vertiflite Commentary

Flying the Crowded Skies

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NASA's new Unmanned Aerial Systems (UAS) Traffic Management (UTM) initiative intends to develop and demonstrate approaches that would allow low-altitude manned and unmanned operations to coexist safely. The agency will then recommend solutions to the US Federal Aviation Administration (FAA) that could be integrated with the national and global Air Traffic Management (ATM) systems.

In July, NASA held a convention – UTM 2015 – at the Ames Research Center at Moffett Field, California with representatives from more than 100 companies and universities. Amazon, Google, Harris Corp., Verizon (the largest cellular carrier in the US) and ten other companies have signed agreements with NASA to support the UTM initiative. Over 1,000 attendees participated in the event, showing a level of enthusiasm and optimism for what promises to be a new and exciting new era in aviation.

Dr. Parimal "PK" Kopardekar, NASA's Safe Autonomous System Operations (SASO) Project Manager, noted that "maybe in 10 years, every home will have a drone, and every home will act as an airport." Dr. David Vos, the head of Google's Project WingUAS, stated that in the future, he believed that thousands of drones – others have suggested it may be tens of thousands – would be flying over cities just a few hundred feet off the ground. Last year, Amazon suggested that "One day, seeing Amazon Prime Air will be as normal as seeing mail trucks on the road today, resulting in enormous benefits for consumers," noting that more than 85% of Amazon orders are 5 lb (2.3 kg) or less, and that the service could enable the company to deliver products to consumers in 30 minutes or less.

Amazon and Google are both advocating industry-led management of low-altitude unmanned airspace, but with different approaches. Amazon proposes that faster, better-equipped small

UAS fly at altitudes of 200 to 400 ft (61 to 122 m), and slower, less sophisticated systems without sense-and-avoid capabilities fly below 200 ft. Google's approach is to use cellular networks used for planning, monitoring and separation, Automatic Dependent Surveillance-Broadcast (ADS-B) for collision avoidance from manned aircraft, and automotive Vehicle-to-Vehicle (V2V) communications for short-range UAS-to-UAS avoidance.

Unfortunately, helicopters often conduct their entire operations at 400-500 ft and transverse through the entire current and proposed UAS airspace, while ADS-B Out is currently installed in only about 4% of helicopters in the US. Furthermore, there has been some debate about whether there is even enough capacity to equip all existing American rotorcraft by the January 1, 2020 deadline. An FAA official noted earlier this year that to meet the deadline, six helicopters would have to be equipped and certified each and every day through the end of 2019.

NASA's UTM initiative should help define the final solution for integration of the airspace. According to NASA, "the UTM system would enable safe and efficient low-altitude airspace operations by providing services such as airspace design, corridors, dynamic geofencing, severe weather and wind avoidance, congestion management, terrain avoidance, route planning and re-routing, separation management, sequencing and spacing, and contingency management. UTM is essential to enable the accelerated development and use of civilian UAS applications."

This new UTM initiative is not a moment too soon. In fact, it's probably 5 to 10 years late, because along with the excitement of new markets and new applications using unmanned aircraft, there is the negative aspect of serious public safety issues that are growing exponentially from increased UAS usage.

By the end of July, the FAA said it was receiving multiple reports every day from pilots experiencing close calls with UAS. Pilots landing at New York City area airports have reported drones flying within 100 ft (30 m) of them – at 1,700 ft (520 m) altitude.

At least five times this summer, unmanned aircraft flying near wildfires in California and other western states have grounded helicopters and airplanes sent to douse the flames, allowing the fires to grow. Groundings have lasted up to 90 minutes. One event in June cost the US Forest Service as much as $15,000 for firebombing services that had to be scrubbed due to drones in the air. Northeast of Los Angeles, a fire in July spread so quickly it jumped Inter-

state I-5, scorching 30 cars in the process; five UAS scurrying around the fire grounded tanker operations for 25 minutes, according to the San Bernardino County Fire Department. According to the incident report, "Hobby drones, or (UAS) unmanned aircraft systems, pose a major safety threat to firefighting pilots and firefighters. When a hobby drone is flown into a fire area, incident commanders have no choice but to suspend air operations and ground aircraft until the drone is removed from the area."

The FAA announced that there have been more than 650 sightings of drones near manned aircraft in the US – some as high as 10,000 ft (3 km) – through the first seven months of 2015, compared to 238 sightings during all of last year.

Near misses with police, medical and other helicopters are also increasing to a frightening frequency, sometimes at altitudes of 2,400 ft (730 m) or more; pilots have had to take evasive action, narrowly avoiding the unmanned aircraft.

Current FAA guidelines separate model aircraft operations and non-governmental civil UAS operations. Hobbyists are able to fly aircraft up to 55 lb (25 kg) without a certification for recreational purposes only, but must fly below 400 ft (122 m), be kept within visual line of sight at all times, remain well clear of manned operations, and generally not fly within 5 miles (8 km) of an airport. However, helicopters routinely operate from heliports – which, despite also falling within the FAA definition of an "airport," are often not recognized as such by the public – and have the ability to land virtually anywhere when necessary.

AHS International recently warned NASA's Associate Administrator for Aeronautics Dr. Jaiwon Shin and the National Academies' Aeronautics Research and Technology Roundtable (ARTR) that it's likely only a matter of time before a UAS causes a fatal helicopter crash. With the explosive growth in unmanned aircraft usage – as well as the ever-increasing number of drone sightings and near misses – it seems to be likely that unmanned-induced fatal accidents may soon begin to occur.

A shared vision and common understanding for safe operations is needed. The FAA is now considering new Small UAS regulations, with a Notice of Proposed Rulemaking (NPRM) released in February 2015 for non-recreational drones up to 55 lb (25 kg), 100 mph (161 km/h) and 500 ft (150 m) altitude. Although the final rule for Small UAS will likely not take effect for another year or more, the FAA has been approving companies to operate commercial UAS through case-by-case "Section 333" exemptions. The agency announced in early August that it had already granted more than 1,000 exemptions, approving requests at about 50 per week. These approvals allow companies to fly systems for non-hobbyist purposes anywhere in the country up to 200 ft (61 m) – except in restricted airspace, close to airports, and other designated areas.

As unmanned aircraft usage continues to grow, the airspace below 500 ft altitude will become increasingly crowded. The lives of helicopter crews and passengers are at risk from hobbyists and drone operators who are not adhering to the simple FAA guidelines that are in place. Helicopter crews must maintain a vigilant watch for these new threats. Collision risk can be mitigated by flying higher when able and flying more slowly down in the realm of the UAS so as to improve the ability for mutual see and avoid and to reduce the potential for catastrophic damage in the event of a collision.

The FAA has partnered with the Association for Unmanned Vehicle Systems International (AUVSI), the Academy of Model Aeronautics (AMA) and the Small UAV Coalition with a campaign (**www.KnowBeforeYouFly.org**) to educate private, public and commercial UAS operators but the words "helicopter" and "heliport" don't appear on the site.

With UAS usage today appearing to be frightfully like the "Wild West," a dramatic change is needed in public awareness and attitudes toward flying unmanned aircraft near areas of operations for fixed-wing and rotary-wing aircraft. Government agencies and UAS organizations, manufacturers, retailers and operators must recognize the special vulnerability of helicopters to unmanned aircraft and educate users of their responsibilities.

AHS International is working to raise awareness of the hazards of low altitude operations and influence the regulation and enforcement of that airspace for the safety and benefit of all of its users.

Student Design Competition Winners

The University of Maryland and Georgia Institute of Technology/Middle East Technical University (METU) took top honors in the 32nd Annual AHS International Student Design Competition. The 2014-2015 competition, "Distributed Logistics in an Urban Setting Using Small Unmanned Aerial Vehicles," challenged students to design a small, distributed logistics delivery UAS and its role in a large logistics system concept. The Boeing Company sponsored the competition with $10,000 in prize money plus $2,000 in travel stipends. A total of 14 teams from around the world submitted entries in this year's competition.

In the graduate category, University of Maryland's winning "AirEZ" was a novel quadrotor-biplane-tailsitter UAS with the ability to hover, transition quickly into high speed forward flight, and efficiently transition back to hover for landing. Second place went to Georgia Institute of Technology/METU for its "GT STORK," which also won the Best Hardware Validation prize. Rensselaer Polytechnic Institute captured third place with its "ADD90." Indian Institute of Science Bangalore's entry, "Lakshya-IIS," captured the Best New Entrant.

The Georgia Tech/METU "Air Buzz" quad tilt-rotor UAS was the first place undergraduate design. The Pennsylvania State University won second place, as well as the best hardware validation prize, for its "ROAR" design; third place went to the Georgia Tech/METU "HARETC" entry. New River Community College, with their entry of "New River Harrier," was recognized as the undergraduate winner of the Best New Entrant award.

More information about the AHS Student Design Competition can be found at **www.vtol.org/sdc**. The top-winning entries from the 32nd Student Design Competition are posted, along with previous winners. The site also features the new Request for Proposal for the 2015-2016 AHS Student Design Competition; sponsored by Bell Helicopter, the "Air Launched Unmanned Disaster Relief Delivery Vehicle," is also a UAS.