

UNMANNED AIRWAYS

UAVs in Civilian Air Space

By David Vos, Ph.D., CEO & CTO of Athena Technologies, Inc.

The law enforcement community is trailblazing the use of unmanned aerial vehicles (UAVs) in civilian air space, and for good reason – the benefits are enormous. UAVs can operate around the clock. They don't tire, are more economical and can cover more territory than manned aircraft. But similar to military use, the purpose of UAVs in law enforcement and civilian applications is to augment manned aircraft operations, not replace them.

Many countries have been using UAVs for law enforcement surveillance for decades, including South Africa. The U.S. has been slower in its progress to allow UAVs to operate in civilian airspace as exemplified by the Los Angeles County Sheriff's Department being prevented by air space authorities to use UAVs, as well as the Palm Bay, FL police.

During the Hurricane Katrina aftermath and search for survivors, the authorities prevented law enforcement and rescue organizations from flying UAVs to search for survivors even though these aircraft have the endurance and payload to fly for many hours and see everything. Instead, a UAV was strapped onto a helicopter so its payload camera could be used to search for survivors, while another UAV was parked on top of a building so that it could conduct surveillance of New Orleans. Fortunately, last year the FAA agreed to allow UAVs to operate in civilian airspace after a catastrophe.

The technical and operational ability to safely and effectively integrate UAVs into controlled airspace to fly alongside manned aircraft exists today. The reliability of UAVs has increased significantly over the past decade, making them critical tools in Operation Iraqi Freedom and Operation Enduring Freedom. Through advancements in flight control and navigation systems, as well as engines and airframes, UAVs are operating today alongside manned aircraft around one of the busiest airports in the world, Balad Air Base in Iraq. There are 20 to 30 UAV flights daily from Balad that are completely integrated with manned military helicopters and jets, military and civilian cargo planes and just about any other aircraft imaginable.

The bigger obstacle to allowing UAVs to fly with manned aircraft in civilian airspace is the culture that perpetuates risk aversion and the status quo. Pilot-less airplanes flying next to airliners is a far-fetched concept to many, but probably no more an implausible concept than the early ideas of introducing autonomous trains or trams at airports. Today, no one thinks twice about walking next to or stepping onto a train with no driver to go between terminals at an airport. The concept of using smaller, tactical

UAVs to conduct surveillance for the police and sheriff's departments is a much easier concept to accept and not a huge leap from the popular hobby of flying radio controlled model airplanes, which can be flown today in civilian airspace with some restrictions.

The younger, more technically savvy generation will help to change culture and drive adoption of UAVs for use in civilian airspace. UAVs are here to stay, and anyone trying to prevent their use will be left behind. Military needs, homeland security, law enforcement surveillance and disaster recovery are all important applications, and demand for these is why we are starting to see more progress with certificates of authorization (COAs) being approved to fly UAVs for border protection, military exercises, disaster recovery and experimental purposes.

The FAA understands the need for technological improvements in airspace management. This is evidenced by the Next Generation Air Transportation System. The "Next Gen" program utilizes advanced technologies, such as automatic dependent surveillance-broadcast (ADS-B), for broadcasting position and enabling air traffic control (ATC) and other aircraft to know an airplane's position in the air and on the ground.

With technologies such as ADS-B, coupled with advanced flight control solutions, we can increase efficiency and safety. Airplanes will no longer have to fly great distances apart and descend at accelerated rates to land, improving air operations efficiency and preserving fuel. These same technologies can enable manned and unmanned aircraft to avoid colliding into each other, terrain or obstacles and can also be used for ground transportation, including automobiles. Taking baby steps to begin to shift culture and adopt technology that exists today in this highly digital age could significantly reduce traffic accidents, saving lives and freeing up airborne law enforcement to focus on crime prevention.

Athena Technologies, a flight control and navigation solution provider for UAVs and manned aircraft, is taking steps to resolve some of the many complexities related to integrating UAVs into civilian airspace. Athena is moving culture forward and alleviating risk concerns by demonstrating technologies that contribute to the reliability and performance of UAVs and improve the interaction and communication between UAVs, ground operators and ATC. The company has demonstrated the following:

- Damage tolerance technology that enables an aircraft to compensate for failures in flight and continue to fly safely, as exemplified by a sub-scale F/A-18 UAV, which shows control adaptation for a lost aileron and safe automatic landing.

- Flight control redundancy architectures that add multiple flight control systems to a UAV for reliability.

- Voice recognition technology to enable UAVs to communicate with ATC in the current way and with the standard ATC language.

- Working with and integrating other technologies to improve safety and overall air traffic management, such as ADS-B.

- Rerouting technology that prevents an aircraft from flying into another aircraft, obstacle or restricted area.

The world has seen enormous success with UAVs conducting reconnaissance in Iraq, Afghanistan and other countries from a mission and performance standpoint, in addition to the overall economic value of these smaller tactical aircraft. As the need and desire to use UAVs in law enforcement, disaster recovery, fire fighting, weather monitoring, cargo delivery and other applications continue to increase, and the civilian air space becomes more and more utilized by UAVs, very light jets and other manned aviation, the need for more technology and automation is critical.

It is unlikely that there will ever be an adequate number of ATC operators added to the system to manage the increase in air traffic. This scenario is very similar to the Internet which after years of increasing traffic fundamentally manages traffic and conflict in an automated and efficient fashion.

From integration of UAVs and manned aircraft in an increasingly congested air space, to total vehicle management of traffic on the roads, automation and advanced controls technology can enhance security and overall quality of life. Even in applications such as crowd and riot control, where there are large numbers of people that need to be managed, advanced algorithms and control systems on ground robots and UAVs can improve safety for both citizens and law enforcement. Robotics in the air and on the ground can provide cost effective, more efficient backup to ATC, airborne law enforcement, ground law enforcement, military organizations, emergency management agencies and others.