

Integrating Army Robotics and Autonomous Systems to Fight and Win

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Why the Army Needs a Robotics and Autonomous Systems Strategy

U.S. military dominance is no longer guaranteed as near-peer competitors have quietly worked to close the gap while the United States was preoccupied with two low-intensity wars in the Middle East. Recognizing that warfighters might no longer have a guaranteed technological advantage, the Department of Defense (DoD) is in the midst of an ambitious modernization program that seeks to ensure superiority in the future battlespace. The Third Offset Strategy, a successor to the Second Offset Strategy of the Cold War (which saw the development of the Army's current big-five platforms to counter numerically superior Soviet conventional forces) is focused on leveraging emerging and disruptive technologies. In particular, human-machine teaming, also referred to as manned-unmanned teaming, will integrate people with autonomous systems or artificial intelligence to enhance decisionmaking speed. This will enable U.S. forces to react faster than future threats and achieve decision dominance.

Near-peer competitors have taken concerted action to develop their indigenous robotics and autonomous systems. Russian President Vladimir Putin has called on their defense industry to create "autonomous robotic complexes." The Russian Military Industrial Committee, responsible for Russian military industrial policy, has set a goal to replace 30 percent of all military technology with RAS by 2025, developing several models of remotely operated combat vehicles designed for a variety of missions, including direct combat.¹ China has also made major strides in RAS by studying the U.S. deployment of unmanned systems and the Third Offset Strategy. The U.S.-China Economic and Security Review Commission concluded that Chinese military thinkers posit that autonomous systems are contributing to an ongoing revolution in military affairs that "relies on long-range, precise, smart, stealthy and unmanned weapons platforms." China's intent is for robotics and autonomous systems, particularly artificial intelligence, to allow it to dominate the next generation of "intelligentized" warfare.²

ISSUE

The Army requires a roadmap for the integration of Robotics and Autonomous Systems (RAS).

SPOTLIGHT SCOPE

- The Army published its first ever RAS Strategy in March 2017.
- It describes the Army's vision for integrating robotics and autonomous systems over the near term (2017–2020), mid-term (2021–2030) and far term (2031–2040).

INSIGHTS

- The RAS Strategy prioritizes investments over time, enabling the Army to maintain overmatch and win in a complex world.
- Robotics and Autonomous Systems can contribute to the realization of five capability objectives:
 - increasing situational awareness;
 - lightening Soldier load;
 - sustaining the force;
 - facilitating movement and maneuver; and
 - protecting the force.
- The Army has more than a dozen robotic programs of record and emerging requirements.
- The Army and its industry partners need to continue to take actions that demonstrate immediate capability of RAS, reduce future risk and provide interim solutions to Army Warfighting Challenges.

■ Historical Basis

Over the past 70 years, the U.S. Department of Defense has leveraged its military ingenuity to maintain an advantage over near-peer competitors. President Dwight D. Eisenhower developed what became known as the First Offset Strategy in 1953, then termed it the “New Look,” which leveraged U.S. nuclear superiority to deter the threat of overwhelming Russian aggression. Adopting this approach allowed DoD to reduce its endstrength by 40 percent between 1954 and 1957.

When the Russians achieved nuclear parity in the 1970s, Secretary of Defense Harold Brown emulated Eisenhower’s approach and developed the Second Offset Strategy, which focused on extended-range precision-guided munitions, stealth and advanced intelligence, surveillance and reconnaissance platforms to maintain a competitive edge. This effort demonstrated its value with the crushing defeat of the Iraqi military during Operation Desert Storm. The world recognized the conventional dominance of the United States.

■ Current Imperatives

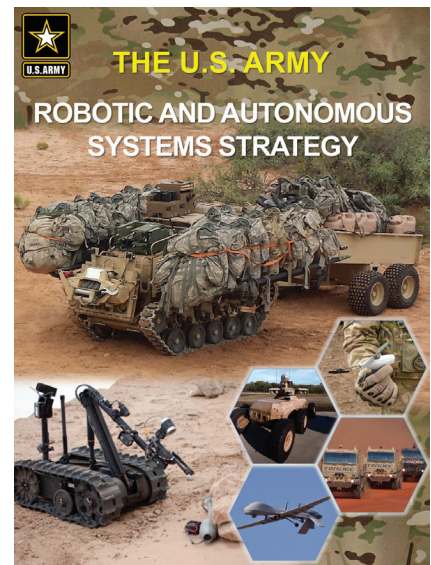
After more than 15 years of persistent conflict, America’s adversaries have once again achieved technological parity with the United States by investing in advanced technologies once monopolized by the U.S. military to degrade its competitive advantage. Seeking to out-pace future adversaries, then-Secretary of Defense Chuck Hagel announced DoD’s intention to implement a Third Offset Strategy with a focus on robotics, artificial intelligence and autonomous deep-learning machines.

In pursuing RAS technologies, the Army seeks to address three challenges in the future operating environment: greater speed of action on the battlefield, increased use of RAS by adversaries and increasingly complex and congested environments. To overcome these challenges, the Army must seize technological opportunities for RAS development.

■ Capability Objectives

To support the integration of unmanned systems, the Army Capabilities Integration Center (ARCIC) developed the Robotic and Autonomous Systems Strategy,⁴ which the Vice Chief of Staff approved on 27 February 2017. The RAS strategy prioritizes investments over time and is a call to commit time and resources to position the Army for success and improve the combat effectiveness of the future force. Today, the Army has more than a dozen robotic programs of record and emerging requirements. To advance unmanned system development, **the RAS Strategy identifies five capability objectives to guide technology development and employment of air and ground systems:**

- **Improve situational awareness.** Complex terrain and enemy countermeasures limit Soldiers’ abilities to see and fight at extended distances. Increasing the number of unmanned aircraft and ground systems at the battalion level (and below) will allow for persistent surveillance and reconnaissance over wide areas. Rucksack-portable Unmanned Aircraft Systems (UAS) such as the Short-range Micro (SRM) capitalize on autonomy and the ability to hover, perch and stare, which enables tactical forces to make contact with the enemy on their own terms.



The U.S. Army Robotic and Autonomous Systems Strategy was developed by the Maneuver, Aviation and Soldier Division at the Army Capabilities Integration Center and released in March 2017.

RAS CONTRIBUTIONS TO THE DEPARTMENT OF DEFENSE

- reducing the number of warfighters in harm’s way;
- increasing decision speed in time-critical operations; and
- performing missions impossible for humans.³

- **Lighten the warfighters’ physical and cognitive workloads.** Excessive equipment requirements on the dismounted Soldier and squad reduce stamina and endurance. Autonomous systems such as the Squad Multi-purpose Equipment Transport (SMET) can drastically lighten equipment loads by carrying up to 1,000 pounds of mission-essential equipment for the team or squad. Having proven its worth in multiple experiments, the Army intends to procure 80 SMET platforms to further develop concepts to increase Soldier speed, stamina and effectiveness.
- **Sustain the force with increased distribution, throughput and efficiency.** Logistics distribution is resource-intensive and leaves Soldiers vulnerable on extended resupply lines. The Leader–follower capability uses a mix of manned and unmanned vehicles to conduct convoy operations. This lifesaving technology employs dedicated short-range radios and computerized behavioral algorithms to allow multiple unmanned trucks to follow the lead manned truck. Unmanned systems, both air and ground, will help resupply units at the greatest point of need—the last tactical mile.
- **Facilitate movement and maneuver.** Potential enemies are able to engage Army forces with emerging technology earlier and at greater distances. In addition, obstacles threaten movement and maneuver along extended routes. The semi-autonomous unmanned combat vehicle exemplifies the manned–unmanned teaming concept by operating in front of maneuver units to increase force protection and the time and space in which Army formations operate. The unmanned combat vehicle creates a buffer between enemy and friendly formations that gives commanders options while presenting the enemy with multiple dilemmas.
- **Protect the force.** Much like today, the future operating environment will require Soldiers to conduct route clearance and explosive ordnance disposal operations that expose them to hazardous situations. RAS technologies such as the Common Robotic System–Individual (CRS-I) and the Route Clearance Interrogation System (RCIS) will enhance Soldiers’ survivability by providing greater standoff distance from enemy formations.

RAS CAPABILITY OBJECTIVES:

RAS supports the Army’s efforts to:

- improve situational awareness;
- lighten the warfighters’ physical and cognitive workloads;
- sustain the force with increased distribution, throughput and efficiency;
- facilitate movement and maneuver; and
- protect the force.

The goal of RAS is to increase the combat effectiveness of the future force and maintain overmatch against enemies.

The RAS strategy prioritizes investments over time, enabling the Army to maintain overmatch and win in a complex world.

	NEAR-TERM 2017–2020	MID-TERM 2021–2030	FAR-TERM 2031–2040
Increase situational awareness	<ul style="list-style-type: none"> • Soldier-borne sensor 	<ul style="list-style-type: none"> • Swarming unmanned aircraft system 	<ul style="list-style-type: none"> • Autonomous recon systems • Warrior suit
Improve sustainment	<ul style="list-style-type: none"> • Leader–follower semi-automated resupply 	<ul style="list-style-type: none"> • Fully-automated convoy operations 	<ul style="list-style-type: none"> • Autonomous cargo delivery aircraft
Facilitate maneuver	<ul style="list-style-type: none"> • Husky mounted detection system/light flail 	<ul style="list-style-type: none"> • Unmanned combat vehicles and advanced payloads 	<ul style="list-style-type: none"> • Improved unmanned combat vehicle
Lighten Soldier load	<ul style="list-style-type: none"> • Squad multipurpose equipment transport 	<ul style="list-style-type: none"> • Exoskeleton 	
Protect the force	<ul style="list-style-type: none"> • Counter-improvised explosive device (C-IED) 		

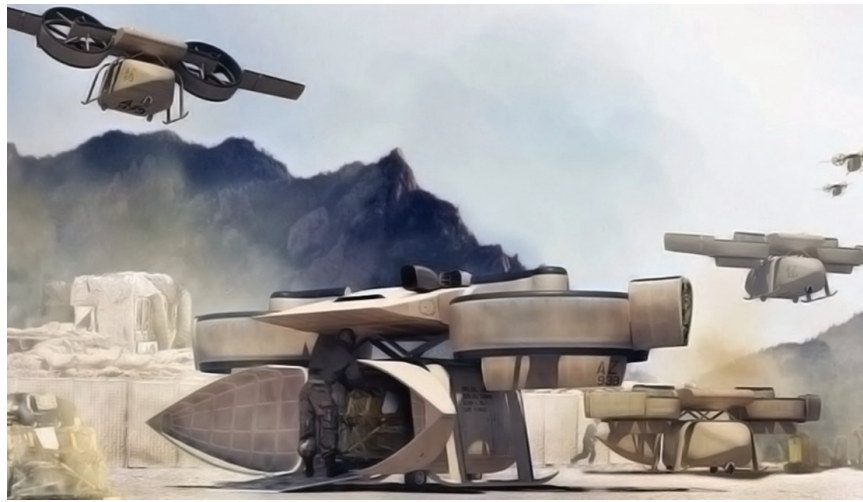
Source: Army Capabilities Integration Center

■ The Way Ahead

From a technology perspective, the primary near-term investments underpinning the RAS strategy are the pursuit of Artificial Intelligence (AI) and autonomy development. AI is generally viewed as the *sine qua non* that enables unmanned platforms to operate autonomously. For the Army, autonomous off-road mobility is the most challenging requirement for ground combat vehicles. Advancements in AI and off-road mobility will change how the Army operates by steadily integrating autonomous systems into combined-arms maneuver.

To expedite the fielding of robotic systems, the Army G-8, responsible for budgeting and programming, has recommended the increased use of directed requirements. This approach serves as a bridge to ensure that rapidly changing technologies get in the hands of warfighters while work continues on time-intensive programs of record. To support the near-term integration of unmanned systems, the Army has significantly increased resources to meet the demands for expedited fielding. Between fiscal years 2018 and 2023, the planned expenditures for RAS programs more than double.

The Army is moving rapidly with the integration and fielding of unmanned systems to meet the objectives of the Third Offset Strategy. The RAS Strategy will evolve over time but will remain focused on the fundamental objective of maintaining overmatch and pursuing new technologies to protect Soldiers. As land forces maneuver to gain positions of relative advantage, RAS will provide a vital component to achieving domain superiority and freedom of maneuver, reshaping how the Army fights in the future.



Concept art for the Aerial Reconfigurable Embedded System (ARES), an unmanned cargo aircraft.

¹ Franz-Stefan Gady, “Meet Russia’s New Killer Robot,” *The Diplomat*, 21 July 2015, <http://thediplomat.com/2015/07/meet-russias-new-killer-robot>.

² Elsa Kania, “AlphaGo and Beyond: The Chinese Military Looks to Future ‘Intelligentized’ Warfare,” *Lawfare*, 5 June 2017, <https://www.lawfareblog.com/alphago-and-beyond-chinese-military-looks-future-intelligentized-warfare>.

³ Defense Science Board Study on Autonomy, August 2016, <https://www.hsdl.org/?view&did=794641>.

⁴ http://www.arcic.army.mil/App_Documents/RAS_Strategy.pdf

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