Multifunctional Utility/Logistics and Equipment (MULE) Vehicle Will Improve Soldier Mobility, Survivability and Lethality

MAJ D. Brian Byers

We are on the cusp of a paradigm shift in the Army. It has been mandated that one-third of Army vehicles are to be robotic beginning in 2015. So what progress are we making? The Army is using a wide range of small robots such as PackBot® and Talon for explosive ordnance disposal, improved explosive device detection and clearance, and reconnaissance and surveillance by dismounted Soldiers throughout the U.S. Central Command area of responsibility. These machines are typical of the rapid fielding mindset that we have embraced in our wartime setting. Yet, these are small robots with limited payloads and limited functionality. Just around the corner is a new breed of robots that will impact how we as an Army move and fight. Get ready for an old friend, the MULE!

A fully loaded MULE EEU is put through its paces on the open road during mobility testing. (Photo by Michael Norman, Lockheed Martin.)

The MULE EEU can tow a vehicle 3 5 times heavier than itself. Here, the MULE successfully tows a 5-ton truck. (Photo by Michael Norman, Lockheed Martin.)

The MULE is the multifunctional vehicle developed by Lockheed Martin Missiles and Fire Control (LM MFC) as part of the Army's Future Combat Systems (FCS) program. The MULE is a family of unmanned ground vehicles (UGVs) that will be in the 7,000 pound class of medium robots. Within 20 years, the MULE will be commonplace in every brigade in the Army. What makes these systems unique is the mobility, processing power, networked connectivity and robot size. The MULE family consists of three robotic vehicles: the MULE Transport (MULE-T), the MULE Countermine (MULE-C) and the Armed Robotic Vehicle-Assault (Light) (ARV-A(L)).

Each variant will lighten Soldier burdens in the near future.

The MULE family is based on a common mobility platform that serves as the vehicle's backbone. The common mobility platform is a 6-wheeled chassis housing power and propulsion systems, computers, Autonomous Navigation System (ANS) hardware and vehicle cooling components. By using this common mobility platform, maintenance will be simplified and common across formations. This will ease logistics burdens for multiple spare parts as well as decrease the amount of training Soldiers will need to conduct repairs. Power and propulsion within the common mobility platform will provide a vehicle that has extreme capabilities for its weight. With its engineering model, the Engineering Evaluation Unit (EEU), the MULE has demonstrated power to tow a vehicle 3.5 times heavier than itself. This flexibility will allow the robot to support limited vehicle recovery operations within brigades, freeing Soldiers and equipment from these dull and sometimes dangerous tasks.

The MULE EEU, configured as a MULE-T, is undergoing capability testing at Camp Gruber, OK. The MULE-T can carry two squads' worth of weapons, ammo and equipment. (Photo by Michael Norman, Lockheed Martin.)

MULE-T

MULE-T is designed to be the Soldiers' "pickup truck." With a payload of more than 1,900 pounds, the MULE-T will take loads off Soldiers' backs. Designed to carry more than two squads' worth of equipment, it provides commanders a flexible platform to move supplies and equipment throughout the operational environment, freeing Soldiers to focus on combat tasks. This ability to form robotic convoys will further take Soldiers out of harm's way by letting these robust robots carry loads instead of placing drivers on the road. The capability of a medium robot to autonomously navigate on the modern battlefield frees Soldiers from having to "teleoperate" it as we do robots today. By integrating ANS onto the MULE, the robot is now able to

perceive its environment and act upon that perception. This frees a Soldier from having to "drive" the robot. It also allows the commander to plan routes throughout the operational environment, thereby increasing tempo throughout the spectrum of operations. Commanders are only limited by their imagination on how to employ the robot.

MULE-C

MULE-C uses the Ground Standoff Mine Detection System (GSTAMIDS) for FCS to identify, mark and neutralize mines in support of mounted forces. Working within a networked force, MULE-C will move to an area of interest that may contain landmines. The unit commander would then employ MULE-Cs to scan the area using the GSTAMIDS to identify landmines for neutralization. The MULE-C would take the GSTAMIDS and place neutralizers on the ground automatically to destroy/neutralize the landmine threat. Additionally, the MULE-C provides a lane-marking capability that identifies the "cleared" lane for following vehicles. This lane is visible in both day and night conditions. This capability provided by the MULE-C removes Soldiers from the dangerous work of searching for and neutralizing mines, as well as marking lanes in minefields for follow-on forces. By automating these tasks, the MULE allows manpower to be used on other combat-related tasks and not remain "pinned down" in the slow and dangerous work of mine clearing.

ARV-A(L)

ARV-A(L) is an armed robot that provides support to dismounted operations and can conduct reconnaissance missions. The ARV-A(L) will be armed with an M240 machine gun and Javelin missiles. This firepower will greatly enhance the survivability and lethality of dismounted Soldier formations. When coupled with its ability to conduct semi-autonomous navigation and networked sensor array, the ability of dismounted Soldiers to see far beyond their current capabilities is exponentially enhanced. Dismounted Soldiers will have a small, highly mobile lethality platform that can be used as a reconnaissance asset instead of Soldiers in urban and other environments. The platoon's ability to have a mobile "support by fire" asset increases that unit's lethality, responsiveness and survivability. The ARV-A(L) sensors will also be connected to the FCS network, providing higher echelons real-time tactical data that can be acted upon by other platforms/assets. By being able to leverage the network, the platoon does not have to engage the enemy "toe-to-toe." This further increases Soldiers' lethality and survivability because of this new standoff capability.

The ability to leverage information is critical to the MULE family's success. This is already being seen in the LM MFC MULE engineering model, the EEU. The LM MFC is setting standards in diagnostic and prognostic data collection that will influence not just the MULE design and implementation, but also the Army work for diagnostics and prognostics. As Dr. Charlie Dawson, Lead Systems Integrator EEU Lead, Science Applications International Corp., explained, "As the primary deliverable, the data collected from a year of extensive testing has proven to be valuable not only to the baseline MULE program, but to the UGV community as well. A wide range of data over an equally diverse range of conditions has been captured and can be used for multiple benefits. As an example, being able to tie actual vehicle operation data together with maintenance and repair logs is allowing the creation of early hardware reliability and maintainability projections. Also, data captured from this vehicle provides a rare insight into induced environments on a midsized UGV that complementary systems, such as sensor suites, will need to address."

This means that early in the product development cycle we understand what data is available and how it is tied to vehicle performance. This allows the Army to better project when parts will fail, further reducing Soldier sustainment burdens due to a greatly reduced logistics train. It also will result in a lower life-cycle cost for spares for the MULE in the future.

The MULE EEU conducts ANS integration testing using a common mobility platform. (Photo by Michael Norman, Lockheed Martin.)

MAJ D. BRIAN BYERS is the Assistant Product Manager for FCS UGVs. He has a B.A. in history from the University of Louisville and an M.B.A. from the University of Phoenix. Byers is Level III certified in program management and is an Army Acquisition Corps member. He is a U.S. Army Command and General Staff College graduate and has attended numerous military schools.