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Building a Better Bomb Robot

Faster than a heavily suited bomb technician. More powerful than a single surveillance camera. Able to leap ice, puddles, and steps. Look, scouting the threat scene—it's the latest bomb-disposal robot.

Compared with some of its predecessors, this bomb-disposal robot may indeed seem to be a "super robot." A sound reason exists for its high performance level: the manufacturer, EOD Performance, Inc., built it to user specifications, sought out evaluation by the National Institute of Justice (NIJ), and refined the original model to incorporate enhancements suggested by the evaluation. The end result—a maneuverable, lightweight, relatively inexpensive robot—may enable more of the Nation's approximately 550 bomb squads to own robots and help save lives.

The history of the bomb-disposal robot began in 1997, when Congress funded NIJ to provide State and local law enforcement agencies with better tools to combat terrorism. NIJ surveyed 139 law enforcement agencies in all 50 States and the District of Columbia to find out what they needed. Better bomb-disposal robots kept turning up on their wish lists. With that in mind, NIJ convened a panel of bomb-squad professionals and asked them to define the features an improved robot would need. NIJ published the results in an online-only report titled *Law Enforcement Robot Technology Assessment.* This first-of-its-kind study identified two on-the-market robots as the closest matches to the requirements, but both had shortcomings.

"Right after the report was published, a number of vendors came in and said, 'If you give us the money, we'll build this robot,'" says Chris Tillery, senior program manager with NIJ's Research and Technology Development Division. About a year later, EOD Performance entered the picture. The Canadian robotics and security products company had read the report and decided to build the robot—without NIJ funding.

"They built it on their own dime, with not one nickel of Federal money," Tillery says. "It was already finished [when] they came to us and asked us to assess it. After we evaluated it, they fixed the problems that our evaluators found. The whole project is a perfect example of how an NIJ project should work." (NIJ did provide funding for the evaluation of EOD Performance's first group of 16 robots, as well as the 5 enhanced models.)

This initial evaluation showed that the robot, which at that time cost approximately $30,000, met many basic requirements in the report. It could lift 35 pounds vertically from a point 18 inches in front of its body, climb stairs at angles of up to 40 degrees, and operate at a 300-yard range. It had easily removable batteries, fit down the aisles of buses and airplanes and into the trunk of a car, and weighed less than 130 pounds. It operated at temperatures ranging from –40 to 120 degrees Fahrenheit and in heavy rain or snow, and it had the capability to fire a disrupter, deploy digital x-rays, and provide views from multiple color cameras.

More than a dozen evaluators from local and State law enforcement agencies; fire departments; the FBI; the Bureau of Alcohol, Tobacco, Firearms and Explosives; and the U.S. Navy put the robot through its paces. All the evaluating agencies tested the robot using the same three scenarios: (1) inspecting and rendering safe a suspect package in an open area, such as the front steps of a building, a table in a lobby, or a parking lot; (2) inspecting and rendering safe a bomb factory in a house; and (3) assisting in hostage negotiations. Tasks included negotiating curbs, stairs, rough wet terrain, and furnished rooms; establishing a command post; performing visual surveillance, including under vehicles and through windows; communicating with people; deploying disrupters; and blowing up suspicious objects.

The robot successfully completed 86 percent of the test scenarios. Although it had many strengths, it came up short of the report's requirements in several areas. EOD Performance used the evaluation results to produce an improved model that included many enhancements: increased speed, an improved drive system, more powerful dual-function lights, high-torque gears to increase arm maneuverability, an adjusted arm to deploy automatically, better cameras with added zoom capabilities, stronger

battery packs to increase operating time, a 1,000-foot fiber-optic cable to provide an alternative to radio control, a second disrupter port and a connection for 24-volt power tools, an external serial port in which to attach sensors to improve its ability to measure radioactivity, an audio upgrade from one-way analog to two-way digital, increased tether length (from 330 to 500 feet), and multitask capability.

Tillery notes that these technical changes requested by end users, along with the recent appreciation of the Canadian dollar relative to the U.S. dollar, have increased the price of the robot to approximately $35,000 to $38,000, depending on accessories. Testing of the robot by law enforcement agencies is to begin this summer. Testing had been scheduled for this past spring but was delayed when the U.S. Army appropriated the first production run for use by its forces in Iraq.

For more information on the evaluation of EOD Performance's bomb-disposal robot systems, contact Chris Tillery at the National Institute of Justice, 202–305–9828 or george.tillery@usdoj.gov. To download a copy of the Law Enforcement Robot Technology Assessment, visit www.nlectc.org/jpsg/robotassessment/robotassessment.html. For more information about the bomb-disposal robots, visit the EOD Performance website at www.eodperformance.com/vanguard.html.

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