

iRobot's PackBot on the front lines

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PackBot EOD robot

Almost three years into the Iraq conflict and four into the Afghanistan war, the phrase "improvised explosive devices" has become one that is met with hesitation. This is a new style of combat that's still being studied, and in the mean time, a good scouting technology that can effectively scout a given area and not place troops at risk has yet to be developed.

Enter the PackBot, a 44-pound unit being developed by iRobot (makers

of the popular Scooba and Roomba robotic floor cleaning devices) which may help save lives as these conflicts continue. The PackBot, which retails at approximately \$100,000 per unit, is a squat, rectangular robot, complete with heavy treaded wheels on its right and left sides. These treads are complimented by movable "flipper" appendages that can be individually moved to provide additional traction.

Despite its somewhat bulky appearance, the unit can grip the edges of a staircase it may be climbing or descending. An internal gyroscopic system reading pitch and roll coordinates shifts the unit's weight where it needs to be.

Controlled by a console stored in a rugged 30-pound metal case, operators swing open the case, screw in two antennas and begin to control the camera and sensor-laden PackBot via a radio or fiber optic connection. The software, powered by a BlueCat linux operating system, allows users access to the PackBot's sensor and tool arrays, which include systems for measuring voltages, currents, internal temperatures, GPS locations and overall positioning. The unit can also include an extendable arm, tactile claw to pick up and handle objects, up to eight cameras and chemical sensors that help to locate improvised explosive devices.

"They're fearless," said Joseph Dyer, executive vice president and general manager of iRobot's Government and Industrial Robotics division. Dyer then cited the idea of tactical speed with the PackBot. While the unit may not win the speed race at five to six miles per hour, it can easily enter into locations soldiers would approach with caution.

In circumstances where it would be dangerous to blindly enter a building, a PackBot can be thrown through a window, unfold itself and be deployed as a remotely controlled scout. The PackBot, which can constrict into a 24" space, has been sent into operations in Iraq and

Afghanistan with over 300 units in action and a current contract extending to provide 1,200 units more of the model. The unit was first put into use as a search tool after the Sept. 11, 2001 attacks and became widely utilized as a search tool during the Afghanistan cave hunts for Taliban fighters.

"These guys realize, 'hey, why am I going down there?' This robot can go down there and take that initial challenge, so now it's a case where these guys won't go out on their own without their robots," said Tom Ryden, director of sales and marketing for iRobot's Government and Industrial Robotics division. "Now these teams are deployed with robots, they use robots all the time."

With hundreds of PackBot units currently deployed into Iraq, the robot has gained something of a following among its users. Although several PackBots have been lost to improvised explosive devices, EOD (Explosive Ordnance Disposal) personnel have made routine use of the units and crafted nicknames and personalities for them. A unit, nicknamed "Scooby Doo," earned a check mark on its camera head for each explosive device it succeeded in disarming. When destroyed, its operator had formed a personal attachment to the unit and returned it to the repair shop, cradling it in his arms as if it were a wounded child and asking if it could be fixed.

Given certain situations, the presence of a robotic unit seemed more comforting than anything a human could offer. In one case with a despondent person holding himself hostage, the PackBot, which is also equipped with a Voice over Internet Protocol communication system that can both transmit and receive audio messages, became something the person felt comfortable speaking with. After a period of time, the person asked for the robot to bring him a telephone and later a cup of coffee, which had been drugged and rendered the subject unconscious to end the situation.

Training for the PackBot currently entails about 1.5 days worth of training before basic proficiency is reached. Within a few weeks, operators have typically figured out settings and maneuvers that work best with what they're trying to accomplish.

"The video game generation learns very quickly," said Dyer.

In addition to bomb disposal and remote work, the PackBot can also be used as a scout unit. A PackBot, or several, can be sent into a hostile environment, such as a building that might be used as a refuge for insurgency forces. The PackBot, using a laser scanner or other device, can create a three dimensional map of the building for later use. Multiple units, if sent traveling through sections, can divide the workload amongst themselves for a faster scan. Current on-board artificial intelligence allows the robot to build its own maps and mission templates while choosing optimal paths and procedures to follow.

The PackBot, which is being developed by iRobot in conjunction with the military's DARPA (Defense Advanced Research Project Agency) program, is part of a \$50 million Future Combat System contract to develop a robot under 30 pounds for deployment. The program is currently creating training programs with both the Army and the Navy with most EOD training being performed in Indian Head, Maryland.

Dyer notes of the PackBot that the ultimate mission of these machines is to save lives.

Shares of Burlington, Mass-based iRobot closed at \$27.40 Thursday, slightly up for the day, but well off the 52-week high of \$37.90.

The stock took a 21 percent drop to \$26.10 on Feb. 15, a day after the company released fourth quarter earnings and held a conference call during which iRobot officials said the company would markedly

increase R&D and selling and marketing budgets for 2006, (thus cutting into earnings.)

Several industry analyst, however, have noted that this may be the right move at the right time for a company trying to build brand equity in such a nascent industry.

"iRobot generated significant year-over-year growth in 2005, as our products achieved substantial gains in military and consumer markets," said Colin Angle, iRobot's co-founder and chief executive officer, in the company's 4Q press release. "We are confident that iRobot's intelligent, practical and easy-to-use robot technology will enable us to expand our existing market leadership, as well as to target new markets such as law enforcement, homeland security, commercial cleaning and elder care."

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