**News Release: Research groups field-test the future of transportation, on the ground and in the air**

April 25, 2018 -- A small drone circled above the Virginia Smart Road, flying over a high-tech vehicle driving southeast along the asphalt.

The drone flight isn't unique — the Virginia Tech Mid-Atlantic Aviation Partnership, the group coordinating the research, has done thousands. The car isn't, either — the Virginia Tech Transportation Institute has logged millions of vehicle research miles in their own test environments and on the open road.

What's important about this research is the way the vehicles are interacting, communicating with each other, with a central software platform, and with the infrastructure on the Smart Road itself.

The tests were part of the latest iteration of NASA's Unmanned Aircraft System (UAS) Traffic Management (UTM) research program, which is developing and testing technology designed to allow unmanned aircraft to share airspace safely and efficiently, with each other as well as with manned air traffic — and ground transportation.

This series of research flights focused on one of the most complex problems in unmanned traffic management and in the drone industry in general: how to enable unmanned vehicles to detect and avoid each other.

"What we call detect-and-avoid is one of the biggest challenges for unmanned-aircraft integration," said Mark Blanks, the director of the Virginia Tech Mid-Atlantic Aviation Partnership, which operates the university's Federal Aviation Administration-designated UAS test site.

"If you're flying a manned aircraft, you always have the pilot's eyes as a backstop," Blanks explained. "With unmanned aircraft, once it's out of the operator's sight, you don't have that failsafe. So you need a technological solution that's equivalent or better."

As part of the NASA project, the team tested two detect-and-avoid-technologies: airborne radar and a type of radio that allows aircraft and ground vehicles to communicate directly with each other.

"A single, perfect solution for detect-and-avoid is unlikely — the industry is probably going to need a combination of several technologies, depending on the aircraft and the context," said John Coggin, the aviation partnership's chief engineer, who led the tests. "So what we're doing here is field-testing a couple of the promising candidates, seeing how they perform, and how well they work in concert, and how they integrate with traffic-management software."

“Two of the main principles that are driving the design and development of the UTM system are to make sure that the small UAS (drones) are deconflicted from each other and from manned aircraft,” said Arwa Aweiss, NASA’s UTM flight test director.

“These flight tests will help evaluate different conflict mitigation strategies.”

The compact radar system used in these tests was provided by Echodyne. Many experts point to drone-mounted radar as an important piece of the puzzle for detect-and-avoid—it can provide both the distance and direction for a potential obstacle, and it works relatively well in bad weather.

A special type of radio called a dedicated short-range communication, or DSRC, system was the other piece of technology being evaluated. A traffic-management platform provided by ANRA Technologies integrated the radar and DSRC signals.

This was one of the first tests of DSRC for unmanned-aircraft operations, but it’s being widely investigated for intelligent ground-transportation networks. The stretch of the Smart Road used for the testing has nine embedded DSRC nodes, which the team used during the testing.

The majority of the research was conducted on the Smart Road’s Surface Street Expansion area, a recently-opened site designed specifically for automated vehicle evaluation in an urban setting.

“The fantastic infrastructure already in place at VTTI was a major factor in winning the award from NASA to conduct this research,” Blanks said. “We’re exploring what’s possible with autonomous technologies in multiple modes of transportation, and we’re fortunate to have the experts in ground transportation right here at Virginia Tech.”

While the test series focused primarily on aircraft, one set of experiments involved a ground vehicle, too. As autonomous and intelligent transportation becomes more common, different types of vehicles will need to be able to communicate smoothly with each other so that they can coordinate when necessary, or stay out of each other’s way.

“We’ve long recognized that DSRC offers great potential for communication between low-flying aircraft and surface vehicles,” said Andy Alden, a co-principal investigator on the project and researcher at VTTI. “Integration of communication and detect-and-avoid applications at the nexus of air and ground modes will enable future Urban Air Mobility operations such as package delivery and passenger transport.”

During the two weeks of testing, the team put the suite of communications and traffic-management technologies through its paces, stress-testing it with some real-world curveballs like another drone that (as a deliberate feature of the test) wasn’t communicating properly, a manned aircraft flying nearby, and a drone on a high-priority public-safety mission that needed right-of-way.

ANRA's traffic management platform used the radar and DSRC signals to identify and track both cooperative and noncooperative aircraft, providing a centralized picture of the operation and communicating with NASA's platform.

Ultimately, third-party software like ANRA's will interface with a national system managed by the Federal Aviation Administration; NASA is playing the central "regulator" role during the research program.

Unmanned traffic management systems will be able to record flight plans, monitor vehicles, and alert operators to hazardous conditions, among other tasks — these functions will be especially important in the low-altitude airspace most drone traffic will occupy.

This is the third year that Virginia Tech has participated in NASA's Unmanned Traffic Management research program, which is progressing through multiple "technical capability" levels with increasing logistical and technical complexity that incrementally approach real-world operations.

The first round of tests in April 2016 involved simultaneous drone flights at six Federal Aviation Administration test sites; the second round in June 2017 entailed more technically challenging flight scenarios and brought in commercial partners to provide aircraft, software, and other support.

The Virginia Tech Mid-Atlantic Aviation Partnership is headquartered at the Institute for Critical Technology and Applied Science.

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***Image:*** http://www.vtnews.vt.edu/content/vtnews_vt_edu/en/articles/2018/04/ictas-maapnasavtti.img.jpg

***Caption:*** This drone is carrying equipment designed to allow it to automatically detect and avoid other aircraft, as part of a research project conducted by the Virginia Tech Mid-Atlantic Aviation Partnership, the Virginia Tech Transportation Institute, NASA, and corporate partners.

***Online Link:*** https://vtnews.vt.edu/articles/2018/04/ictas-maapnasavtti