

Unmanned Systems Testing Presents Challenges to ATEC's DTC

Michael Cast

The U.S. Army traditionally has acquired weapon systems through a process that can take years, but the ongoing fight in Afghanistan and Iraq has shortened the time frame considerably. Robotic systems that can save lives on the battlefield are getting into Soldiers' hands more rapidly than ever before, and the U.S. Army's Developmental Test Command (DTC) is transforming its business practices to support that effort.





The retractable arm of the TALON enables the safe removal of explosive ordnances such as IEDs. (U.S. Navy photo by PH1 Robert R. McRill.)

Processes Transformed

Test and evaluation (T&E) to support rapid fielding of both manned and unmanned systems has been streamlined in recent years. “We are not doing everything we would in a normal test program,” said James Johnson, DTC’s Executive Director. “In a traditional program, we would test in a hot, cold, and tropical environment and maybe other environmental testing. We know fairly well how systems are going to behave in Iraq or Afghanistan.

However, for some of the rapid acquisition programs, we have left out testing, for instance, in the cold and tropics, so if the Army moved to a different theater of operations, we couldn’t tell for certain how well that equipment would do there.”

Developing test reports for acquisition program managers (PMs) and Army evaluators also has become a speedier process. Instead of issuing a pass/fail report for many systems the Army

needs, the Army Test and Evaluation Command (ATEC), Aberdeen Proving Ground, MD, provides reports on their capabilities and limitations. The command also deploys testers to the theater of operations to help assess how systems perform there. “Because we are not getting to do as much testing as we would necessarily like on this end, we are somewhat catching up to the equipment out in the field,” said Johnson. “We’re seeing how the equipment is operating, and we’re providing expert



Soldiers on the battlefield increasingly rely on unmanned systems, including this Tactical Micro Air Vehicle. (Photo by SGT Andre Reynolds.)

advice to the Soldiers who operate that equipment. That is quite different.”

Rapid acquisition is not the only issue DTC is working to address. Keeping costs down for test customers is a key objective of the command. Johnson noted that DTC is constantly tackling the challenge of reducing costs to customers. “We’ve always got to have a reasonable cost, do testing on time, and provide a quality product to the customer,” he said. “When you get into these newer commodity areas, such as unmanned ground systems and unmanned aerial systems, it adds to the challenge because we have to learn a new technology, maybe something we’ve never tested before. We’re trying to do that when budgets are tight. We’re trying to figure out how we can cut our costs and be more efficient to answer budget challenges.”

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DTC has the instrumentation and facilities needed to tackle the challenges associated with testing new unmanned systems, but its test procedures must evolve to be appropriate for both ground and air. “For those new commodities, procedures are being developed and safety concerns arise,” said Johnson.

“For example, we talk about unmanned aerial vehicles [UAVs] operating in the same airspace as manned aerial vehicles, but we haven’t yet fully come to grips with how we can operate in the same airspace. That’s something on which we’re working with the Federal Aviation Administration. Right now, this is driving many tests out to our western ranges, where there is a lot of airspace and not a concern with UAVs running into a manned aircraft.”

The operation of unmanned ground vehicles (UGVs) on DTC ranges also poses procedural challenges for testers. “For example, if you remotely operate

a large vehicle such as a High-Mobility Multipurpose Wheeled Vehicle and it goes out of control because the remote operator loses contact with it, it could run over and kill somebody,” said Johnson. “So procedurally we’re taking a look at how we test those kinds of things. Then, when we go even a step further where we test an unmanned system with missiles or guns, there are safety issues we’ve got to work out. DTC is charged with completing safety confirmations and safety releases for Soldiers. ... We’ve got to think through that and have safety mechanisms in place so Soldiers are not placed in a difficult situation where they could get injured or killed when operating these systems.”

Operational Tempo

Another significant challenge testers face is the operational tempo that goes with rapid-acquisition programs. “It is not unusual at many of our ranges to see employees working two, sometimes even three, shifts, possibly 6 days a week because there is just so much pressure to get that equipment over to the Soldier as quickly as possible,” explained Johnson. “If we’ve got something that will save lives, we’ve got to turn that around as quickly as we possibly can. That raises issues of burning

workers out over time, so we're trying to watch out for that. You can drive an employee so hard that he/she will try to find a job elsewhere because the work hours are just so much."

DTC must do what it can to attract and retain workers with the expertise needed to support its customers. As Army organizations undergo relocations under the Base Realignment and Closure process, they seek to hire employees with the kinds of skills testers and evaluators possess, potentially drawing them away from DTC. "There is a competition for people because you've got a lot of jobs moving in, but not necessarily the bodies that go with those jobs," Johnson said. "In the T&E world, as in any other business, we're only as good as the people we've got. Without them, we can lose our expertise and suddenly not offer that great service to the customer anymore."

DTC Customers and Systems

DTC's test customers for robotic systems include the Army's Rapid Equipping Force (REF) and DOD's Robotic Systems Joint Project Office (RSJPO) and Joint Improvised Explosive Device Defeat Organization (JIEDDO). The customers are involved in the acquisition of various robotic systems intended to enhance warfighting capabilities and prevent casualties from roadside bombs and other threats. The RSJPO is aligned to support, field, and sustain ground robots along three primary mission areas—maneuver, maneuver support, and sustainment.

Some of the most urgently needed and fielded systems are Soldier-portable UGVs. Among these are the PackBot,

TALON, and MARCbot, and their variants—relatively small robotic systems whose payload and configurations depend on the mission for which they are used. Systems such as these are teleoperated, meaning an operator can control them while looking at video feedback for command and control decisions and local situational awareness. The payloads that can be mounted onto system platforms depend on their mission; in the future, some may include weapons.

In the sustainment category, the U.S. Marine Corps is developing a teleoperated front-end loader that resembles a Bobcat tractor. DOD is also looking to field a system called the Saratoga, designed with sensors to detect chemical, biological, radiological, nuclear, and explosive threats.

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The Future Combat Systems' (FCS') Multifunctional Utility/Logistics Equipment (MULE) Vehicle is another unmanned platform that will require both developmental and operational

testing. The MULE transport variants are designed to carry equipment and supplies in support of dismounted maneuver elements. Other MULE variants include the Armed Robotic Vehicle

(ARV)-Assault (Light), and the ARV (Assault) platform, which will be armed to support dismounted infantry in the close assault mission.

"For the robots that we have fielded, the mission application includes surveillance and extended standoff from the Soldier operator to around the corner, into a building, structure, cave tunnel, or dwelling," said Jeffrey Jazzkowski, an unmanned systems acquisition worker at Program Executive Office Ground Combat Systems, Warren, MI. "That basically allows the Soldier or Marine about a kilometer of standoff to do surveillance or interrogation. The systems that we have in that area are MARCbot and xBot. Both of those are Soldier-portable systems. The MARCbot is a wheeled platform that is relatively inexpensive, and the xBot is a PackBot variant primarily used for reconnaissance. TALON, as well as Packbot, variants are used to enhance route-clearance missions. On the larger side, we have the MV-4, a program-of-record system used for area clearance."

The 5-ton MV-4 is a remotely operated tracked vehicle using a flail and hammer to dig up and destroy, or activate, mines. Its small dimensions and low track-ground pressure allow the machine to pass over difficult terrain, including steep slopes. "MV-4 is approaching Milestone C, but we have contingency systems in use for both



Secretary of Defense Robert M. Gates, center, operates a UGV during a tour of the FCS facility at Fort Bliss, TX. DTC has been instrumental in testing such systems. (U.S. Army photo by Cherie Cullen.)

Iraq and Afghanistan,” Jaczkowski said. Milestone C signifies that a system has gone through system development and demonstration and is ready to enter the production phase of acquisition.

DTC's Success

Both Jaczkowski and James Van Coillie, Product Assurance/Test and Configuration Management Division Chief within the RSJPO, advise that DTC has been successful in facilitating the fielding of unmanned systems through expeditious testing. They see DTC as a reliable partner in the acquisition process and very supportive of fast-track acquisitions. “When we get Operational Needs Statements [ONS] and joint ONS that are funded through an REF or a JIEDDO initiative, it is a very fast acquisition process to meet some very streamlined schedules,” Van Coillie explained. “We work together with DTC and ATEC, coordinating the appropriate tests to evaluate these platforms for users, certify their safety, and acknowledge any of their limitations. The capabilities and limitations document highlights any type of dangers associated with these platforms. This works relatively well, but because we deal with commercial-off-the-shelf [COTS] items and fast-track programs for meeting contingencies, it makes our relationship with DTC and ATEC unique.

“We are challenged to perform all necessary tests to determine the system’s capabilities and limitations, and meet the Soldiers’ needs for urgent fielding. One of the issues currently slowing down our schedule involves the COTS trailer,” Van Coillie said. “We’ve got to make sure the system is adaptable in the environment in which it’s going to be used without going through all this environmental-type testing. Basically, we and the Soldiers are aware that this COTS trailer is a temporary measure until we get the long-term solution, the final government-approved trailer.”



A robotic vehicle undergoes mobility testing on a bump course at the Cold Regions Test Center, Fort Greely, AK. (Photo courtesy of Yuma Proving Ground, AZ, Public Affairs Office.)

The development of military robotic systems is moving from platforms that are teleoperated to those that have autonomous capabilities, meaning they can sense their environment, adapt to it, and respond without a command from an operator. Properly testing such systems will require a close collaboration between the acquisition community and testers. Redundant controls will be added to ensure system safety during testing.

“The test methodologies that we use for teleoperated systems are going to be quite different from those methodologies that we will need for autonomous or semiautonomous systems,” Jaczkowski said. “We need to be able to do processes such as an operational test with the test environment similar to the environment in which these systems will be used. We’ll add initial safety systems that would not be on a final product. We have redundant radios. We have an emergency-stop radio and a safety operator. There are challenges to work through that I see in the future, especially with FCS coming. The test community and the PMs need to start

thinking about how we are going to test and get through this together.”

Because DOD still has a long way to go in developing the capabilities of robotic systems, DTC will continue to adapt to support the testing that future unmanned systems will require. “DOD has not tapped into all the capabilities that these unmanned systems can bring to bear,” Jaczkowski said. “DTC has to ensure that we’re progressing—in our expertise, capabilities, and instrumentation—along with those unmanned systems, so that as unmanned systems become more and more prevalent, we’re going after that business. It’s an exciting time to be involved in that kind of commodity.”

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