

# Robotics Mitigate Explosive Risks of Military Base Vegetation Clearance

Posted At : September 16, 2015 6:17 AM | Posted By : Admin

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**Fort Bragg, North Carolina** From the safety of a 40-foot-long, eight-foot-wide truck-drawn mobile command center parked on a gravel and dirt road, four twenty-something technicians sip soft drinks while fixed on their individual computer screens. Using video game controllers connected to laptop computers, the technicians maneuver heavy forestry equipment up to a mile away. Viewing the terrain via cameras mounted on the equipment, they safely maneuver around obstacles, as the equipment they control cuts and clears vegetation growing in areas littered with potentially dangerous unexploded ordnance.

Huntsville Center is using this innovative robotic range clearance process at Fort Bragg, North Carolina before construction can begin on the installation's new \$40 million live-fire aerial range that will soon provide Army rotary wing aircraft aerial bombing and target practice. Huntsville Center has been a leader in the development of robotics for work at ordnance clean-up sites around the country and at installations worldwide since 2005, and Bob Selfridge, Huntsville Center chief geophysicist and robotics technical lead for the vegetation clearance program, said newly developed second generation robotics equipment is certainly the safest and most economical way to clear the 80 year-old munitions range. "We're removing and cutting the vegetation to improve the line-of-site for the pilots and observers who will use the range. Because of the potential risks associated with UXO in the ground, removing the trees, shrubs and woody vines from the range target areas is a daunting task. Our solution is to utilize remotely operated forestry mulchers, tree shears and feller bunchers to do the job," Selfridge said.

"We've been working closely with the Environmental Chemical Corporation (ECC) team which includes their two key subcontractors: Applied Research Associates Inc. (ARA) and QinetiQ of North America, and the improvements in the reliability and robustness of the newly developed robotic kits has significantly increased ease of use, reduced training time and substantially increased production. The robotic systems we developed are efficiently performing the work at Fort Bragg while reducing risks associated with buried UXO."

According to Spencer O'Neal, Huntsville Center vegetation clearance project manager for the Fort Bragg project, there's certainly a lot of risk associated with personnel driving equipment while clearing the area, and using the robotic equipment to do the job is the sensible thing to do.

"Manual removals methods are dangerous and expensive to implement and armored equipment can only protect the operator from fragmentation, but not the overpressure from larger munitions that could possibly explode during the clean-up operations. Using the second generation remotely controlled heavy equipment to clear the dense vegetation covering the impact area here at this Fort Bragg range has been highly successful and is potentially saving lives," O'Neal said.

Charles Pregeant, lead engineer of the Huntsville Center team said the equipment used in the line-of-site clearance process is typical state-of-the-art, track-based utility machines used in the timber harvesting industry and each piece can be leased locally from suppliers at any specific

location. However, the modular control kit the brain which maneuvers the machines' steering, acceleration and braking and hydraulic lift boom (or arm) operation is mobile and can be mounted onto most of the heavy equipment in less than half-an-hour. Pregeant said this allows technicians to move operations from one project location to another location without having to transport the heavy forestry removal equipment.

"You just lease the heavy machinery at the new site and attach the modular control kit onto the newly leased equipment. This provides an extraordinary cost savings to the project when transportation costs of these large machines is over \$10,000 each," he said.

Pregeant said to operate the equipment once the control kit is installed, a signal with a reach of up to a mile is sent from an antenna to a receiver mounted atop the field equipment. For remote areas, the Huntsville Center team designed and fabricated two mobile command centers that are located on heavy-duty pick-up trucks capable of driving deeper into forested areas. In both the mobile trailer and mobile truck mounted command centers, there are work stations set up for the machines' operators. Each forestry vegetation removal machine has multiple mounted cameras so the controllers have up close, first person views of their equipments' operations via the laptop screen or attached TV monitors. The cameras and monitors allow the operators to see how best to clear obstacles such as standing trees, fallen trees, range targets, hills, ditches or other rough terrain.

He said each machine also has a wide selection of attachments available -- such as a tree shearer, a mulcher, a grapple or a mower and the attachments used depend on the specific work required.

O'Neal said the range vegetation clearance systems used on the Fort Bragg project typically clear more than an acre per-day per-machine in difficult areas and up to two acres per-day, per-machine in areas with brush and small trees. The Fort Bragg contract calls for clearance of a total of more than 900 acres and the project is ahead of schedule.

Wolf Amarack, Fort Bragg Range Control chief, said he is discovering just how valuable and efficient Huntsville Center's newly developed tools are for a very important training range set to begin construction in December 2016.

"Attack helicopters need large areas to maneuver in and this AGR gives them that distance and all the targets they need (to train). Once we have this range cleared of vegetation and construction completed, we will finally have the aerial gunnery training capabilities right here at Fort Bragg," he said.



