade

Precision-guided weapons have the potential to dramatically change infantry combat in the coming decades, requiring new training and tactics. A U.S. Army Ranger from Bravo Company, 2nd Battalion, 75th Ranger Regiment, keeps his sight on a target with an M240L machine gun during a company live fire training at Camp Roberts, California, in January 2014.

Russia is also improving its ability to deliver devastating fires on ground forces, both conventionally and in tactical nuclear weapons. In the Ukraine, Russia has deployed advanced conventional fires to great effect, destroying whole Ukrainian battalions in minutes through a combination of top-attack and thermobaric weapons.[27] Russia is also evolving its nuclear doctrine, exploring limited use of tactical nuclear weapons.[28]

U.S. ground forces will need to modernize their equipment, update their tactics, and train rigorously to prepare against this modernized Russian threat. Increased training is especially critical since large-scale combined-arms maneuver warfare and fires is not a skill that most current mid- and junior-grade officers and NCOs have experience with. Doctrine will similarly need to evolve, and both the Army and Marine Corps are exploring concepts for distributed and dispersed operations in anti-access areas.[29]

The Precision-Guided Munitions Revolution Comes to the Infantry

Changes are also coming to the world of infantry combat, as miniaturization brings precision-guided weapons into the hands of the infantry soldier. Today, early signs of a new revolution in infantry combat are apparent, one that could potentially be as big as the introduction of the machine gun. Improvements in computer processors and sensors are enabling smaller, lower-cost, and more ruggedized electronics. These, in turn, are bringing the same game-changing advances in precision-guided weapons that have revolutionized American airpower down to the squad level.

The beginnings of this revolution can be seen across a range of first-generation precision-guided infantry weapons. While these weapons have limitations in their current form, such as weight and

cost, they hint at the potential of what is to come. Just as early arquebus matchlock guns had limitations but were a sign of the firearms revolution that followed, these first-generation weapons show the nascent potential of precision-guided weapons in ground combat:

The **Switchblade** is a small, single-use, anti-personnel drone. At only 5.5 pounds, it can be easily carried in a rucksack on patrol. Launched from a tube, it can stay aloft for up to 10 minutes, sending video footage down to troops on the ground. The Switchblade does more than intelligence, surveillance, and reconnaissance (ISR), however. Its nose incorporates an anti-personnel warhead. Once the Switchblade operator designates a target, the Switchblade moves into an attack profile where it dive bombs the target and detonates its warhead from only a few feet away, killing the enemy. The Switchblade – and similar future lethal miniature aerial munitions (LMAMs) – brings organic close air support to the infantry squad.

The **XM25 Counter Defilade Target Engagement System** takes away the enemy's most valuable defensive asset in a firefight: cover. The XM25 is a handheld grenade-launcher that incorporates a laser rangefinder to determine the distance to an enemy hiding behind cover. The XM25 gunner then fires the weapon just above or around the rock, building, or other piece of cover that is hiding the enemy. The XM25 round incorporates electronics that enable it to precisely determine the distance of flight. Just past the enemy's cover, the grenade detonates, killing the enemy. Effectively, the XM25 gives infantry troops the ability to shoot around corners.[30]

DARPA's **EXtreme ACcuracy Tasked Ordnance (EXACTO)** program has developed a laser-guided .50 caliber bullet that can maneuver mid-flight to hit a laser-designated target. This allows extreme accuracy at long range, including against moving targets.[31]

The TrackingPoint **Precision-Guided Firearm** has a fire control system built into the rifle that times the release of the bullet to counteract the effects caused by the shooter's movement. The result is that an untrained shooter can hit within a half-inch

of his or her aimpoint at 1,000 yards, nearly an order of magnitude more accurate than world-class shooters. Unlike the DARPA EXACTO laser-guided round, the "smarts" of the TrackingPoint Precision-Guided Firearm are in the rifle, not the bullet. This means that the bullet itself is unguided once released and cannot adjust mid-flight to hit maneuvering targets. However, the advantage to this approach is that the cost per shot is extremely low because the rifle uses ordinary bullets. All of the electronics are in the gun, which is reused for multiple shots, rather than in the bullet, which is expended.

The **Pike missile** is a hand-launched miniature laser-guided missile. Weighing under 2 pounds and with a range of over 2 kilometers, the Pike dramatically improves the effective range of an individual soldier.[32] Launched from the hand-held EGLM or M320 standalone grenade launchers (the M320 can alternatively be carried as an attachment underneath an M4 rifle), the Pike missile puts unprecedented range, precision, and lethality in the hands of an individual soldier.[33]

Collectively, these nascent handheld precision-guided weapons represent just the beginning of possible future weapon designs. Most importantly, much of the underlying technology that enables this precision is commercially driven. Precision-guided weapons that rely on tightly-packed sensors and microprocessors in the round itself, such as the XM25, EXACTO, or Pike, are likely to be costly and require advanced state development. Weapons similar to the Switchblade drone or the Tracking-Point rifle, on the other hand, leverage technology that is likely to be widely available.

This suggests that while U.S. troops may see precision-guided infantry weapons first, they may not have a monopoly for long. Just as the British had to adapt to an era where the enemy too had machine guns, U.S. troops should begin thinking now about infantry tactics in a world where the enemy has squad-organic ISR, close air support, and long-range precision-guided weapons at its disposal. The result is likely to be engagements at much greater distances with even greater lethality. If U.S. troops can be found, the enemy is likely to be able to hit them. This places a premium on hiding through camouflage, concealment, and deception. However, ubiquitous information technology and

radical transparency will make hiding even more challenging, especially in urban environments.

Experimentation is Key to Innovation

Just as experimentation through exercises such as the Louisiana Maneuvers in the interwar period between World War I and World War II was central to discovering the best tactics for using tanks, experimentation will be key to adapting to a more lethal ground combat environment. Innovation cannot be directed from the top when the best tactics to fight in this new operating environment are unknown. Nor can innovation occur in canned unit qualification exercises, where the "right" tactics are already known. Innovation must come from the bottom up by letting warfighters try new tactics and fail in a safe environment before learning lessons the hard way on the field of battle.

> EXPERIMENTATION WILL BE KEY TO ADAPTING TO A MORE LETHAL GROUND COMBAT ENVIRONMENT.

Continuities in Ground Warfare

Even as the future operating environment becomes more contested, transparent, and lethal for U.S. forces, many other elements in ground warfare are unlikely to alter. The causes of warfare, which are as old as human nature, are not likely to change; nor is the inherent nature of warfare as full of friction and uncertainty. Radical transparency will not peel away the fog of war. Militaries will have access to large amounts of information, but it will never be complete, will invariably include conflicting information, and may be infused with enemy deception. Militaries that do not train leaders to make decisions amidst conditions of uncertainty will find themselves paralyzed, drowning in a deluge of data but still mired in the fog of war.

Similarly, while an advantage in information can help find the enemy first, enabling U.S. forces to outmaneuver opponents and seize the initiative, information alone cannot lead to success. Information is not protection, mobility, or lethality. It can enhance those but cannot replace them. Non-physical weapons such as electromagnetic warfare or cyber tools will also play a critical role on the battlefield, but they will not negate or usurp physical force. The physical and the digital will become increasingly intertwined as the internet colonizes the battlefield and software "eats the war," but the end state of these contests will remain the threat or reality of violence.[34]

> INFORMATION ALONE CANNOT LEAD TO SUCCESS. INFORMATION IS NOT PROTECTION, MOBILITY, OR LETHALITY.

Just as physical violence will remain an essential component of war, physics will also limit ground warfare in important ways. There is currently no easy answer to the protection-mobility tradeoff that plagues both mounted and dismounted forces. For ground vehicles, the burden of armor has consistently grown heavier, reducing off-road mobility and restricting movement. For infantry troops, the

Both mounted and dismounted forces face a protection-mobility tradeoff: for ground vehicles armor has become heavier, which both reduces off-road mobility and restricts movement. In December 2013, at Red Cloud Range at Fort Steward, Georgia, an M1A2SEP Abrams tank from Company D, 1st Battalion, 64th Armor Regiment "Desert Rogues," 2nd Armored Brigade Combat Team, 3rd Infantry Division, conducts Table V, in which the crew attempts to qualify on the vehicle through numerous targets and maneuvers.

tradeoff between armor or other capabilities that add weight and mobility is even more stark. The basic weight-carrying ability of an infantry soldier has not changed dramatically since Roman times.[35] As a result, while technology has been able to give U.S. forces tremendous advantages over adversaries in the air and at sea, its ability to enhance the survivability of the dismounted soldier is limited. Any additional armor, weapons, sensors, radios, or other capabilities add weight, and each pound saps mobility. Infantry troops literally weigh the advantages of each new piece of gear (and often its accompanying batteries) against the loss in mobility.

While new technologies can improve protection and mobility, none on the horizon would fundamentally change the tradeoff mounted and dismounted forces currently face. Active protection systems

and other proactive protection measures to defeat incoming anti-armor threats could significantly enhance ground vehicle survivability, but they are unlikely to be effective enough to warrant eliminating armor entirely. For dismounts, exoskeletons would be a game-changer that could dramatically increase the weight troops could carry without sacrificing mobility.[36] Functional exoskeleton suits exist today, but their practical utility is limited by their endurance. While modest improvements in battery life are likely, the multi-day endurance that U.S. forces would desire for infantry operations is still a ways off.[37]

Finally, the low barrier to entry for ground combat will likely remain a constant for the foreseeable future. Unlike military operations in the air, at sea, or in space, where expensive platforms are needed just to gain entry to the fight, in ground combat

U.S. forces, although extensively engaged at the platoon and squad levels in Iraq and Afghanistan, did not require battalion, brigade, or division level coordinated fire and maneuver. In the future, large-scale exercises must be included in training. Marines with Weapons Company, 1st Battalion, 7th Marine Regiment, run to security positions after offloading from a CH-53E Super Sea Stallion helicopter during a mission in Helmand province, Afghanistan, in April 2014. The company's mission was to disrupt Taliban forces in Larr Village and establish a presence in the area.

no advanced technology is required to enter the battlefield. A fighter can grab an AK-47 and walk outside his front door and be in the fight. This significantly complicates the challenge of controlling terrain, since eliminating major military platforms is not enough to dominate the ground domain. This reality is unlikely to change.

Adapting the Force

U.S. ground forces must adapt to these emerging challenges by evolving their capability investments, training, doctrine, and policies. Some specific initiatives are included below, although this is by no means an exhaustive list.

Capability Investments

Significant capability areas for additional investment include those intended to counter advanced enemy weapons as well as capabilities to understand and compete in the evolving influence domain.

U.S. forces need active protection systems — both "soft" and "hard" kill systems — to help defend ground vehicles against increasingly lethal ATGMs

and RPGs. While active protection systems have limitations, they are an important component of holistic, layered vehicle protection. Counter-drone capabilities, both kinetic and non-kinetic, will also become increasingly important, including for on-the-move defense against enemy drones.

U.S. ground forces also will need to modernize their communications, electronic warfare, and fires capabilities to operate against modernized Russian ground forces. Investments that aid in concealing U.S. forces, such as protected communications on the move, jamming, decoys, and deception are particularly valuable to help U.S. forces operate within range of Russian artillery, which has shown great lethality in the Ukraine. Robotic scouts and decoys could be valuable in helping to find enemy forces first or undertake feints or deception operations, particularly because they could be sent on sacrificial missions.[38] Distributed operations in anti-access areas will also require protected, jam-resistant mobile communications so that widely dispersed forces can coordinate their actions.

WARGAMING AND EXPERIMENTATION IS CRITICAL TO TRYING NEW IDEAS AHEAD OF THE CRUCIBLE OF COMBAT.

New capability investments could also help U.S. forces monitor, understand, and respond in the influence domain. Narrative analytics could help U.S. forces understand the social context for warfare and sharpen U.S. messages to key populations.[39]

Training

Training will similarly need to adapt to these emerging challenges. While U.S. forces have fought extensively at the squad and platoon level in Iraq and Afghanistan, these fights did not require battalion, brigade, or division level coordinated fire and maneuver. Future conflicts could require combined arms maneuver warfare conducted on these scales, however, and large-scale military exercises must be an important element of training.

U.S. FORCES MUST TRAIN TO SIMULTANEOUSLY DOMINATE ENEMIES PHYSICALLY THROUGH FIREPOWER AND IN THE INFLUENCE DOMAIN.

At the same time, training in kinetic operations cannot neglect the parallel fight for the human terrain. U.S. forces must train to simultaneously dominate enemies physically through firepower and in the influence domain. Training also must incorporate the viral nature of social media and citizen reporters, preparing troops for a world of radical transparency.

Doctrine and Policies

Doctrine and policies likewise must evolve. The Army and Marine Corps are already working on distributed and dispersed operations inside anti-access areas, and these concepts will need to continue to mature. The ground forces have an important opportunity now, as they transition from a decade-plus of counterinsurgency operations, to solidify the role of the human domain of warfare as an essential component of land warfare. Policies on operational security and publicly displayed personally identifying information for troops should evolve to a world of radical transparency. Policies that restrict the information U.S. troops post on social media are prudent, but are undermined by the public display of sensitive information on every Soldier's and Marine's uniform. Finally, tactics and doctrine will need to adapt to a world of increased lethality at the squad level, potentially in ways that cannot be foreseen today. In all of these challenges, wargaming and experimentation is critical to trying new ideas ahead of the crucible of combat.

The Need for Agility

These are not the only challenges U.S. ground forces will face. Even as they adapt to new problems, they will need to retain old skills as well. There undoubtedly are also new challenges that cannot be foreseen today, or solutions that seem appropriate but for one reason or another fall short on the battlefield. This points to the broader need for a force that is agile enough to adapt to a range of challenges.

U.S. Marine Corps, Lance Cpl. Aaron S. Patterson

Ground forces will need to retain skills in a variety of infiltration methods. Gunnery Sgt. Eddie Myers, parachute safety officer assigned to Detachment 4th Force Reconnaissance Company, parachutes from a UH-1Y Venom helicopter dur-ing airborne insertion training aboard Marine Corps Air Station Kaneohe Bay, Hawaii, in June 2015.

Building Strategic Agility

Current trends can point the way to potential future challenges, but the character of future fights is anything but certain. The only certainty is surprise. Even if U.S. forces do their very best to adapt to emerging challenges, enemies will seek to attack U.S. forces with tactics and methods that minimize U.S. advantages. Asymmetry in tactics should be expected, not treated as an exception. And as the United States has experienced in Iraq and Afghanistan, enemy tactics will continue evolving to search for and exploit U.S. weaknesses.

To continue to succeed on a changing battlefield, U.S. forces must be more agile than the enemy. U.S. ground forces must be able to recognize and understand new challenges, experiment with solutions, and implement effective responses faster than the enemy. This is no small task for the world's

largest bureaucracy competing with decentralized movements that spread tactics via YouTube. While the U.S. military has vast resources at its disposal, its sheer scale can get in the way of agile responses to emerging threats.

DoD's track record of adaptation in Iraq and Afghanistan is less than inspiring. As Secretary of Defense Ashton Carter remarked in 2014, reflecting on the experience in Iraq and Afghanistan, "the Pentagon is ill equipped to address urgent needs that arise during wartime."[40] While the U.S. military eventually adapted its tactics, equipment, and strategy to fight in Iraq and Afghanistan, the process of doing so took years. Those delays cost U.S. servicemembers their lives. The Army and Marine Corps did not promulgate service-wide counterinsurgency doctrine until December 2006, three and a half years into the war in Iraq and five years into the war in Afghanistan. The United States did

MRAPS – A CASE STUDY IN ADAPTABILITY

IEDs emerged early as the signature weapon of the Iraq war. In June 2003, CENTCOM Commander General John Abizaid described IEDs as the "number one threat." By December 2003, they were responsible for roughly half of all U.S. combat-related deaths.[44]

The need for more heavily armored vehicles was also identified early on. In the summer of 2003, the Army rushed 200 up-armored HMMWVs to Iraq and began production of additional ones. Improvements in IEDs outpaced improvements in armor, however, and IED-related deaths increased.[45]

In February 2005, a Marine unit deployed to Iraq submitted an "urgent universal need statement" for MRAPs, which provided a much higher level of protection than up-armored HMMWVs.[46] However, it was not until two years later, in 2007, that the Pentagon began to move out expeditiously on procuring MRAPs.

Defense leadership clearly knew the value of MRAPs in providing additional protection. Senior military commanders testified before Congress that MRAPs were "up to 400 percent more effective than the up-armored Humvees in reducing injuries and deaths" and could "cut casualties by perhaps as much as two-thirds."[47] Despite this, both the Army and Marine Corps described MRAPs as an "unfunded requirement." Each service's acquisition priorities were hypothetical future combat vehicles that would not arrive quickly enough for the Iraq war, rather than MRAPs.[48]

Eventually, fielding MRAPs required the personal intervention of Secretary of Defense Robert Gates, who made them DoD's highest acquisition priority.[49] With the support of Gates and Congress, 10,000 MRAPs were fielded in a year and a half from 2007–2008.

These delays cost lives, however. In the intervening period from when the first urgent request for MRAPs hit the Pentagon until they were eventually fielded, IEDs accounted for 50 to 80 percent of all U.S. combat deaths.[50] Once fielded, MRAPs turned out to be even more effective than commanders had expected, by some estimates reducing IED-related injuries by four to five times relative to up-armored HMMWVs.[51]

An independent estimate by Christopher Lamb, Matthew Schmidt and Berit Fitzsimmons suggested that the two-year wait from 2005 to 2007 to begin fielding MRAPs resulted in an additional 1,600 American lives lost due to IEDs.[52] While the specific number is debatable, there is no question that if MRAPs had been fielded sooner, more American lives would have been saved.

not implement an effective counterinsurgency strategy matched with sufficient troop levels until 2007 in Iraq (four years into the war) and 2010 in Afghanistan (nine years into the war).

Vital equipment, such as mine resistant ambush protected (MRAP) vehicles, unmanned aircraft for ISR, and counter-IED technologies, was stymied by a sluggish acquisition system and a bureaucracy overly focused on future challenges at the expense of current ones.[41] As secretary of defense, Robert Gates criticized the Pentagon's prioritization of possible future wars over current ones as a disease of "next-war-itis."[42]

Necessary equipment eventually made it to the field only through the creation of standalone task forces and ad hoc organizations that reported directly to the secretary of defense (the MRAP Task Force, ISR Task Force, and Joint IED Defeat Organization {JIEDDO} for example). Other organizations and processes, such as the Joint Rapid Acquisition Cell (JRAC), Rapid Equipping Force, Joint Urgent Operational Needs, and Operational Needs Statements, eventually became vital avenues for fielding quick reaction capabilities, but they had to be created whole cloth to meet the needs of the wars.[43] Many of these processes and task forces were not created until well into the war and required the personal intervention of the secretary of defense. The JRAC was created in 2004, relatively early, but JIEDDO, the MRAP Task Force, and the ISR Task Force were not created until 2006, 2007, and 2008, respectively.

PRESENTING LEADERS WITH A CONTINUALLY SHIFTING ARRAY OF STRATEGIC CHALLENGES IN THESE ENVIRONMENTS WILL BE KEY TO INSTILLING AGILITY.

These delays in adapting to the wars, which occurred in areas of equipping, strategy, and resources, were the product of failures at multiple levels in DoD: military and civilian, operational and institutional, policy and acquisitions. Within these failures lies the blueprint for a more agile and adaptable DoD for the future, however. Tomorrow's wars will invariably require different solutions, but institutionalizing the processes that enabled adaptability in Iraq and Afghanistan will result in a more agile U.S. military that is able to respond to whatever challenges future conflicts may bring.

Strategic agility depends first and foremost on building agile and adaptable leaders. They must be supported, however, by acquisition processes that allow rapid technology refresh to keep pace with a fast-moving technology landscape. Similarly, warfighting concepts must evolve over time to adapt to new threats and opportunities on future battlefields.

Agile People

Strategic agility begins with people. To develop future leaders who can quickly adapt to new operational challenges or adjust to a changed strategic context, the ground forces must present them with a diverse array of problems in training. These must include not only different operational problems from a kinetic standpoint, but also different strategic situations and shifting human terrain, including among civilian populations and social media. Even as the ground forces refresh their skills on combined arms maneuver warfare, training exercises should not neglect the importance of winning the human terrain, a lesson that has been learned painfully in Iraq and Afghanistan. The U.S. military is the best trained in the world and has tremendous resources at its disposal, including training

facilities such as the National Training Center at Ft. Irwin, Joint Readiness Training Center at Ft. Polk, and Marine Corps Air Ground Combat Center at 29 Palms. Presenting leaders with a continually shifting array of strategic challenges in these environments will be key to instilling agility.

Education also has a vital role to play in building strategically agile leaders by helping to expose U.S. servicemembers to a wider set of ideas and cultures. This is particularly true of educational experiences outside of the U.S. military, such as existing programs for officers to pursue postgraduate degrees at civilian institutions. Much of the education lies not in the courses themselves but in exposure to different cultures and new ways of thinking, making education at civilian institutions especially valuable. This exposure to a broader set of ideas is particularly important at a time when military service comes from an ever-smaller subsection of the U.S. population.

While the U.S. military invests heavily in higher education for its officer corps, educational investment for enlisted servicemembers lags far behind. Just as continued education is expected of military officers, with opportunities for master's degrees and even sometimes doctorates, continued education should be expected of NCOs as they rise through the ranks, with associate and bachelor's degrees expected during an NCO's career progression. In the era of the "strategic corporal," NCOs who are better educated and aware of the broader strategic and political context for military operations are a critical enabler for success.

Agile Equipping

The wars in Iraq and Afghanistan exposed DoD's deliberate acquisitions process as too slow to respond to urgent wartime needs. Yet developing new major combat systems will inevitably take time. MRAPs could be rushed to the field only by leveraging existing designs used in South African mine-protected vehicles, but brand new fighting vehicles or tanks cannot be developed overnight. When the Army or Marine Corps procures a new tank, fighting vehicle, helicopter, or aircraft, they likely will have that weapon system in their inventory for decades. Thus, agile equipping will depend on reforms in both deliberate and rapid acquisitions.

The deliberate acquisition process should emphasize modularity, so that combat systems can be upgraded incrementally. Investments should emphasize "payloads over platforms" and "software over payloads," with major platforms seen as "trucks" that can be updated over time. (Of course, for the ground forces, sometimes the platforms will literally be trucks.)

INVESTMENTS SHOULD EMPHASIZE "PAYLOADS OVER PLATFORMS" AND "SOFTWARE OVER PAYLOADS."

This is particularly vital in digital technology, where the technology refresh rate significantly outpaces the DoD bureaucracy. Using commercial off-the-shelf or commercially-modified equipment, adversaries will often have the ability to contest U.S. forces in the electromagnetic spectrum and cyberspace, hindering U.S. troops' ability to communicate, pass targeting data, find the enemy, and conceal U.S. movements. Simply using the electromagnetic spectrum, much less dominating it, will depend upon a continuous campaign of innovation, experimentation, and technology upgrades to keep U.S. forces at the cutting edge of hardware and software. This is particularly important since capabilities like communications on the move to coordinate actions and pass targeting data are vital to success in warfighting environments of all types, from combined arms maneuver to stability operations.

Even if DoD builds optimally modular and adaptable equipment, it will still need rapid acquisition processes to respond to urgent and emerging needs. These processes will require giving geographic combatant commanders a stronger voice in Pentagon spending priorities. As Ashton Carter explained in a 2014 *Foreign Affairs* article on Pentagon reform:

> [T]he military services tend to prioritize investments in their own long-term modernization requirements – unlike the combatant commands, which are primarily concerned with immediate battlefield needs – and thus may not be best equipped to move quickly and take risks.[53]

Institutional mechanisms that give combatant commanders a seat at the table in shaping requirements, much like the Warfighter Senior Integration Group used by Secretary Gates, are critical to reorienting the bureaucracy toward near-term needs. As DoD institutionalizes rapid acquisition processes, it should extend the time horizon they cover to address emerging requirements that can be foreseen in the two to five year window as well, not only solutions that can be fielded in the next 24 months.[54] Unfortunately, DoD's deliberate acquisition process is generally too slow to field capabilities even within five years, necessitating a separate process.

Effectively responding to near-term needs requires more than the right processes, however. It also requires a shift in the mindset within DoD, especially if the solutions needed in the present aren't the same as those anticipated for the future. MRAP acquisitions moved slowly before Secretary Gates intervened in large part because DoD did not see them as the right vehicle for future wars beyond Iraq and Afghanistan. One defense analyst went so far as to describe them as a "million dollar kleenex."[55] Of course, many MRAPs were discarded after the wars, but in the interim they helped bring the strategic threat from IEDs under control.

The illogic behind opposing a critical, game-changing capability for an ongoing war because it may not be used in future wars is staggering. Vice President Joe Biden compared it to denying a request to building landing craft for the D-Day invasion because they would not be used afterward.[56] A military's purpose is to win wars, and a defense bureaucracy that so heavily prioritizes hypothetical future conflicts over ongoing wars that it is willing to forgo a potentially war-winning capability is a seriously dysfunctional institution. This dysfunction is largely baked into DoD's programming and budgeting process, however, since the military services control the modernization budgets and are largely oriented towards future needs.

Addressing near-term needs thus requires accepting the reality that some equipment needed today may not be used in future conflicts. Carter explained that getting key wartime capability solutions fielded required thinking of them as "consumable goods, more like body armor than satellites."[57] This shift in mindset is critical to remaining agile and adaptable to emerging challenges. Perhaps paradoxically, the best way to prepare for an uncertain future is to increase one's capacity to respond to emerging near-term challenges.

Agile Warfighting Concepts

Agile people and equipping are not enough; they must be supported by warfighting concepts that can adapt to changing operational and strategic needs. Just as the Army and Marine Corps had to re-orient their operational focus toward counterinsurgency to turn the tide in Iraq and Afghanistan, that same process of adaptation will invariably be needed in future conflicts, but for doctrinal shifts that cannot yet be predicted.

In order to anticipate these needs, the ground forces should implement a regular program of experimentation to explore new warfighting challenges and solutions across the spectrum of conflict. U.S. forces need a "New Louisiana Maneuvers" that challenges conventional thinking and doctrine to rapidly evolve warfighting concepts ahead of adversaries. Shifts in the operating environment such as radical transparency and handheld precision-guided weapons could so dramatically change ground warfare that they would call for entirely new concepts of operation. Experimentation has different incentives than unit qualification training, where commanders may not want to take risks or depart too far from accepted doctrine. Experimentation therefore should be a separate, ongoing effort that incorporates both new technologies and tactics.

Conclusion

As the U.S. ground forces reset from the wars in Iraq and Afghanistan and prepare for future challenges, they face a daunting task. They must prepare for a diverse array of missions against a wide variety of threats and potential adversaries, and in a security environment that is evolving in dramatic ways. It is prudent to adapt capability investments, training, doctrine, and policies to meet emerging challenges, but this is not enough. To succeed in an uncertain world, the United States needs ground forces that are inherently more agile and adaptable. They need to be prepared for the challenges we cannot yet anticipate today, or those we get wrong.[58]

Today's crop of Soldiers, Marines, and Special Operators have learned strategic agility the hard way, by finding themselves in situations in Iraq and Afghanistan that required innovative and creative solutions. The ground forces' challenge is to sustain this process of adaptation and creativity in peacetime. Presenting warfighters with a diverse array of training challenges and encouraging those who challenge assumptions is key to building strategic agility in the force. The ground forces need warfighters who are willing to ask uncomfortable questions, who challenge old ideas, and who take risks to do something different. Most importantly, they need to be supported by institutions that reward that creativity and incentivize outside-the-box thinking to novel problems.

The U.S. military its strategy, tactics, and equipment to meet the challenges of Iraq and Afghanistan, but it will have to evolve faster in future wars. Lengthy delays in adaptation could cost not only U.S. lives, but potentially mission success as well. However, the blueprint for future success lies in the missteps of the past. Not all of the specific tactics or equipment used in Iraq and Afghanistan will apply in future wars, but the process of responding to new challenges and adapting will undoubtedly be needed.

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