

From Rodeo to Reality

By Jake Deuel and Chris Mullaney, Sandia National Laboratories

The 9th Annual Western National Robot Rodeo & Capability Exercise at Sandia National Laboratories from May 11-15, 2015 was barely in the books when Jake Deuel, manager of Sandia's Robotic and Security Systems department, received a call that went something like this:

"Hey, Jake, this is Margaret. I'm out on a call right now. Do you have a robot that can drill a hole in a steel drum that appears to be bulging?"

"WWWhhaattttt? !? !? !"

FROM RODEO: The Western National Robot Rodeo & CAPEX (Capability Exercise) is a technical competition for military and civilian bomb squads and emergency responders that puts teams through ten to twelve challenging scenarios ranging from operator skill to full mission planning, execution, and TTPs (Tactics, Training, and Procedures). "The goal of the event is to make good robot operators into great robot operators," Jake Deuel says.



New technology at the Robot Rodeo at Sandia National Laboratories allows members of bomb squads and other public safety organizations to review new products.

Jake Deuel of Sandia National Laboratories co-hosts the event each year with Chris Ory of Los Alamos National Laboratories. This year's competition was held at Sandia Labs in Albuquerque, New Mexico. The scenario sites included:

- A medical facility

- A movie theater
- A library
- A museum
- A fire department training tower
- A moto-X track
- A landfill

The scenarios involved:

- Dealing with a gang member in a hospital wing
- A suicide bomber inside a movie theater
- Dual-robot manipulation skills inside a library
- An active shooter scenario inside a museum
- Working with a UAV
- Trying out new tools to gain access to the inside of a roll-off dumpster at the landfill

Essentially, the teams never knew what to expect for their next scenario.

This year Jake invited Sandia's Emergency Response Team (ERT) to assist with the Rodeo. ERT principle technologist, Margaret Mora served as an evaluator. She brought in other ERT members to add realism to the scenarios while giving them an opportunity to integrate and practice with visiting, competing bomb squads, a first for many members of the ERT. Two weeks later, upon receiving the call for help from Margaret, two scenarios immediately came to mind. The first was, **Some Like it Hot!** This scenario combined elements of an active shooter, unsecured radiological sources, working with a new robot, and interacting with Sandia's Security Force and the ERT. Teams were told that a Rad Tech had "gone bad" and thrown radiological sources around the facility and then attempted suicide.



The Robot Rodeo at Sandia National Laboratories allows responders to get hands-on training in a realistic environment. Sandia evaluator Margaret Mora briefs 2015 Robot Rodeo participants before a training exercise.

As part of the CAPEX, each team was required to use the Micro Tactical Ground Robot (MTGR) to 1) determine the radiological condition of the site using a hand-held rad detector, 2) secure any sources and “safe” the facility if needed, 3) support the security personnel in clearing the facility, and 4) aid Emergency Management (EM) personnel in extracting any victims, all within 90 minutes.



A robot defuses a dangerous situation during the 2015 Robot Rodeo at Sandia National Laboratories.

The second scenario was called **The Dump**. In this scenario a local teenager had been hired to clean out his neighbor's garage and haul the junk to the dump. Upon arrival at the waste transfer facility, the teen began dumping the contents of his load unknowingly dumping old blasting caps, dynamite, and other energetic items along with the junk his neighbor had been storing for years. The bomb squad was called in to “sort things out.” Teams were required to use their own robots and gain access through the side of a roll-off container to visually verify and search the contents of the dumpster using some new tools including a battery operated drill and a reciprocating saw.



Robots at the annual Robot Rodeo are used to help emergency responders keep danger at a distance.

TO REALITY: On Tuesday, May 26th, there was a 911 call about a 30 gallon steel waste drum that appeared to have a bulging lid outside a thermal spray research facility at Sandia. The drum contained powdered metals, an overspray in a coating process. Emergency Management and Security personnel were dispatched to the scene. Upon discussion, the Line and the ERT theorized that rain water had sometime earlier entered the drum (before sealing) causing a chemical reaction that pressurized the container. The powdered metals with an incredibly large surface area were trapped with rain water in the drum, caused oxidation; basically there was a lot of “rust” happening. The metals ripped off the Oxygen from the H₂O to form “rust,” leaving the now gaseous, expanding, flammable Hydrogen to pressurize and bulge the drum.

After isolating and denying entry to the drum and accounting for all members of the workforce, the Incident Commander integrated workers from the facility, Industrial Hygiene, and Fire Protection into the Incident Command Structure as SMEs. The ERT and Command determined that the drum had to be vented and opened. That meant drilling a hole in the steel lid, or “popping off” the hold down ring, freeing the pressurized Hydrogen, if, in fact, that was even the cause. The operation could get violent. Could the Hydrogen explode, or flame like a jet? A drilling operation would have plenty of arcs, sparks, and ignition sources. Or, after backing out the hold down bolt and ring, could the drum lid rocket off and strike the responder in the head? This was the somber “What if?” conversation at the command post, but regardless, something had to be done; it was getting hotter and longer in the day.



Sandia manager Jake Deuel prepares a Remotec HD-1 robot for a real emergency incident at Sandia National Laboratories.

Since a couple of weeks earlier the ERT had teamed with the Robot Rodeo, Command recognized that an unmanned robot was the answer to the potential hazards instead of putting an ERT member at risk. They contacted Jake, who rapidly joined the response, with two Sandia operators (Mike Heister, New Mexico's IABTI Chapter President, and Steve Marley) and their Remotec HD-1. The robot was outfitted with a drill, went down range, and vented the drum. After less than two seconds of drilling, a loud, rushing sound like a deflating tire was heard 40 yards away for about 12 seconds – there was some significant pressure in that container! While ERT team members were donning their gear, the robot went back down range with a hand-held gas monitor (just like in the Rodeo scenario, **Some Like it Hot**,) to assess O2 concentrations near the drum. The ERT did a PPE-protected entry and removed the now unpressurized lid. Though no liquid was seen, monitoring in the drum indicated significant Hydrogen production. The ERT put the drum in a safe, waste accumulation transportainer and since then has continued to work with the facility owners, Line, Waste Management Group, and Pollution Prevention to quickly get operations back up and running.

Some after thoughts to share (or the Bottom Line). When I (Jake) got the call from Margaret for robot help, I explained to her that I was in a meeting (I'm a manager, I go to a lot of meetings, this was a more important one, something about funding, staffing, and schedules....you know how that is) so I asked, when did she need someone? She said, "Now!" Responders do a lot of good things well, but one of them is not waiting and being patient. They *will* do something. So when we moved out, we moved fast.

We work hard every year to come up with meaningful, realistic, challenging scenarios. We felt validated that our ERT was asking for our urgent help with something in our own backyard, and this was so very similar to what we had just practiced in a Robot Rodeo scenario. I urge you to try to come to the next Robot Rodeo; I know it will be worth your while.

We get a lot of support from vendors at the Robot Rodeo. Everyone knows that budgets are tight. We do, and the vendors do. It just makes good common sense that instead of checking out new tools inside an air conditioned, nicely carpeted convention center with a plastic bag of "gimmees" for the kids, or browsing online at a picture in a brochure, you can come to the Rodeo and actually use brand new tools. Brand new tools mounted on your bot, out in the dirt, in real life sweaty conditions. You can talk to the guys that make them and have used them, and *then* ask your boss for the money to buy it – based on your real, actual experience. That goes a long way in today's competitive spend plans.

Finally, as you may know, there have been, and will be thousands of bulging, over-pressurized, dangerous, bulging drums out there. If they are bulging, something bad and energetic is going on inside. And what is in those drums? Pretty much every hazmat known to man and it is anxious to get out. I urge you to talk with the people and groups in your jurisdiction who respond to hazmat. You may be surprised how many people in small companies, large industries, airports, hospitals, waste facilities, railroads, production facilities, fire departments, and municipalities deal with hazmat. Have a cup of coffee, shake some hands, find out what

gives them the “heebie-jeebies” and make a straw plan now (not later or the first time you have met). And yes, this kind of integration is also taught and practiced at the Robot Rodeo. Hope to see you next year. And give me a call if you have more questions, please.



First responders at Sandia National Laboratories test a waste accumulation drum during a real-life emergency incident.

Acknowledgments: The WNRR has been faithfully supported by the Technical Support Working Group (TSWG), led by Dr. Ed Bundy, and the MOD Counter Terrorism Science & Technology Centre, led by Mike Jones, Capability Lead, EOD. Finally, several vendors have been long-term supporters of the event including Remotec, QinetiQ, ICOR and iRobot along with a collection of vendors who provide support depending on the needs of each year's event. Thank you team!