The battlefield of the future is closer than some may think. By 2025, the Army sees ground troops conducting foot patrols in urban terrain with robots, called Squad Multipurpose Equipment Transport vehicles, that carry rucksacks and other equipment alongside Soldiers. Overhead, unmanned aircraft will also serve as spotters to warn troops so they can engage the enemy on their own terms, according to the the Army's new strategy on robotic and autonomous systems. (Photo Credit: U.S. Army)

Technology and Warfare

Concepts and Integration

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Science and innovation have been integrated into battle strategy and tactics since the beginning of warfare. Metallurgy in weapons, gunpowder, rifling in barrels, combustion engines, and railroads are all examples of modernization that changed the way wars are fought. Today's U.S. Army is pushing the boundaries of technology in both the preparation for combat, as well as mechanizing and digitizing the current and future battlefields.

The Evolution

As warfare evolves it becomes increasingly necessary to enhance training and develop more rigorous programs to prepare new recruits. The U.S. Army has fortified its combat infantry training cycles to allow more time for physical training and exposure to combat scenarios (Suits, 2018).

Virtual Reality is defined as "an artificial environment which is experienced through sensory stimuli (such as sights and sounds) provided by a computer and in which one's actions partially determine what happens in the environment" ("virtual reality," 2019). The improvements in virtual reality (VR) allows the Army to revolutionize its combat training, making it more efficient. Virtual reality platforms allow the Soldiers to immerse into combat scenarios. In these different programs one can feel, smell, touch, hear, and get a sense

of the realities of battle without the direct risk of injuries.

In a white paper by the *U.S. Army Combined Arms Center*:

> The application of Augmented Reality with Artificial Intelligence in the future live-training environment will provide the Army the ability to replicate cultural specific human behaviors as well as autonomous civilian and military equipment behaviors (robots, drones, droids etc.). This combination of capabilities will simulate large density human behavior "patterns of life" and crowd behaviors in dense urban environments. The ability to conduct live training in conjuction with gaming, constructive, and virtual is possible and will enable units all over the world to train together improving multi-echelon training exercises. (Synthetic Training Environment White Paper, n.d., p. 5)

Player 2 has Entered the Game

Graphic by the NCO Journal.

Utilizing VR scenarios decreases the time and logistics required to train Soldiers on combat tactics and increases the time that may be devoted to improving and increasing real physical capabilities such as strength, endurance, mobility, and stamina. Multiple scenarios can be rehearsed, experienced, replayed, and reviewed simultaneously to maximize training efficiency.

Through the VR platforms, the scenarios experienced are now only limited by the imagination and can include ethical decision-making, target discrimination, physical capacity (by quantifying the avatar with real physical abilities), adaptability, and more. Leaders can also design their own scenarios based on mission specific goals. According to Dan Robitzki, "The Army has already built a virtual version of North Korea, South Korea, San Francisco, New York, and Las Vegas, according to military engineers" (2018, para. 5).

While the ability to create and train in any virtual environment at any given time gives the U.S. military an advantage over its adversaries in terms of preparedness and operational experience, VR isn't strictly for training purposes. It's also being used to treat returning combat veterans suffering from Post Traumautic Stress Disorder (PTSD).

In his article for *NBC News*, Simon Parkins interviews Albert Rizzo, a research professor at the USC Davis School of Gerontology, who explains "Exposure therapy is an ideal match with VR. You can place people in provocative environments and systematically control the stimulus presentation" (2017, para. 24). This form of therapy utilizes VR to repeatedly expose the patient to their trauma scenario in a controlled environment until the patient's anxiety or emotions are no longer triggered by the event.

As VR becomes more prevalent in everyday society, its ability to train and heal also increases. It is a technology that the world is just beginning to utilize.

A U.S. Army Sapper, Ranger, and Airborne qualified Soldier assigned to the 101st Airborne Division, uses the Virtual Battle Space 3 (VBS3) system at the Joint Multinational Simulation Center's Tactical Gaming division in Camp Aachen, Germany, May 3, 2019. VBS3 is a flexible, video game-based platform where service members can conduct virtual training scenarios as they would in the field. (U.S. Army photo by Sgt. Christopher Stewart)

The Spectrum

The digital realm is not the only area that the U.S. Army is making significant advances. The Army's operational advisors have long anticipated a degraded utility of the electromagnetic spectrum (EMS). Sgt. 1st Class Michael Waxler from the Army's *Asymmetric Warfare Group* explains that when U.S. adversaries jam and sabotage the electromagnetic spectrum as a means to disable or minimize American capabilities, the U.S. improves communications by integrating a series of contingencies into communications suites and learns to adapt to compromised EMS by training in degraded EMS environments. "One solution to mastering the EMS problem quickly is having an experienced spectrum manager at the brigade level" (Waxler, 2019, para. 9). With the growing accessibility of EMS-jamming tools to adversaries, forward progress in the EMS realm is not having the fanciest gadget, but to train an EMS specialist for each unit that can function with or without EMS capabilities that can adapt to each unique situation.

Operations

***The following sections are all projects the U.S. Army is developing and were obtained from open source publications.**

Shoot

The Army is currently working with defense firms to design and manufacture two new weapons. Under the Next Generation Squad Weapon program, they will replace both the M249 SAW and the M4/M4A1 carbine. According to *Military.com*, "Both the rifle and automatic rifle versions of the weapon would be equipped with a sophisticated fire control designed with the following characteristics:

- An adjusted aiming point that considers range to target, atmospheric conditions, and ballistics of weapon and ammunition.

- A ballistic calculator that runs on Government Ballistic Software — Small Arms.

- Wireless communication, capable of transmitting fire control data such as range to target, ballistic solution and temperature.

- A wired port that will send and receive data and allow for software updates.

- A start time within '1.0 seconds' from off to fully active, using common batteries." (Cox, 2019, para. 7).

The new Soldier Protection System, or SPS, includes a modular scalable vest, a ballistic combat shirt, and a ballistic combat belt, along with the new helmet. (U.S. Army photo by Devon L. Suits)

Move

Mobility equals survivability. In *The Soldier's Heavy Load*, (in the "Super Soldier" series of reports by the Center for a New American Security, commissioned by the U.S. Army Research Laboratory) the report states "Body armor is heavy, bulky, and hot. It has the immediate effect of hampering Soldier mobility by adding weight, limiting joint mobility, and restricting movement in tight windows, doorways, and vehicles not designed for the bulk of modern armor" (Fish & Scharre, 2018, para. 5).

Because of this, combat advisors have been advocating for smaller and lighter body armor (Asymmetric Warfare Group, 2017). Items like plate carriers as opposed to bulky, layered body armor, allows the Soldier to maneuver faster thereby increasing survivability. Also, smaller and lighter equipment allows Soldiers to move greater distances before reaching fatigue. This allows them to preserve energy and engage the enemy with greater efficiency.

The Army is currently field testing the new Head Protection System, Improved Outer Tactical Vest Generation IV, Ballistic Pelvic Protection, and the Ballistic Combat Shirt (South, 2019).

Beyond just upgrading the individual Soldier, the Army has spent several years developing a robotics component for future battles that will both lighten the Soldiers' physical workload, as well as cognitive workload as these robotic systems are being designed to improve communications and enhance real-time logistical capabilities.

According to the U.S. Army Training and Doctrine Command, the Army's Robotic and Autonomous Systems strategy will enhance the following:

Composite picture by Army Press in their Future Warfare Writing Program story "Cyber Specialists and Future Force Structure."

- Increase situational awareness

- Lighten the Soldiers' physical and cognitive workloads

- Sustain the force with increased distribution, throughput, and efficiency

- Facilitate movement and maneuver

- Protect the force (Training and Doctrine Command, 2017)

Of the five capability objectives, the priority in the near-term is to increase situational awareness and lighten the Soldier's physical load, which will improve combat effectiveness of dismounted units. In the mid-term, the priority is to improve sustainment and Soldier protection with automated convoy operations. The autonomous technology within automated convoy operations will transfer to many other future initiatives such as unmanned combat vehicles. In the far-term, the priority is to facilitate maneuver with unmanned combat vehicles, which will increase capabilities within brigade combat teams. (Training and Doctrine Command, 2017, p. 2)

Communicate

The global military communications field is evolving at a geometric rate. And while there have been many advances and upgrades in software and devices, there have also been just as many hacks and weaknesses found in other systems. According to *Foreign Policy*, "The U.S. Army has concluded that its $6 billion battlefield communications system would likely be breached by Russia or China in the event of a big-power conflict, rendering it all but useless against sophisticated foes" (McCleary, 2017, para. 1).

The *U.S. Army Futures Command* has recently introduced its Radio Interoperability Capability – Universal (RIC-U) device that allows for real-time radio communication between the U.S. and its allies during multinational exercises and operations while still keeping the military network's protection and encryptions intact.

In the last few years, especially with the events in Ukraine, China and Russia have shown that they are capable of competing in the technological landscape and that the illusion of superiority created by fighting against enemies with minimal technological capabilities has disappeared (McCleary, 2017). Maj. Gen. Cedric T. Wins told *Army Technology* "Our warfighters need to be agile, expeditionary and interoperable, so we are developing tactical network solutions that are mobile, hardened, resilient and able to operate in degraded and contested environments" (Venna & Husseini, 2019, para. 9).

Synthesis

With all the military technological advances in the works it is an exciting time to defend this nation. This article barely scratches the surface on the innovative devices and designs the U.S. military is planning to unveil in the near future. From hand-held portable medical stations, to exo-skeletons, to modular and armed robotic systems with crowd control capabilities, to even autonomous ships that don't require a physical crew.

There is no doubt that technology has changed how the military fights wars, and how it plans for wars, but military leaders cannot lose sight of the human domain of war regardless of technological advances. To echo Waxler's argument, and as demonstrated by our adversaries and allies alike, the U.S. cannot trust that it will have dominance of the EMS or that electronics will be functional during a battle (Waxler, 2019). The Army can't even prove that technology will be effective at all, as shown by the Iraq and Afghanistan conflicts where the enemy simply adapted their fighting techniques to counter our technology and tactics by blending in with civilian populations or destroying large military vehicles with homemade explosives often using common materials. As always, the perpetual truth remains that the most important part of the U.S. Army is not the fancy toys, but the cunningness and adaptability of its Soldiers. ∎

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