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Stop Upgrading: Buy 21st Century Equipment

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Introduction

Remotely-piloted aircraft (RPA), i.e., drones or unmanned aerial vehicles (UAVs), revolutionized how the U.S. military conducts military operations against insurgents and terrorists. This revolution resulted from an early outside push from Congress and a change to U.S. foreign policy (namely, the prioritization of counterterrorism).[1] The RPA revolution substantially changed the U.S. military's doctrine and structure for fighting terrorists, which led to a substantial improvement in tactical and operational military capabilities for counterterrorism operations. A change is now necessary to revolutionize the U.S. Army's combat capabilities for dealing with great-power adversaries and other 21st-century national security challenges beyond just terrorists. The Army's attachment to legacy equipment, originally designed in the 1970s, wastes resources and slows investment in the equipment, force structure, training and doctrine needed to successfully overcome 21st-century threats. The U.S. Army should significantly curtail investments in upgrades for heavy, manned tanks that cannot effectively or efficiently address current or future problems—better investments exist.

Russia and China represent the most important current threats. They have adapted their strategies and operations to specifically target the U.S. military's legacy structure and way of war, which relies on moving massive amounts of heavy equipment and support from partner nations. After America's resounding coalition success in Operation Desert Storm, Russia and China spent tremendous time and energy understanding how the United States decimated Iraq's military.[2] The U.S. military's success in that conflict lay in its ability to spend six months moving forces to a partner country, Saudi Arabia, in order to fight an adversary with mid-20th-century air defenses and virtually nonexistent strategic interdiction capabilities. Since then, Russia and China have invested in capabilities and strategies to prevent a similar outcome if they were to fight the United States. Today, U.S. adversaries would use all available tools—cyber, submarines, sabotage, diplomacy, etc.—to prevent the United States from massing forces to push back adversary aggression.

The U.S. Army has upgraded its equipment and force structure substantially since defeating Iraq in 1991 to remain the world's premier army; however, a large portion of the Army's firepower remains centered on the M1 Abrams tank, which has limited strategic mobility. As the Army reduces its force presence overseas, the importance of strategic mobility continues to increase because the U.S. Army remains primarily an expeditionary force.[3] Efforts to pre-position equipment near potential conflict zones and rotate units to likely combat areas reduces the strategic lift problem, but only at the margins. The vast majority of U.S. forces will need to cross oceans or continents before they can enter the fight. Every additional day required to move troops to the battlefield provides U.S. adversaries with an opportunity to consolidate gains that they have made, interdict U.S. military movements and persuade potential partners to limit U.S. military access, basing or overflight. Public opinion and the information environment move quickly in the 21st century, but transcontinental and transoceanic movements still require weeks. The efficacy of a tank or helicopter on the battlefield is irrelevant if the system cannot arrive before an adversary achieves its objectives. Strategic speed matters.

Every dollar invested in updating current systems has an opportunity cost, which becomes significant when those costs run into the billions of dollars. For Fiscal Year 2021, DoD requested over $1.2 billion for upgrading or building new AH-64 helicopters, along with $1.5 billion for M1 tanks.[4] Additionally, continued spending on upgrades disincentivizes Army personnel from thinking and experimenting with revolutionary ideas, like robotic ground vehicles, by masking the need to do so. In other words, steady investments in legacy systems send a clear message that the Army continues to prioritize legacy systems. The Army's choices will likely get tougher in the near future as fiscal constraints and downward pressure on defense budgets increase due to rapidly rising U.S. government debt accelerated by the COVID-19 pandemic response.[5] Some members of Congress are already calling for reductions in military spending.[6] With limited resources, the Army should stop investing in legacy systems and should instead focus investments on equipment, doctrine and force structure that is suitable for 21st-century conflict. This would require the Army to rapidly conduct strategic movements and operate against increasingly lethal weapon systems.

Tank Alternatives

The M1 Abrams tank is a relatively effective combat platform once it arrives at the front lines because it has received numerous upgrades to the original 1970s-era design. However, it lacks strategic and operational mobility, which drastically limits its 21st-century utility. The upgraded M1 tank variant's weight of 90-plus tons hinders strategic airlift and substantially reduces operational ground mobility due to bridge capacities.[7] These limitations have not significantly impacted U.S. combat operations to date because adversaries have not challenged U.S. strategic movements, and the United States has been able to build up forces (i.e., set the theater) before major combat operations. However, China and other potential adversaries have studied U.S. operations and will contest U.S. strategic movements while attempting to achieve a *fait accompli* before U.S. forces can arrive and be ready to fight.[8] RAND wargaming analysis suggests that preventing Russia from rapidly overtaking the Baltic states requires around seven brigade combat teams, including three tank brigades.[9] The Army can, and should, keep fighting for a robust overseas presence but should plan for no more than what already exists, as U.S. politics will likely hinder increased foreign deployments. In this environment, the capability of M1 tanks stationed in the United States lacks relevance if an adversary can accomplish their goals before sufficient tanks arrive due to limited transportation capacity or an adversary's ability to disrupt movement through cyberattacks, diplomacy or kinetic attacks.

Army Futures Command's Next Generation of Combat Vehicle (NGCV) program will produce upgraded vehicles. However, the NGCV is prioritizing the building of optionally manned fighting vehicles (OMFV) to transport troops and replace the Bradley Infantry Fighting Vehicle, along with developing robotic combat vehicles (RCV) to augment M1 capabilities.[10] Improving manned vehicles in a brigade or adding RCVs to a brigade will increase the formation's combat power but also impact its strategic mobility. The NGCV programs are useful but have the potential to reinforce the legacy of a low priority for transportability and the M1-centric Armored Brigade Combat Team (ABCT) force structure, which cannot meet many of today's strategic and operational mobility requirements.[11] Instead, the Army should make strategic mobility a higher priority and experiment with substantially different force designs and warfighting concepts that can achieve U.S. objectives at the strategic pace of 21st century combat. The Army should evaluate at least three potential options and fast track the best one, or a combination of the best ones—ultralight RCVs, heavy RCVs and light manned vehicles with missiles.

RCV Options

An ultralight RCV offers a radically different option because it would require a force structure drastically different from today's, with significant advantages and disadvantages that are difficult to evaluate. An ultralight RCV would be relatively cheap and easier to mass produce, allowing for the potential to produce a somewhat disposable combat vehicle. In combat with a capable adversary, the Army would expect to lose (and then replace) most RCVs committed to the fight. These ultralights could be wheeled, have little armor and essentially be a frame with an engine, communications and weapons. This type of ultralight RCV's survivability depends on speed, small size and a resilient control system. Over time, automation capabilities could be added, but, for the near future, remote control resiliency is crucial for success.

An ultralight formation would likely differ dramatically from current tank brigades due to requirements for control vehicles or dismounted controllers, as well as entirely different logistics and maintenance requirements.

Ultralight RCVs have the potential to substantially reduce maintenance requirements; however, replacements might consume supply chain capacity and challenge the U.S. industrial base. History suggests that an easy-to-manufacture but less-survivable ultralight RCV has the potential to succeed. World War II showed the ability of a well-balanced force with more plentiful but weaker tanks (i.e., Shermans) to defeat an adversary with superior tanks (i.e., Panzers). Operational and strategic success results from many factors, but quantity has a quality of its own. Successful ultralight use requires a mass-producible platform along with appropriate support infrastructures, doctrine and force structure. Adopting an ultralight model would require changing Army culture, which has emphasized using the best equipment and goes to extreme lengths to prevent loss—as Soldiers sent to recover a cheap, crashed UAV or old, lost night vision devices will attest.

Heavyweight RCVs may align more closely with current Army culture and force structure but still offer a revolutionary change. Replacing M1 Abrams tanks with 27-ton RCVs in U.S.-based tank brigades could increase the combat power, strategic mobility and operational maneuverability of a tank brigade. For example, the Army Science Board indicates that an RCV can obtain the capability of an Abrams tank with a vehicle two-thirds the size and less than half the weight of an Abrams.[12] A C-17 could carry two RCVs and some control vehicle variants (e.g., Stryker) instead of one Abrams tank.[13] This provides the Army with the ability to rapidly reinforce light brigade formations with tank companies—large force movements would still require sealift. Additionally, replacing lost RCVs is easier than replacing an M1 and trained tank crew. Relative to ultralights, heavy RCVs provide increased combat power and survivability at the cost of less strategic air mobility and increased requirements for maintenance and fuel.

RCV Concerns

All RCVs offer advantages over M1 tanks for 21st-century conflict, but they also come with their own weaknesses. Each RCV design has different advantages and disadvantages for mobility (strategic, operational and tactical), logistics support and battlefield effectiveness. Relative to manned tanks, RCVs open up the vehicle design space by changing many requirements resident in manned vehicles. Manned vehicles have minimum requirements for crew protection and operator cabin space that increase vehicle size. RCVs also have less need for shock absorption and little need for nuclear (i.e., radiation), biological or chemical protection. RCVs have the potential to encourage commanders to objectively consider a wider variety of tactical options when comparing the benefits of a mission to the costs when robots, not Soldiers, would be at risk.

Despite the advantages, RCVs present three primary concerns: communications reliability, hacking susceptibility and situational awareness. Reliable communications are essential because artificial intelligence (AI) has not advanced to a point where AI is suitable for combat operations, and it may never progress to that point for technological or policy reasons. RCVs require controllers who are relatively close because the latency between an RCV and a controller communicating via satellite links is too great for effective combat operations—exemplified by the delay visible during satellite video conferences. The requirement for relative physical proximity between controllers and RCVs makes jamming difficult, and today's automation technology is sufficient to provide safeguards for connection interruptions; disconnected RCVs could stop in place, automatically retreat or execute a different tactic. Additionally, effective use of terrain and other tactics, techniques and procedures (TTPs) could help ensure reliable communications and prevent jamming. TTPs would also need to ensure the survivability of the control vehicles. In some cases, controllers may be able to operate dismounted, and control vehicles should not be on the front line, but controllers would inherently have less protection than when in an M1 tank.

Hacking and situational awareness are potential problems, but these two issues might be an equivalent or greater problem for legacy vehicles. A new RCV should be built from the ground up, with cybersecurity baked into the design. The Abrams was originally built without consideration for hacking or networking, but the modern battlefield means that Abrams tanks will operate in a networked environment, and upgrades have connected such legacy systems to the broader network. These upgrades may have robust security, but they connect the network to a series of vulnerable nodes—the legacy systems (e.g., M1 tanks)—built without consideration for cybersecurity. However, the impact of a cybersecurity breach should be less harmful to legacy systems in many cases.

RCVs have the potential to provide equal or greater situational awareness to remote operators than a driver physically in the vehicle. Although a tank commander (TC) standing up in the hatch has greater situational awareness than any RCV driver, no competent TC would stand in the hatch during a firefight. RCVs offer other advantages

as well. For example, experiments showed that drivers can maneuver vehicles over rough terrain faster when operating remotely relative to in-person operation, according to my discussions with Tank Automotive Research, Development and Engineering Center (TARDEC) engineers in 2016. The engineers believe that the impact of bouncing around in a vehicle makes driving more difficult, although operating an RCV from a moving vehicle could negate this advantage. The overall costs, benefits and risks of RCVs are uncertain because they are new and have never been used at scale in a combat environment. RCVs could replace manned tanks, but the marginal costs and benefits vary and are difficult to measure. Perhaps most important, an RCV's costs and benefits will depend on the overall force structure and doctrine in which the RCV operates. Just as important, RCVs will have greater advantages for some tasks than others.

Ultralight Manned Option

The potential weaknesses of RCVs create a need to consider a third manned option—small, fast vehicles with missiles. This type of force could not replace the survivability of M1 tanks, but it could provide sufficient firepower to support defensive operations that would substantially increase the cost of an adversary's aggression. Building a force of fast and agile—but vulnerable—units goes against the modern American way of war that spares no expense to protect U.S. Soldiers. However, antitank capabilities have advanced faster than tank defenses, and small, agile vehicles gain some protection by avoiding direct enemy fire. Using a much smaller and lighter force would ease strategic transport to the battlefield and resupply operations, but it would likely reduce the force's capacity for holding ground against large enemy formations.

My experience as an airborne antitank platoon leader over two decades ago demonstrated the capability of light vehicles relative to dismounts alone. My four gun trucks—High-Mobility Multi-Wheeled Vehicles (HMMWV)—carried more firepower than any of the rifle companies in the battalion. Converting rifle companies into antitank companies has the potential to substantially increase lethality while maintaining a relatively light and air-transportable footprint relative to an M1 tank company. A light unit with sufficient antitank trucks and missiles may lack the capacity to quickly defeat an armored enemy force but will be able to slow the enemy's advance through attrition. Well-designed simulations should be able to suggest the capability of proposed light forces to slow a determined adversary in a direct fight. Additionally, tabletop exercises could identify how a light force may significantly improve local resistance efforts. Slowing down an adversary may not win the war, but it could prevent a loss that would buy time for partners to field heavier forces or allow heavy U.S. units to conduct strategic movements.

The Army's current effort to produce a Mobile Protected Firepower (MPF) vehicle for light units appears to support the idea of small vehicles with antitank capabilities.[14] Unfortunately, even a light tank substantially increases the weight and logistical requirements of a light force well beyond a gun truck-like vehicle. Augmenting light units with a manned light tank likely has limited utility and precludes gaining insights into the practical problems and solutions of using an RCV. Either an RCV or heavily armed, not armored, HMMWV-like car would likely provide a better option than the current MPF proposal. U.S. military commanders and political leaders would not like this option, but it would cause more damage to the enemy than a more survivable formation that may not arrive at the battlefield before the enemy achieves its goals.

The M1 tank and current force structure may have more raw combat power and survivability than any of the three options described. Upgrading the current force could be a better option *if* the Army could pre-position sufficient forces near the forward edge of the battle area. However, for a global military, it is impossible to know where the next battlefield location will be. Pre-positioned stocks are a possible way to alleviate this problem even without knowing exact locations, but only if the Army can secure the funding and political agreements necessary to create stockpiles in the right locations. Although they are useful, pre-positioned stocks have two key vulnerabilities. First, they are often stationary and therefore relatively easy for adversaries to identify and target. Second, the readiness of pre-positioned equipment depends on disciplined maintenance that is not always easy to keep up, as demonstrated by recent maintenance lapses for ventilator stockpiles.[15] These limitations make upgrading M1 tanks to improve combat capability while increasing weight a questionable endeavor. Improvements for the entire force are almost certainly a waste of time and money that could be better spent on numerous other projects, including but not limited to expanding pre-positioned stocks or identifying future, expeditionary formations that the Army could deploy in time to make a difference.

Choosing the Best Alternative

Building a revolutionary and more expeditionary force structure requires comparing different options against one another and the current force. Each option should be a complete formation that includes the necessary support structure and connectivity to the joint and combined forces, which will require input from a cross-functional team with the appropriate expertise for each aspect of a combined arms fight. The previously discussed alternatives to the M1 tank offer a starting point for new force structures and are an important aspect of the new formations, but only represent one aspect. The design team will likely need to consider adjustments that extend beyond the M1 as well as adjusting the formation's TTPs. War simulations provide the best way to compare different force structures, and the criteria for comparison should be clearly articulated ahead of time.

The comparison should include results for each force structure fighting the state and non-state adversaries outlined in the *National Defense Strategy*.[16] The different challenges presented by China, Russia, Iran, North Korea and non-state actors create a situation where each alternative's advantages and disadvantages may have a significant impact against one potential adversary and little or no impact against others. The criteria for evaluating each simulation must remain the same and evaluate all functions from tactical and strategic movements to repairs, logistics and replacements. The simulations should produce data for monetary costs (purchase, operations, maintenance and transportation), casualties, time to cessation of combat operations, degree of battlefield success and other factors important to senior leaders. Costing is a difficult task, but the growth of digital analytics platforms likely provides a way to obtain sufficient monetary cost estimates.[17]

In addition to costs and casualties, understanding the time that forces take to arrive at the battlefield and defeat an adversary are critical evaluation criteria. There are many ways to measure time. To maintain realism, the clock should start when troops receive alert orders, which should be the day an adversary initiates hostilities. Measuring time in this manner assumes no warning to pre-deploy forces because that is the most likely and most dangerous situation based on the ability of potential adversaries to surprise U.S. forces with large troop movements.[18] Additionally, the evaluation must account for the time required to move forces from the United States to the battlefield.

Unfortunately, many war games and simulations prioritize how well units will fight once engaged in combat, overlooking the strategic and operational movement problems. A holistic simulation begins with units deploying from their home station and includes adversary efforts to disrupt those deployments. Ignoring these problems unfairly advantages M1 tanks by ignoring one of the most important heavy tank vulnerabilities—its ability to get to the battlefield before an adversary achieves its objectives. Examining global threats and strategic movements for wargaming is difficult because combatant commands have the responsibility to "produce plans for the employment of the armed forces."[19] The regional nature of combatant commands complicates any effort to look at the entire strategic picture, which inherently includes issues outside of the combatant command's responsibility and resident expertise. Further complicating analysis is the reality that strategic movements and global logistics are less exciting than combat strategies and tactics, which unconsciously incentivizes commands to focus wargames on evaluating operational concepts and tactics. Regardless of what happens normally, simulating and understanding how different force structures affect vital strategic imperatives such as strategic mobility and logistics should drive institutional Army decisions. After all, "amateurs talk about strategy and tactics. Professionals talk about logistics and sustainability."[20] Only a professional answer will provide the Army's secretary and chief with the information needed to make a revolutionary change to Army force structure and investments that will increase the Army's ability to win current and future wars with fewer human casualties.

Conclusion

The Army should stop upgrading the M1 Abrams tank and potentially other legacy systems that will not be effective in the 21st-century strategic environment. What should replace or augment the Army's current armor brigades is unclear and requires substantial analysis, simulation and experimentation. The Army is too large and has too much invested in the current force to discard the M1 without a solid replacement; however, the M1 lacks the strategic mobility needed for today's environment, and the Army must accelerate the transition to a more expeditionary force structure. A new force structure might lose a head-to-head contest with a similarly-sized M1-led unit, but that comparison lacks relevance if only units with the new force structure can arrive at the battlefield in time to achieve U.S. objectives.

The Army should focus its investments on capabilities that will be effective in today's strategic environment, which often prioritizes strategic speed. In all future scenarios, RCVs will play an important part in the U.S. Army's capabilities. Putting the time and effort into developing the right force structures to compare, and then building prototypes to experiment with, should be the focus of Army efforts to upgrade its combat forces. The Army's plan to conduct unit experiments using light RCVs from QinetiQ and Textron in 2022 is a great start because only complete units can develop the tactics, techniques and procedures necessary to make RCVs combat-effective.[21] Additionally, only unit operations will provide the data necessary to improve the fidelity of simulations using RCVs. More research on what should be done is necessary, but for now it should be clear that upgrading M1 tanks is a poor way to spend limited Army resources. There are more important priorities.

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