# Engineering team developing helicopter that would investigate nuclear disasters

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Kevin Kochersberger, a research associate professor with the Virginia Tech College of Engineering and director of the Virginia Tech Unmanned Systems Laboratory, and the autonomous helicopter. Credit: Virginia Tech Photo

Students at Virginia Tech's Unmanned Systems Laboratory are perfecting an autonomous helicopter they hope will never be used for its intended purpose. Roughly six feet long and weighing 200 pounds, the re-engineered aircraft is designed to fly into American cities blasted by a nuclear weapon or dirty bomb.

The helicopter's main mission would be to assist military investigators in the unthinkable: Enter an American city after a nuclear attack in order to detect radiation levels, map and photograph damage.

"It's for a worst-case scenario," said project leader Kevin Kochersberger,

a research associate professor of mechanical engineering and director of the Virginia Tech Unmanned Systems Laboratory. His team consists of several graduate and undergraduate students from the mechanical engineering and electrical and computer engineering departments.

Kochersberger and his team re-engineered a remote-controlled Yamaha-built Unmanned Aerial Vehicle RMAX helicopter to fly in fully autonomous mode. They also created flight control software algorithms that will direct the helicopter to radioactive sources on its own accord. To carry out various missions, the researchers outfitted the helicopter with various "plug-and-play payloads" as the vehicle's weight capacity is limited. The payloads are easily loadable and unloadable boxes that fit snugly under the helicopter's main body, carrying devices that would detect radiation levels in the atmosphere and on the ground, and take video and still images of damage. Flight control software would allow the mission to be changed mid-flight.

One payload is unique: A miniature tray-like robot on treads that can be launched via a tether wire from the helicopter to collect evidence. The helicopter would hover over the robot, and pull it back via the wire. A student team is building this robot, which will boast not only "chunk" sampling capability, but also a miniature vacuum which could suck up dust and dirt.

The robot is expected to easily maneuver any terrain, including expected bomb craters, as part of its investigation, said Michael Rose, a graduate student in mechanical engineering, from Gilroy, Calif. The team plans to make the robot water proof, in the event that it comes across water - busted water mains, lakes, rain puddles, etc. "The electronics must be protected from the harmful elements," Rose said.

The group also designed a downward-looking stereo camera system mounted to the helicopter, to image affected areas. The cameras would

allow for computerized 3-D terrain mapping of affected areas, an absolute necessity to understand the characteristics of the blast. It is expected that the helicopter will have night vision capabilities, and enhanced imaging technologies that improve vision through smoke and fog as the project progresses, Kochersberger said.

The project, already funded at $735,000 with an additional $650,000 allocated for 2010, is overseen by the U.S. Defense Threat Reduction Agency and spearheaded by the Department of Energy's Savannah River National Laboratory. Plans call for the helicopters to be mission-ready in three years. Department of Defense personnel already have visited Blacksburg to watch a demonstration as the craft zeroed in on a small, planted radioactive source at Kentland Farm, several miles from the Virginia Tech campus. More testing is underway, with another DoD demonstration planned for 2010 in Savannah, Ga.

Provided by Virginia Tech