



# Near-Term U.S. Army Modernization

Buying What Is Available and  
Buying Time

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## Executive Summary

The U.S. Army is rapidly losing its competitive advantages in high-end combat. The ability to achieve tactical overmatch, that combination of superior systems, intelligence, combined arms tactics and command and control is under assault from adversaries who have spent decades developing capabilities and techniques specifically designed to counter areas of Army advantage. Recent conflicts have shown how far Russian conventional forces now exceed the capabilities of the U.S. Army in electronic warfare, long-range fires, tactical air defense and anti-tank systems. Of the 10 major capabilities that define warfighting superiority, by 2030 Russia will have exceeded the Army's abilities in six, will have parity in three, and the United States will dominate in just one. In the near-future, the Army may not only have to fight outnumbered but without its historic advantages in air and naval power for support and bereft of its communications, navigation and intelligence.

In addition, Russia and China are providing advanced conventional military hardware to a growing number of states which means that if the Army has to fight in the Middle East, Africa or Asia, it will face advanced Russian and Chinese equipment. The terrorist group ISIS has successfully employed Russian advanced anti-tank guided missiles against U.S.-made Abrams tanks operated by the Iraqi Army.

Today, the U.S. Army faces the proverbial "perfect storm" consisting of ever-increasing demands, ever-more capable threats, a shrinking force structure and continuing budget strictures. In this new world, the U.S. Army is at a high risk of being outnumbered, outgunned and outmaneuvered by prospective adversaries. A recent Heritage Foundation report downgraded the Army's military power from "marginal" to "weak."

**Investment in the near-term modernization of the U.S. Army is one of the few areas where the incoming administration can have an almost immediate impact on the state of the U.S. military. Increasing the number of ships deployed by the U.S. Navy will take years. Modernizing the U.S. nuclear triad is a project of decades. But the U.S. Army can achieve a substantial increase in combat power within the next five years.**

On its present course, the U.S. Army will lack the modern equipment and organization necessary to deter or, if necessary, defeat a high-end adversary. The U.S. Army needs to rebuild its capabilities to engage in high-end combat that made it the most feared competitor in the world. This involves restoring the technological, tactical and operational superiority developed over decades. What the Army must do is maximize the potential of existing platforms and systems. There are programs in place to enhance the capabilities of virtually all the Army's armored fighting vehicles, long-range fire systems and aircraft. Near-term modernization also is being pursued in unmanned aerial vehicles, soldier capabilities and on-the-move communications. What is problematic is the scale and pace of these programs.

An infusion of an additional \$15 billion a year for each of the next five years (FY2018-22) would allow the Army to expand investments in critically needed and time sensitive capabilities in lethality, force protection, fires, air and missile defense, aviation, communications/networks and electronic warfare. Almost all of these investments are based on accelerating current procurement plans. These proposed investments do not constitute an end-state for Army modernization. However, an accelerated upgrade program will significantly improve the combat capability of early arriving forces and buy time for the longer-term development of a new generation of platforms and systems.

# Near-Term U.S. Army Modernization:

## Buying What Is Available and Buying Time

### The Army Faces an Uncertain Future

Today, U.S. national security may be under greater stress than at any time since the early days of the Cold War. The number of geo-strategic threats to U.S. global interests and allies has increased, and the ways and means of modern warfare are evolving with remarkable speed. Advanced military and dual-use technologies are proliferating widely. The U.S. Army, Navy and Air Force are the smallest and oldest that they have been in many decades.

Senior defense officials and military leaders have identified five evolving strategic challenges to U.S. security: Russia, China, North Korea, Iran and terrorism. The first two are engaged in major military modernization programs, investing in capabilities designed to counter long-held U.S. military-technological advantages. According to one senior U.S. Army general officer, “some analysts have said of 10 major capabilities that we use for warfighting that by the year 2030, Russia will have exceeded our capability in six, will have parity in three, and the United States will dominate in one.”<sup>1</sup>

In a number of ways, Russia has made the greatest strides in the shortest period of time. Compare Russia’s problematic campaign against Georgia in 2008 with the much better planned and executed operations in Crimea and Ukraine a short six years later. Moscow’s operations in Ukraine allowed the world to observe the gains Russian ground forces have made both in technologies and combat techniques. Russian forces have demonstrated advances in armored combat vehicles; electronic warfare (EW); long-range massed fires coupled with drone provided intelligence, surveillance and reconnaissance (ISR); mobile, high-performance air defenses; and air assault.<sup>2</sup>

Russian and separatist forces are employing combined arms warfare with advanced weapons to devastating effect. Russian artillery, particularly rocket launchers with conventional, thermobaric and cluster munitions—using unmanned aerial systems, both for target location and battle damage assessment—is particularly effective against Ukrainian light armor and infantry formations. Additionally, the Russians are using their most advanced tanks in the Ukraine, including the T-72B3, T-80 and T-90. All of these tanks have 125mm guns capable of firing a wide range of ammunition, including antitank/anti-helicopter missiles with a six-kilometer range and advanced armor protection, including active protection on some models. Finally, man-portable and vehicle mounted Russian air defense systems have made it all but suicidal for the Ukrainian Air Force to provide air support to ground forces. Thus, the

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<sup>1</sup> Major General Eric Wesley, in “Wesley: Russia offers ‘pacing threat’ for Army modernization effort,” *Inside the Army*, Volume 28, Number 44, November 7, 2016, pp. 4-5.

<sup>2</sup> Phillip Karber and Joshua Thibeault, *Russia’s New Generation Warfare*, Potomac Foundation, May 13, 2016.

battlefields of Eastern Ukraine are similar to those envisioned by the U.S. Army during the Cold War, but with more mature technologies.<sup>3</sup>

The impact of Russian investments in a new generation of ground combat capabilities has been amply demonstrated by operations over the past several years in Ukraine and Syria. The combination of drone-based ISR, communications jamming and the application of long-range firepower with advanced warheads has proven particularly lethal. A respected expert on this new generation of Russian military capabilities described one engagement:

In a 3-minute period . . . a Russian fire strike wiped out two mechanized battalions [with] a combination of top-attack munitions and thermobaric warheads . . . If you have not experienced or seen the effects of thermobaric warheads, start taking a hard look. They might soon be coming to a theater near you.<sup>4</sup>

Russian advances in EW have been particularly noteworthy and have resulted in the deployment of systems that can challenge one of the central features of modern U.S. military capabilities, the ability to link sensors to shooters in a manner that provides a near real-time ability to conduct long-range and multi-domain fires. Ukrainian separatist forces equipped with Russian EW systems have demonstrated a highly sophisticated ability to jam communications systems, deny access to GPS and interfere with the operation of sensor platforms. Recently it has been reported that U.S.-made tactical drones operated by Ukrainian security forces were being jammed and hacked by the Ukrainian rebels.<sup>5</sup>

Russia has developed and demonstrated a capability for conducting a kind of quasi-military campaign designed to achieve ends equivalent to those formerly attainable only by military means but with a diminished risk of actual war with NATO. According to a report by the Defense Committee of the United Kingdom's Parliament:<sup>6</sup>

The Russian deployment of asymmetric tactics represents a new challenge to NATO. Events in Ukraine demonstrate in particular Russia's ability to effectively paralyse an opponent in the pursuit of its interests with a range of tools including psychological operations, information warfare and intimidation with massing of conventional forces. Such operations may be designed to slip below NATO's threshold for reaction. In many circumstances, such operations are also deniable, increasing the difficulties for an adversary in mounting a credible and legitimate response.

Many Western leaders and defense analysts focus solely on the actual capabilities of the Russian military to engage in a high-end conventional conflict. The Russian military is an extremely brittle instrument. It will be decades, if ever, before Russia will pose a conventional threat to NATO writ large. Rather, it is the role of Russian conventional capabilities as an escalatory threat and a backstop to its quasi-military activities that is most threatening.

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<sup>3</sup> David Johnson, "The Russian Invasion of Ukraine," in Headquarters, Department of the Army, *The U.S. Army Combat Vehicle Modernization Strategy*, January 5, 2016, p. 15.

<sup>4</sup> Phillip Karber cited in Patrick Ticker, "How the Pentagon is Preparing for a Tank War with Russia," *DefenseOne*, May 19, 2016.

<sup>5</sup> Mark Pomerleau, "Threat from Russian UAV Jamming Real, Officials Says," *C4ISRNet*, December 20 2016.

<sup>6</sup> House of Commons Defence Committee, "Towards the next Defence and Security Review: Part Two – NATO," Third Report of Session 2014-15, July 31, 2014, p. 17.

In any case, Russia does not need to mount an actual invasion in order to use military intimidation against its neighbours. The Crimea operation demonstrated that it is already willing to use those parts of its military it considers fit for purpose, while the main force is still being developed. In the meantime, Russia's Ground Troops created effect simply by existing. Throughout much of 2014 and early 2015, the main force opposite the Ukrainian border served as a distraction from actual operations within Ukraine, by being depleted or augmented as the political situation dictated, keeping Western governments and intelligence agencies in a perpetual state of speculation as to the likelihood of a full-scale invasion. The actual capability of those troops was irrelevant; they were ready and available to be inserted into Ukraine as and when required to counter Ukrainian government offensives.<sup>7</sup>

Russian military modernization must be juxtaposed to the withdrawal of U.S. forces, particularly land power, from Europe and continuing declines in the conventional military power of virtually all NATO members. As a result, Russia may believe not only that it can deter a Western response to its hybrid warfare activities but that it could successfully fight a conventional war. The Russian ambassador to the United Kingdom recently observed that "Russia can now fight a conventional war in Europe and win. Russia is the only country that will remain relevant forever. Any other country is dispensable, and that includes the United States. We are at end game now." Unfortunately, this viewpoint is confirmed by strategic analyses from a number of prestigious American think tanks.<sup>8</sup>

Russia and China are extending their presence in Eastern Europe, the Arctic, the Middle East and the waters of the Western Pacific. These deployments are creating a defensive arc intended, in part, to isolate U.S. friends and allies. The combination of parity or even superiority in military capabilities, favorable geographic positions and the ability to employ non-military measures to achieve strategic objectives short of war could undermine the ability of the United States to deter aggression by precluding U.S. military responses to threats to the nation's vital global interests.

In addition, Russia and China are providing advanced conventional military hardware to a growing number of states. According to a senior U.S. Army source, "if the Army goes into ground combat in the Middle East, we will face equipment from Russia, Iran and in some cases China."<sup>9</sup> Russia is a major defense exporter selling advanced aircraft, air defense systems, radar and ships to China and India. Moscow recently began to deliver the S-300 air defense system to Iran. Russia got back into the Egyptian market, selling that country 50 Kamov Ka-52 Alligator combat helicopters.

Regional challengers such as North Korea and Iran are investing in asymmetric military capabilities such as ballistic missiles, advanced air defense systems and even nuclear weapons. Both nation-states and non-state terrorist groups are able to access advanced military equipment provided by not only Russia and China but Western countries as well. Iran has received advanced air defense systems from Russia and land-based anti-ship cruise missiles from China. Capabilities that were once considered to be restricted to the province of peer competitors are increasingly within the arsenals of local

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<sup>7</sup> Keir Giles, *Russia's 'New' Tools for Confronting the West Continuity and Innovation in Moscow's Exercise of Power*, Research Paper, Russia and Eurasia Programme, Chatham House, March 2016, p. 19.

<sup>8</sup> *Strategic Risk: Implications of a United States-based Force Posture and Strategic Mobility Shortfalls in the Emerging Security Environment*, Association of the U.S. Army, draft paper, pp. 1-2.

<sup>9</sup> Kris Osborn, "Army Analyst: We Will Fight Russian and Chinese Tanks, Weapons," *Scout Warrior*, November 18, 2016.

adversaries and terrorist groups. The Army's latest operating concept, *Winning in a Complex World*, described the challenge thusly:

As new military technologies are more easily transferred, potential threats *emulate* U.S. military capabilities to counter U.S. power projection and limit U.S. freedom of action. These capabilities include precision-guided rockets, artillery, mortars and missiles that target traditional U.S. strengths in the air and maritime domains. Hostile nation-states may attempt to overwhelm defense systems and impose a high cost on the U.S. to intervene in a contingency or crisis. State and non-state actors apply technology to *disrupt* U.S. advantages in communications, long-range precision fires and surveillance.<sup>10</sup>

Even terrorist groups are deploying advanced weaponry. A recent YouTube video that went viral shows the destruction of an Iraqi M-1 Abrams, basically the same kind operated by the U.S. military, by an ISIS fired, Russian-made Kornet anti-tank guided missile (ATGM). Several Abrams were disabled but not totally destroyed by this same missile during Operation Iraqi Freedom. It was employed successfully by Hezbollah in the 2006 Lebanon War to destroy a number of Israeli Merkava tanks. Since 2003, the U.S. military and its coalition allies have lost vehicles of all kinds to rocket propelled grenades (RPGs).<sup>11</sup> U.S. Navy ships operating in the Gulf of Aden have been repeatedly attacked by Yemeni Islamist rebels armed with Chinese-made anti-ship cruise missiles. It has been discovered that ISIS set up industrial-scale facilities to produce improvised explosive devices (IEDs) and other military equipment.

It is evident that U.S. competitors and adversaries, but also nation-states and terrorist groups, are investing enormous effort to negate the long-held technological advantages possessed by the U.S. military. Some challengers are developing a comprehensive suite of countervailing capabilities; others are deploying available technologies sometimes based on commercial systems adapted for military purposes. But all are creating forces intended to counter or even defeat U.S. ground forces.

The consequence of decades of investments by adversaries in systems to counter and even exceed the capabilities deployed by the U.S. military is the progressive loss of tactical overmatch. Challengers, generally, but the Russian military, in particular, have invested in asymmetric capabilities such as EW, air defenses anti-armor weapons, improved combat vehicles and advanced artillery and missiles precisely for the purpose of denying tactical overmatch to U.S. ground forces (and those of allied forces).

## The U.S. Army's "Perfect Storm"

Since the end of the Cold War, national leaders, defense officials and members of Congress could justify reducing the size of the U.S. military by referencing the reduced threat and arguing for greater reliance on U.S. technological superiority to compensate for inferior numbers. With specific reference to the U.S. Army, the assumption was made that there would be no serious challenge to this country's air and naval superiority. As a result, it was assumed that the Air Force and Navy would retain air superiority and provide on-demand close air support, ISR and electronic warfare resources.

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<sup>10</sup> U.S. Army Operating Concept, *Winning in a Complex World, 2020-2040*, October 31, 2014, p. 10.

<sup>11</sup> Daniel Goure, "Are Tanks Obsolete?: YouTube Video Makes The Case For Active Protection Systems," *The National Interest*, November 4, 2016.

Hence, the Army could reduce or even eliminate what had once been considered critical capabilities, including tactical air defense, artillery, electronic intelligence collection and electronic warfare. Similarly, in order to maintain a minimum of combat forces and reduce the costs of operating its deployed forces, the Army rid itself of a substantial portion of its logistics capabilities choosing to rely instead on contracted support and on the establishment of larger immobile command posts, depots and other support facilities that were highly efficient but potentially vulnerable to hostile action.

The twin assumptions of uninterrupted support from air and naval forces and minimum vulnerability of the logistics network and bases are no longer the case. “We had been able to have smaller forces have bigger impact because we weren’t as challenged in the cyber/electromagnetic domains, in the aerospace domain. . . (now) we can’t rely on maintaining dominance in any domain.”<sup>12</sup>

Even as the challengers to U.S. national security have proliferated and improved their military capabilities and overseas deployments of U.S. military forces have continued at an extremely high level, budget cuts have forced reductions in force structure, the termination or drawing out of modernization programs and a shortchanging of readiness. The Army in particular has suffered as a result of budget reductions. The Army Chief of Staff, General Mark Milley, made this point quite bluntly:

We have had a 75 percent reduction in our modernization accounts in the last eight or nine years, 30 percent as the secretary says in the last four years . . . Relative to other services, we spend about \$36 to \$40 billion less in modernization than either the Navy or the Air Force. . . That’s a huge amount of money.<sup>13</sup>

The need to preserve some measure of current readiness in order to meet today’s demands and be prepared for near-term conflicts has come at the expense of modernization. According to its 2017 Posture Statement, in order to maintain current readiness and protect a minimum force structure, the Army has had to delay and even forgo critical modernization.

An unintended consequence of the current fiscal environment is that the Army has not equipped and sustained the force with the most modern equipment and risks falling behind near-peers. Instead, funding constraints forced the Army to selectively modernize equipment to counter our adversary's most significant technological advances. While we are deliberately choosing to delay several modernization efforts, we request Congressional support of our prioritized modernization programs to ensure the Army retains the necessary capabilities to deter and, if necessary, defeat an act of aggression by a near-peer.<sup>14</sup>

The lack of adequate funding to support a sensible modernization program results in the need to make acquisition decisions that both restrict the ability to introduce needed capabilities and increase procurement costs. In response to an urgent operational need from the U.S. Army in Europe, the single Stryker brigade combat team (SBCT) deployed there is receiving a critical lethality upgrade. While it would make sense to provide the same enhancement to the remaining SBCTs as soon as possible, resource limits will constrain the Army’s options. As one senior U.S. Army official pointed

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<sup>12</sup> Sydney Freedberg, Jr., “McMasters: Army may be outnumbered and outgunned in next war,” *Breaking Defense*, April 16, 2016.

<sup>13</sup> Sydney J. Freedberg Jr., “Army \$40B Short On Modernization Vs. Russia, China: CSA Milley,” *Breaking Defense*, October 3, 2016.

<sup>14</sup> Chief of Staff of the Army General Mark A. Milley, *2017 Posture Statement of the U.S. Army*, February 24, 2016.

out with respect to Stryker lethality upgrades, “Production rates for the Stryker, for the (first) Engineering Change Plan could be as little as one brigade every three years because you’re just not giving it the level of resources to create an efficient production rate.”<sup>15</sup> None of the planned upgrades will be completed in the next five years at current rates of production. In most cases, they will take more than a decade to be fulfilled.

Current efforts to halt and then reverse the decline in Army end strength are something of a mixed blessing. It is increasingly clear that at 450,000 or fewer in the Active Component, the Army cannot meet its current set of demands and may not have enough manpower to address even one major regional conflict. However, proposals to raise end strength to 540,000 from the current level of 476,000 come at a huge price, more than \$8 billion a year just in salary and benefits. Organizing, equipping and supporting the additional units could easily double this figure. In addition, it will take years to train new brigade combat teams.

A modest increase in the size of the Army, say to the same level as before 9/11, or 491,000, would substantially ease the stress on the force while not crowding out badly needed modernization funding. If 540,000 is the goal for the eventual size of the Active Component, then the new Trump Administration should consider pursuing this goal in two phases, increasing end strength to 490,000 while undertaking a near-term modernization program as described later in this paper and only then adding another 50,000 personnel to reach the 540,000 figure.

Today, the U.S. Army faces the proverbial “perfect storm” consisting of ever-increasing demands, ever-more capable threats, and a shrinking force structure and continuing budget strictures. In this new world, the U.S. Army is at a high risk of being outnumbered, outgunned and outmaneuvered by prospective adversaries. A recent Heritage Foundation report downgraded the Army’s military power from “marginal” to “weak.”<sup>16</sup> The former Vice Chief of Staff of the Army, General Jack Keane, described the Army’s current problem succinctly in testimony to the Senate Armed Services Committee:

The ground force today is essentially organized and equipped as it was in the 1980s, yet considerably smaller (Army 200K less). Furthermore, enabling forces like artillery, armored reconnaissance, engineers, air defense, theater support, etc. have been reduced to levels that compromise our ground force ability to field campaign quality forces. Our ground force is not in balance and they must rethink their organization, doctrine and put together a modernization program that moves away from the 1980 legacy systems and embrace advanced technology that is available and push the R&D hard for new technology.<sup>17</sup>

The U.S. Army needs to rebuild its capabilities to engage in high-end combat that made it the most feared competitor in the world. This involves restoring the technological, tactical and operational superiority developed over decades. While doing so will take time, there are concrete steps that can be taken in the near-term to improve the Army’s combat potential and begin to restore the vital tactical overmatch.

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<sup>15</sup> Connie Lee, “Army receives green light to move forward with Stryker upgrade,” *Inside the Army*, Volume 28, Number 40, October 10, 2016, p. 3.

<sup>16</sup> Dakota Wood, ed., *2017 Index of U.S. Military Strength*, The Heritage Foundation, Washington, D.C., 2016.

<sup>17</sup> General Jack Keane, USA (Ret.), *Testimony to United States Senate Committee on Armed Services on Emerging US Defense Challenges and Worldwide Threats*, December 6, 2016.



## Modernizing Current Capabilities and Buying Time

The Army must pursue three tasks simultaneously. First, it must continue to meet current demands, particularly the global struggle against Islamic terrorism. As terrorists acquire new capabilities, such as ISIS's use of drones, new countermeasures must be introduced. Second, the Army needs to prepare for major conventional conflict in the near-term. Finally, the Army must invest in research and development (R&D) for a new generation of platforms and systems that can re-establish overmatch in critical capability areas. For example, with respect to combat vehicle modernization, the Army must invest for today, tomorrow and the longer-term future simultaneously.

Increased investment in combat vehicle modernization is necessary to reverse a growing trend towards obsolescence and ensure overmatch on current and future enemies. Army acquisition efforts must simultaneously develop new solutions that provide mobility, protection and lethality to our future formations while maintaining current fleet investments and long lead-time improvement programs.<sup>18</sup>

The international security environment is such that the Army cannot continue to forgo near-term modernization and rely on the introduction of transformational systems a decade or two hence. In the face of investments by prospective adversaries, particularly Russia, in advanced conventional and nuclear armaments, the U.S. Army needs to bolster its own capabilities for high-end land warfare thereby enhancing deterrence of aggression, particularly in Europe. This includes halting the reductions in end-strength at the level proposed by the fiscal year (FY) 2017 National Defense Authorization Act, which would be 475,000.

The Army faces a difficult situation with respect to the challenge posed by increasingly capable competitors. A combination of failed acquisition programs over the past 20 years and the need to focus investments on the fight against Islamic terrorism resulted in a shortchanging of future capabilities for high-end combat. Today, the Army is behind in modernization against current and future threats. Currently, there are no major ground combat vehicles in development. The next generation of long-range fire systems, air defenses, rotary wing aircraft and EW systems will not even begin deployment until the middle of the next decade at the earliest.<sup>19</sup>

On its present course, the U.S. Army will lack the modern equipment and organization necessary to deter or, if necessary, defeat a high-end adversary. Therefore, what the Army must do is maximize the potential of existing platforms and systems. There are programs in place to enhance the capabilities of virtually all the Army's armored fighting vehicles, long-range fire systems and aircraft. Near-term modernization also is being pursued in unmanned aerial vehicles, soldier capabilities and on-the-move communications. What is problematic is the scale and pace of these programs.

Recognition of this problem by senior Army leadership resulted in the creation of the Rapid Capabilities Office (RCO) which is focused initially on filling serious capability gaps with repurposed systems, militarized versions of non-developmental items and near-term solutions. As described by the Secretary of the Army, Eric Fanning, "The Rapid Capabilities Office sort of fills the

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<sup>18</sup> *Combat Vehicle Modernization Strategy*, U.S. Army TRADOC, September 15, 2015, pp. 2-3.

<sup>19</sup> Michelle Tan, "Budget cuts are forcing the Army to lose its competitive edge," *Army Times*, April 5, 2016.

gap between (the Rapid Equipping Force) and our normal acquisition programs of record to try to accelerate targeted capabilities and . . . deliver it in the one- to five-year window.”<sup>20</sup>

The RCO is focused, inter alia, on near-term solutions to the dearth of electronic warfare capabilities in the Army. The RCO has identified a number of options based on existing EW systems that were developed to counter electronically-triggered IEDs. A longer-term effort, the Multi-Function Electronic Warfare program, may begin to produce new systems in the middle of the next decade.<sup>21</sup>

Upgrades to existing platforms have carried the Army forward for almost 40 years. One positive byproduct of deferred modernization is that significant gains in effectiveness and efficiency can be achieved by simply upgrading to the current state-of-the-art. Since the introduction of the Big 5 set of Army combat systems in the 1970s, there have been significant advances in manufacturing, materials, power generation and storage, computer processing power and miniaturization, sensors and diagnostics, ergonomics and human interfaces, and system automation. Unquestionably, existing platforms will reach the limits of what upgraded systems can provide in the way of additional performance. However, there is much that can be done to extend the capabilities of existing platforms, systems and formations.

The U.S. Army has a near-term modernization program to substantially enhance the lethality, protection, mobility and logistics sustainment of its current fleets of armored combat vehicles, long-range fires and communications systems. Portions of the Stryker fleet have been upgraded several times, most recently with the addition of a double-V hull to four brigades and a 30mm cannon. The Army is employing engineering change proposals to pursue continuous modernization of both the Bradley fighting vehicle and the Abrams tank. These upgrades will improve these platforms’ maneuverability, fire control, battle management, sensors and protection against anti-tank missiles and cannon rounds. The 50-year-old M-113 personnel carriers are being replaced. The Paladin self-propelled howitzer is in the midst of a modernization effort that will enhance its overall reliability and sustainability. Army aviation is pursuing an upgrade program for its Apache helicopters to the new and more capable E model.

The Army also has plans for an additional round of modernization that will substantially enhance the lethality of the Abrams and Bradley fleets. Currently, these programs still require engineering work before procurement can begin. However, unlike a new start program, there are no significant technological hurdles involved in completing developmental work in this set of upgrades. Additional resources could accelerate these programs.

There are opportunities to deploy several new, advanced systems and platforms as part of a near-term modernization program. One of the most important of these is an Active Protection System (APS) for armored fighting vehicles. Russia has already deployed such a system on its T-90 and brand-new Armata tanks. The U.S. Army is conducting tests of several existing systems, including the Israeli Trophy system which successfully protected that country’s Merkava tanks during the 2014 conflict in Gaza. The deployment of an existing APS system would precede development by the Army of its own Modular APS sometime in the next decade.

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<sup>20</sup> Brendan McGarry, “Army Wants New Office to Field Gear Within a Year,” *DoD Buzz*, October 3, 2016.

<sup>21</sup> Sydney J. Freedberg, “Army’s New Rapid Capabilities Office Studies Electronic Warfare Boost,” *BreakingDefense*, July 1, 2016.

Another near-term new start is the Mobile Protected Firepower (MPF) the Army is looking to develop for the infantry brigade combat teams. The MPF will be a modified version of an existing vehicle with the expectation that this will substantially reduce the time needed to develop and produce the system. The MPF will be a relatively light, tracked armored fighting vehicle with sufficient armor to defend against small arms fire, offensive armament sufficient to destroy main battle tanks and defense structures and, probably, an APS system.<sup>22</sup>

Army aviation is also in dire need of investments in self-protection systems. The current Common Missile Warning System (CMWS) and the Radar Warning Receiver are being upgraded but at a rate which could be accelerated with additional resources. A replacement for the CMWS is in development along with the Common Infrared Countermeasure, and the Advanced Threat Detection System. Army Aviation also needs to deploy a navigation system to solve the problem of “brownout,” the cloud of dirt and debris that has been the cause of countless helicopter accidents.

Another innovative program is the Integrated Force Protection Capability-Increment 2 (IFPC-I2). The growing threat from unmanned aerial systems and rockets and artillery has challenged the Army to rapidly deploy air/missile defense systems. Currently, the Army is looking to enhance its short-range air defense capabilities by deploying widely the venerable Stinger man-portable/vehicle mounted anti-aircraft missile. The IFPC-I2 will consist of a truck-mounted multi-missile launcher and several different interceptors that use existing tactical sensor systems to provide target detection and track.

Finally, the Army and the Department of Defense are working on near-term programs to revolutionize long-range fires. There is an improvement program for the current systems, the ATACMs and multiple launch rocket systems. By the middle of the next decade the Army hopes to deploy the Long-Range Precision Fires (LRPF) system with a range of some 500 kilometers, more than four times the range of current ground-based missile systems. Using existing launch platforms, the LRPF will have a new warhead capable of addressing both point and area targets and advanced guidance technology that will enable all-weather, highly responsive deep-strikes.<sup>23</sup> The Pentagon’s Strategic Capabilities Office is exploring the near-term potential of hyper velocity projectiles (HVP) launched from existing howitzers and Paladin artillery pieces to provide medium-range air defense for both ground and naval forces.<sup>24</sup> Modest additional funding could accelerate development of the LRPF and HVP.

The overarching problem is the lack of funds in the Army’s procurement budget to support a rapid and cost-effective near-term modernization program. An infusion of an additional \$15 billion a year for each of the next five years (FY2018-22) would allow the Army to expand investments in critically needed and time sensitive capabilities in lethality, force protection, fires, air and missile defense, aviation, communications/networks and EW. Almost all of these investments are based on accelerating current procurement plans rather than initiating new programs.

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<sup>22</sup> Brian Kellman, “U.S. Army Armored Vehicle Developments in the 21st Century. Military Analysis,” *Southfront*, December 20, 2016.

<sup>23</sup> Kris Osborn, “US Army’s New Ground-Launched Missile; Raining Down Death from 500 Kilometers Away,” *National Interest*, September 6, 2016.

<sup>24</sup> Sam LaGrone, “Pentagon: New Rounds for Old Guns could Change Missile Defense for Navy, Army,” *USNI News*, July 18, 2016.

Below are the major capability components and costs for the proposed \$15 billion plus-up to the Army's modernization budget:

- **Armor Brigade Combat Teams (ABCT) (\$3.25B/yr.):** Upgrade five Armor Brigade Combat Teams with Abrams v.3 main battle tank, Bradley A4 fighting vehicle and the Armored Multi-Purpose Vehicle. These vehicles also must be provided with Active Protection Systems. In addition, complete modernization of European pre-positioned equipment such as the Abrams and Bradley in one year. Accelerate development of Abrams/Bradley Engineering Change Plan 1B lethality upgrade.
- **Ground Forces Enablers (\$1.75B/yr.):** New heavy equipment transporter, new mobile bridges, new recovery vehicle, High Mobility Multipurpose Wheeled Vehicle modifications, and additional Joint Light Tactical Vehicles. Accelerate Armored Multi-Purpose Vehicle procurement, secure new armored vehicles to replace M-113 in echelons above Corps.
- **Fires (\$2.5B/yr.):** Upgrade program for Guided Multiple Launch Rocket Systems (seekers, extended range) and smart artillery; Shelf-Life Extension Program Army Tactical Missile System (ATACMs) and accelerate development of long range precision fires to replace ATACMs; accelerate Paladin Integrated Management fielding and accelerate the Joint Air-to-Ground missile. In addition, increase the acquisition of existing munitions (Excalibur, Precision Guidance Kits) with the goal of procuring enough capacity in five years to set three theaters: U.S. Central and European Commands and Korea. Also, invest in the munitions infrastructure at both government owned and operated facilities and government owned and contractor operated facilities.
- **Lethality/Survivability Enhancements for Stryker and Mobile Protected Firepower (\$2.25B/yr.):** One additional SBCT upgraded per year and one brigade of Mobile Protected Firepower per year. Complete double-V hull upgrade for fourth SBCT; Active Protection System for both SBCTs and Mobile Protected Firepower units.
- **Air Defense (\$1B/yr.):** Short Range Air Defense (Indirect Fire Protection Capability-Increment 2) and Patriot Upgrades to missiles and radar; Stinger upgrades and new procurement; counter drone systems.
- **Aviation (\$2.5B/yr.):** Accelerate Apache AH-64E upgrades and new procurements; accelerate modernization of Black Hawk UH-60; aircraft survivability enhancements; upgrade all Grey Eagles with advanced ISR sensors.
- **Communications (\$1.25B/yr.):** Assured Position Navigation and Timing in a heavily contested environment; upgrade existing network systems, acquire a total of four additional brigade sets of Warfighter Information Network-Tactical (WIN-T) Increment-2 per year; invest in communications security to deploy rapidly a solution for advanced radio encryption and survivability on EW battlefield.

A more detailed table in Appendix A provides a breakdown of proposed expenditures by major programs. The first two columns show planned expenditures and quantities for Army modernization in the FY2017 budget, while the last two show proposed additional modernization, both the annual costs and additional quantities to be procured for FY2018-22.

## Final Comments

These proposed investments do not constitute an end-state for Army modernization. It will take many years and billions of dollars to complete planned upgrades of combat vehicles, long range fires, EW and aircraft. For example, the proposed lethality upgrades to the Abrams tank still require several years of R&D before even low rate production can begin. The same is true for EW upgrades, new air defense systems and additional communications security. However, the accelerated upgrade program proposed above will significantly improve the combat capability of early arriving forces, ensure the availability of sufficient ammunition stores to support high-end combat, and begin the process of countering prospective adversaries' investments in EW, unmanned aerial systems, long-range fires and new combat vehicles.

The Army also is working on a future force development strategy that will address the requirement for a new generation of armored fighting vehicles, vertical lift platforms, long-range precision fires, EW systems and communications capabilities. The Army is investing heavily in the development of manned-unmanned teaming which could transform ground combat. In the medium-term, robotic "wingmen" could extend the operational life and relevance of current generation armored fighting vehicles. A demonstration will be conducted in 2017 with a program of record anticipated in 2023.<sup>25</sup>

The Army is critically dependent on a munitions production infrastructure that is in desperate need of investment and upgrading. Much of the public portion of the munitions industrial base dates back to World War II. There are numerous potential single points of failure that could place at risk the basic ability to produce explosives and propellants. The production of smart munitions, largely the responsibility of private companies, is constrained due to aging facilities and supply chain limitations. The stress of operations against ISIS has depleted stockpiles of weapons such as Hellfire missiles. Investments are needed in both the public and private portions of the munitions industrial base to improve their efficiency and effectiveness. The Army needs additional funding to fill war stocks for regional conflicts in Europe, the Middle East and East Asia. The expanded procurement of munitions will create an incentive for companies in the supply chain to invest in expansion of their production capacities.

Investment in the near-term modernization of the U.S. Army is one of the few areas where the incoming administration can have an almost immediate impact on the state of the U.S. military. Increasing the number of ships deployed by the U.S. Navy will take years. Modernizing the U.S. nuclear triad is a project of decades. But the U.S. Army can achieve a substantial increase in combat power within the next five years.

A robust modernization budget also could help the Army (and the rest of the military) buy time until it can begin to field the next generation of platforms and systems. In order to deter aggression, near-peer and regional challengers need to see the Army as a formidable opponent. The proposed investments would go a long way to denying prospective adversaries confidence in their ability to deter the United States.

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<sup>25</sup> Kris Osborn, "U.S. Army M-1 Abrams Tank Crews Could Soon Control 'Robotic Wingmen,'" *National Interest*, October 6, 2016.

## Appendix A: Proposed Army near-term modernization

Program	Quantity proposed in (FY17)	Cost proposed for (FY17) in \$Billion	Additional Quantity (FY18-22)	Additional Annual Cost in \$Billion
<b>Stryker</b>				
DVH/ECP 1	123	\$0.4446	1 SBCT/year	\$1.300
Lethality	83	\$0.314	1 SBCT/year	\$0.314
APS			1 SBCT/year	\$0.300
<b>M113 Replacement (EAB)</b>			150/year	\$0.180
<b>Abrams</b>				
ECP 1	60/year	\$0.480	30/year	\$0.265
ERI	14	\$0.172	76	\$0.935
APS for ERI			76	\$0.100
APS for the 90 Abrams			90/year	\$0.150
<b>Bradley</b>				
ECP 1&2	337	\$0.276	337/year	\$0.276
APS			770/year	\$1.200
ERI	14	\$0.073	111	\$0.555
<b>New ABCT (Converted from IBCT)</b>			90-125	\$1.300
<b>Abrams/Bradley ECP 1b Lethality Acceleration</b>			90-120/year	\$0.500
<b>Paladin</b>	36	\$0.469	60/year	\$0.650
<b>MPF Acceleration</b>			100/year	\$0.500
<b>Hercules Upgrade</b>			50/year	\$0.075
<b>AMPV Acceleration</b>			300/year	\$0.500
<b>JLTV Acceleration</b>	1,827	\$0.588	2,500/year	\$0.500
<b>HMMWV MOD</b>			2,500/year	\$0.100
<b>IFPC 2 (CUAS)</b>		\$0.020	100/year	\$0.250
<b>LRPF Acceleration</b>		\$0.050	100/year	\$0.100
<b>Patriot</b>	85 missiles	\$0.423	85/year	\$0.425
MODS	122 missiles	\$0.055	240/year	\$0.080
<b>JAGM</b>	324	\$0.100	1,200/year	\$0.300
<b>GMLRS</b>	1,068	\$0.171	2,100/year	\$0.350
<b>Excalibur</b>	140	\$0.039	150/year	\$0.050
<b>PGK</b>	1,500	\$0.035	1,500/year	\$0.035
<b>Assured PNT</b>				\$0.175
<b>WIN-T</b>	2 BCTs/year	\$0.437	4 BCTs/year	\$0.200
<b>Manpack</b>	2 BCTs/year	\$0.275	4 BCTs/year	\$1.000
<b>AH-64E</b>	52	\$1.200	52/year	\$1.200
<b>UH/MH-60</b>	36	\$0.929	60/year	\$1.300
<b>CH-47F</b>	22	\$0.590		
<b>GRAND TOTAL (in \$Billions)</b>		<b>\$7.1406</b>		<b>\$15.165</b>

Source: Army Green Books FY2017

## Glossary

ABCT	Armor Brigade Combat Team
AMPV	Armored Multi-Purpose Vehicle
APS	Active Protection System
ATACM	Army Tactical Missile System
ATGM	Anti-Tank Guided Missile
CMWS	Common Missile Warning System
CUAS	Counter Unmanned Aerial System
DVH	Double-V Hull
EAB	Echelons Above Brigade
ECP	Engineering Change Proposal
ERI	European Assurance Initiative
EW	Electronic Warfare
FY	Fiscal Year
GMLRS	Guided Multiple Launch Rocket System
GPS	Global Positioning System
HVP	Hyper Velocity Projectile
HMMWV	High Mobility Multipurpose Wheeled Vehicle
IED	Improvised Explosive Device
IBCT	Infantry Brigade Combat Team
IFPC	Indirect Fire Protection Capability
ISIS	Islamic State of Iraq and Syria
ISR	Intelligence, Surveillance and Reconnaissance
JAGM	Joint Air-to-Ground Missile
JLTV	Joint Light Tactical Vehicle
LRPF	Long-Range Precision Fires
MOD	Modification
MPF	Mobile Protected Firepower
NATO	North Atlantic Treaty Organization
PGK	Precision Guidance Kit
PNT	Position, Navigation and Timing
R&D	Research and Development
RCO	Rapid Capabilities Office
RPG	Rocket Propelled Grenade
SBCT	Stryker Brigade Combat Team
WIN-T	Warfighter Information Network-Tactical



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