Aerial surveillance technology could keep soldiers safer

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New technology that enables aerial vehicles to plan and verify missions could mean there is less need for military personnel to conduct dangerous surveillance operations in war zones.

Developed for use in multiple unmanned aerial vehicles (MUAVs), the sophisticated autonomous computer framework - the first of its kind - allows one operator to control a number of vehicles from a safe position on the ground. It would also make surveillance missions significantly cheaper.

The EPSRC (Engineering and Physical Sciences Research Council) research project has been developed by scientists from Cranfield University, based at the Defence Academy of the United Kingdom. They are collaborating with a research team at Imperial College London.

UAVs are used regularly in defence scenarios, but having a team of vehicles means more "eyes", safer missions and more accurate results. It also means that if one vehicle is lost in action the others can carry on until the mission is complete. Launching a fleet of vehicles in crowded or dangerous skies, however, requires very sophisticated control and guaranteed performance of the vehicles.

The framework technology allows an operator to programme a mission objective, authorising the group of vehicles to decide the most efficient way to complete their task. Through a series of control algorithms the framework manages each vehicle's functions, such as navigation,

guidance, path planning and decision making, and ensures the vehicles avoid colliding with one another or other objects.

Principal researcher Professor Antonios Tsourdos explains the importance of the framework's accuracy: "We have to be absolutely certain of the behaviour of the UAVs if they are operating over civilian areas or in a battle situation."

Other benefits of using the framework technology with MUAVs are that it increases the chances of a mission being conducted safely and successfully. "Missions sometimes have to be abandoned due to poor weather or on safety grounds, but pilotless vehicles can be used in more challenging situations and can also provide real-time feedback on current conditions," says Professor Tsourdos.

MUAVs using this framework technology can also be used by search and rescue services to look for lost people or vessels. It allows searches to be conducted without the loss of attention to detail or tiredness that occurs when humans work in challenging situations for extended periods.

Another novel use of the technology is within environmental surveillance. The team has modelled the MUAVs with chemical sensors attached to track the movements of contaminated cloud formations. The vehicles were able to successfully track a cloud and predict its movement pattern. This could revolutionise the way emergency services respond to explosions such as the Buncefield disaster in 2005, where a contaminated cloud posed a risk to the local population. The technology will give a more accurate idea of which areas are likely to be affected.

Other civil applications include mining, oil exploration, surveillance and reconnaissance for traffic control, fire extinction, oceanographic or geological surveys, and marine and border inspection.

The Cranfield researchers were part of a team that won the 2008 Ministry of Defence Grand Challenge competition and are leading the world in the development of this type of technology. Professor Tsourdos hopes the technology will be deployed regularly within five years.

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