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As More Drones Populate the U.S. Arsenal, Intel Analysts Grapple With Flood of Data

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An abundance of unmanned aerial vehicles in combat zones has given U.S. intelligence agencies and commanders a crucial edge in war and espionage, but managing the information flow has been fraught with problems.

Bringing order out of chaos is the job the National Geospatial-Intelligence Agency (NGA). In response to the inundation of raw data, the NGA is adopting new methods to help reduce the amount of time it takes for UAV intelligence to reach the agency's two customers: national intelligence community personnel and military commanders.

"This is the un-sexy part of the problem, and no one has put a lot of money into it," said Stephen Long, special advisor for emerging airborne capabilities for the NGA. "Everybody loves the pretty airplanes."

The problem, senior NGA officials said, involves employing emerging technologies to gather new kinds of data, speeding up the transmission of relevant information to their customers and managing the influx in a way that allows archiving and interoperability, even if the data varies in format.

New sensor technology and an expanding number of collection systems have resulted in growing demands for processing digital video, still images, sophisticated laser imagery and other formats. As an added challenge, analysts need to provide this homogenized information in real time.

The current security environment is driving these changes, said Robert Zitz, NGA technical executive. "The timelines of our customers are compressing," he said at an industry conference hosted by the Institute for Defense and Government Advancement. "They are not measured in hours, but in minutes or seconds."

As an example he cited the strike against buildings thought to harbor Saddam Hussein and his family members at the outset of the 2003 campaign to oust him from power. If commanders had more current intelligence before deciding to make that strike, the result may have been different.

"Our adversaries know if you sit still, you can be seen," Zitz said. "The way to survive, and for your weapons to survive, is to be highly mobile."

An additional focus for NGA is to gain insights into the underground facilities that shield many weapons programs from view or attack, he continued, adding that the United States knows details of only a slight fraction of these underground bunkers. Also vexing are denial and deception methods, both sophisticated and simple, that can trick U.S. forces into using expensive ordnance on worthless targets.

"We must embrace airborne sensors, manned and unmanned, as the way forward for our agencies," Zitz said. "To drive timelines down, you're not going to get there with just satellites."

New capabilities have arrived with UAVs, and future research promises more forms of data NGA must be ready to handle. For example, one tool that can be used to scan inside buildings and defeat some deception techniques is laser radar, or LIDAR. "A permissive air environment is needed (to deploy LIDAR) now," Zitz said. "NGA is paying to have this put on unmanned aircraft."

NGA has established airborne fusion cells to quickly process images from manned and unmanned aircraft.

Along with commercial and classified space and air imagery, operators at NGA centers process signal intelligence, human intelligence streams and weather patterns for wartime operations planning. Their size and number are classified. The agency also is overhauling the way it collects and disseminates data. One new concept called “gridlock,” is co-sponsored by NGA and U.S. Central Command. The system is designed to shorten the time between the collection of tactical imagery to the engagement of a target. The program is still in the prototype stage, NGA spokesman Steve Honda said.

Another example is the multi-resolution tool, or “Mr. T,” established to support the Predator drone. The program, currently used by analysts, correlates data from the unmanned aircraft to give commanders and Pentagon players improved data on the locations of targets of interest. The software can match fairly imprecise or unclear images to known images in other databases to correctly identify a target within 10 minutes.

Zitz lauded the program’s progress, but only briefly. “You know, that ain’t good enough,” he said. “We got to get it down to real-time.”

An organized method of processing and sharing information from different sensors has become necessary, given the many new platforms and need for quick analysis. Analysts struggle to get an idea of what the incoming data is telling them and then pass it along the information food chain to NSA or battlefield commanders.

The real issue is providing interoperability and a common picture using many streams of information. “We have hundreds if not thousands of data types, and UAVs have promulgated that same problem,” said Long.

NGA is spearheading the adoption of a common format to ensure that the information flow will not be slowed by technical incompatibility. Their solution, first developed by commercial television to send digital imagery between special effects shops, is the advanced authoring format, or AAF.

AAF provides a way to track the history of raw data from its source through every step up the chain and as it passes through analysis software. The format is open-source and can be used after signing a no-fee contract.

It also provides a convenient way to “wrap” all elements of a project together for archiving by placing a tag around pieces of related data for consistent referencing. Format doesn’t matter, as long as the wrappers are consistent. Sharing data is often complicated by classified sources and AAF can be used to smooth this process. If a target of interest has been scanned by several platforms, the classification level can be tagged within the format wrapper as the foundation for human or automatic safeguarding.

UAV programs have been criticized for their insular nature, with each system generating its own form of data in a unique format that is coherent for only that single system. This, Long said, is an approach that hampers the movement of intelligence, and one AAF should improve. “The second that information hits the ground, you are now needed to be in the domain of talking in AAF.”

Transmissions to soldiers in the field will not be by AAF. A slimmer, translatable program called material exchange format, or MXF, will be employed. The two programs are “genetically-related,” said Long, which eases the technicalities in carving out and compressing a small piece of intelligence and beaming it to a soldier in the field.

Long noted that the wholesale adoption of AAF “is not a done deal yet” and that he was still engaged in selling the concept to other federal agencies.

“AAF is just a file format. However, it is an incredibly important enabler for the capabilities we need,” he said. “We will still have to build systems that ingest, store, process and use the AAF-enabled data. But we have to do that anyway.”

The question of building common infrastructure to support the rising amount of incoming data is a matter of numbers, he contended: either the government builds hundreds of systems, one for each data type, or just builds a few integrated systems using a common format. “If anyone has a better plan than AAF, let us know,” Long added.

Another critical addition to the agency’s ability to manage information is not a technical issue, but a human one.

“Very few analysts were aware or understood how to use data coming off the aircraft,” Zitz said. “Training is key.”

The new crop of agency analysts will be familiar with UAV operations from the start of their careers. During the post-Cold War period, NGA experienced a reduction in analyst positions. Since the terrorist attacks of September 2001, that trend has reversed sharply, with the agency authorized to hire 900 analysts.

The number of new analysts brought onboard each year depends on the number of seats available. To date, roughly 400 new analysts have been brought onboard, said NGA officials. All new NGA analysts attend a six-month course, where UAV processing techniques are now covered during classroom training.