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AMREL is committed to delivering OCU solutions that efficiently utilize power resources, maximize operational distances, and reduce the logistical burden on the warfighter. The article below, originally appearing in DEFENSESYSTEMS.COM, describes the importance of these features.

Robots slimming down for Afghanistan duty
New 35-pound vehicles are better suited to rough terrain

By Barry Rosenberg
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Mountainous terrain and the lack of paved roads in Afghanistan are spurring the development of new robotic vehicles that weigh nearly half as much as the typical 60-pound robot used for explosive ordnance disposal (EOD). Already, a handful of 35-pound robots have arrived in theater, and several hundred more will be in use within the next year.

“First and foremost, what the soldiers and Marines are telling us they want in Operation Enduring Freedom is lighter systems because the terrain and elevations in Afghanistan are much different than what we see in Iraq,” said Marine Corps Lt. Col. David Thompson, project manager for the Robotic Systems Joint Project Office (RSJPO), which is responsible for developing and fielding robots for the Army and Marine Corps.

“In Iraq, you could drive pretty close to where you needed to go in a armored vehicle,” Thompson said. “Many times in Afghanistan, though, you can only get within a couple of klicks of where you need to go. What that means is that the warfighter is humping the last few klicks and carrying whatever he has with him. The last thing the soldier wants to be doing is operating that robot as he’s walking…burning up battery power, and using cognitive lobes to operate the robot.”

Although it's not a walk in the park, carrying a 35-pound vehicle, as the robots are called in the parlance of RSJPO, is preferable to struggling with a 60-pound one.

Integral to RSJPO’s efforts to build more efficient vehicles is a migration from OEM-manufactured, proprietary batteries to standard batteries that are already in the Army inventory, specifically BB 2590 and BA 5590 lithium, rechargeable batteries that power the hundreds of thousands of Single Channel Ground and Airborne Radio System radios in the Army inventory.

“Those are much cheaper than the proprietary batteries that we were getting from the vendors,” said Jeffrey Jaczkowski, RSJPO’s deputy project manager. “In terms of life cycle support, these are already in the Army inventory. The soldier or Marine doesn’t have to carry around additional batteries that are outside his inventory. They’re readily available, they’re on hand, and it’s one less piece of equipment the warfighter has to have.”

For robots already in the field, manufacturers are making kits that allow their vehicles to operate with standard Army batteries.

The battery situation was one of two major technology issues that RSJPO has addressed. The other is communications between operator and robot that give the soldier or Marine the necessary stand-off distance from the robot, so the soldier or Marine is close enough to control the robot but far enough

away not to be harmed by an improvised explosive device, while also remaining functional in the vicinity of electronic jammers used to counteract radio-controlled roadside bombs.

“All the robot is an extension of the soldier,” Jaczkowski said. “It doesn’t take the soldier out of harm’s way. What we provide the warfighter is an asset that puts distance between the warfighter and the threat, and that’s enabled by the communications packages. What we’ve done is retrofit the fleet with [robot controllers] that are compatible with the electronic jammers on the battlefield.”

More intelligence, more autonomy

The Army buys robots from two primary suppliers: iRobot, maker of the Packbot and Warrior robots, and QinetiQ North America, which is best known for its Talon robot. A number of second-tier companies also supply robots to the military, including Applied Geo Technologies and a Croatian company named Dok-ing.

The Army and Marine Corps have four ground-robot programs. The first is the MV-4 mini-flail vehicle made by Dok-ing. It is shaped like a small Zamboni machine and explodes mines and roadside bombs by beating the ground with chains that spin on a roller.

The second is the Multifunction Utility Logistics Equipment (MULE) vehicle, which carries supplies and was part of the Future Combat Systems program. After the reorganization of FCS, it is now part of the Program Executive Office-Integration, which is responsible for implementing FCS spinouts.

The third program is the Mobile Detection and Assessment Response System (MDARS), a joint Army/Navy robot about the size of a golf cart that monitors perimeter security around fixed installations and intrusion detection in warehouses.

The last program of record is the most well known: the Man Transportable Robotic System, which is used for EOD and have an articulating arm. The follow-on EOD program is the Advanced Explosive Ordnance Disposal Robot System, which is expected to be ready in 2012.

By introducing a number of incremental advancements in intelligence and autonomy, RSJPO wants those vehicles and others like them to function more independently of their operators. Controlling the robotic vehicles is a labor-intensive job in which a soldier or Marine must handle all the driving, manipulation, positioning and oversight of the robot by looking at an operator control unit, which is often a laptop computer that receives video imagery from a camera mounted on the vehicle.

Jaczkowski said incremental advances in vehicle autonomy can follow a path similar to automation introduced into automobiles — cruise control and automatic braking systems were introduced first, followed by new technologies such as collision avoidance systems, lane departure warnings and automatic hands-free parallel parking.

By adding intelligence functions to autonomy, the vehicles will be able to take over functions that demand all the operator’s attention.

“Layering intelligence into the automated functions of the robot is another thing the warfighter is asking for,” Jaczkowski said. “If you want to grab an object, point to it on the screen, and the manipulator arm determines the actuation necessary to pick it up. If you want to drive straight, just nudge the joystick and the vehicle will use optical detection and avoidance sensors to negotiate in that direction. If you want it to

go through a hallway or inside a building, it determines where the door opening is and guides itself through."

Such capabilities don't exist today, which means that robot operation calls for "100 percent soldier in the loop." Jaczkowski expects that figure to drop to 50 percent in about five years. A decade from now, the goal is for one solider or Marine to oversee multiple robots.

"The end state is that the robot is a co-combatant; the robot is another squad member," he said. "Eventually we'll get to that point where I, as a solider or Marine, am communicating to my robot squad member to assist with the mission, and the robot has the ability to interpret what the mission is, perceive the terrain and move in some kind of tactical formation. That's the end state ... having the robot as co-combatant by maybe 2020."