New drone technology enhances accuracy

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The Johns Hopkins News-Letter

http://www.jhunewsletter.com/2013/02/21/new-drone-technology-enhances-accuracy-59314/

The majority of the recent debate over unmanned aircraft vehicles (UAVs), more commonly called drones by the media, has focused on the political, ethical and legal questions regarding their use in war. Technology, though, plays a huge role in the utilization of drones for military applications.

“Advances in unmanned aircraft technology will impact the debate,” John Villasenor, a nonresident senior fellow in governance studies at the Brookings Institution’s Center for Technology Innovation, wrote in an email to The News-Letter.

“In fact, in many respects they have created the debate. By expanding the scope of what is possible, technological advances raise new and critically important questions regarding the proper use of that technology.”

Perhaps no drone technology frames this better than the Autonomous Real-Time Ground Ubiquitous Surveillance Imaging System (ARGUS-IS). The sensor was developed by BAE Systems and the Defense Advanced Research Projects Agency (DARPA) in 2007, and the first reported test flight was completed successfully in 2010. It is likely that the system is already being used in combat, though nobody knows for sure since this information is classified.

The ARGUS-IS is essentially a camera system that has the ability to take ultra-high resolution video of a large area. It can be loaded into a wide variety of different UAV platforms including Predator and Reaper drones. The field of view of the ARGUS-IS is much greater than that of its predecessors, allowing the operators of the UAV to see a much larger portion of the area where the UAV is flying. With the ARGUS-IS, drone operators have a field of view about 7.2 kilometers across (roughly the distance from Baltimore’s Inner Harbor to Loyola University).

The resolution of the system is an amazing 1.8 gigapixels. For comparison, the camera in your smart phone most likely has a resolution between five and eight megapixels. The sensor can achieve such a high resolution by putting 368 cell phone cameras to work simultaneously. That’s right, the same camera that’s in your cell phone may also be in use in Pakistan right now to hunt terrorists.

The ARGUS-IS has four cameras mounted behind a single lens that each contain an array of CMOS imagers, active pixel sensors. Each of the four cameras creates a checkerboard image that is then integrated into one mosaic image. The use of CMOS imagers from cell phone cameras allowed the sensor to be manufactured at a much lower cost and also let the team that designed the sensor get around some potentially vexing issues involving the focal planes of lenses.

With the enormous amounts of data being produced by the ARGUS-IS sensor, a powerful processing system is required to turn that data into useful information on the ground. In fact, the ARGUS-IS uses two processing systems to do this – one in the UAV itself and the other on the ground.

The ground processing system presents the data to drone operators in a user interface similar to one you might see on a consumer tablet computer. People and vehicles in the video feed are highlighted by colorful boxes and users can work with a touch screen display to zoom in on dozens of different targets simultaneously.

Villasenor discussed the undoubtedly large impact that the ARGUS-IS will have on battlefield operations, intelligence gathering and targeted killing.

“Imaging systems advances can have an enormous impact on strategy and operations,” Villasenor wrote. “For example, ARGUS could make it practical for a single unmanned aircraft to continuously and permanently monitor every single vehicle and pedestrian in an area spanning many square miles. That can provide complete operational visibility in a combat zone.”

Some experts think that even though advancements like the ARGUS-IS will largely improve operational capability in and out of war zones, they won’t have a huge impact on the extensive debate in this country over drone warfare.

“It is an amazing technology, but I don’t see it as fundamentally changing the strategy and politics of drone warfare,” Peter W. Singer, director of the 21st Century Defense Initiative and senior fellow in foreign policy at the Brookings Institution, wrote in an email to The News-Letter.

“It is a huge enhancement of current sensor capabilities, allowing more targets to be tracked with more precision, but the key questions (regarding) the new technology of unmanned systems were already being posed by earlier generations. It’s like the leap from using eyesight to the Norden bombsight on WWII bombers; a leap forward, but the essential issues of strategic bombing remained the same.”

Advancements in UAV technology do raise ethical questions about drone research for some though. Many UAV opponents are against research that might enhance the capabilities of drones. But if technologies like the ARGUS-IS have the potential to make drone targeting more accurate, thus saving innocent lives, will this make the advances universally accepted by drone opponents and proponents alike?

It is possible that the ARGUS-IS will help prevent civilian casualties by giving drone operators a better picture not only of what they are targeting, but also of the area surrounding their targets. With much higher resolution video feeds, it is easier to tell if a man is holding a gun or a shovel.