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Newsgathering drones move step closer

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- **By Hank Perritt, RTDNA Contributor**

On February 24, the FAA signaled its interest in writing its final small drone rules, expected as early as this summer, to accommodate the needs of journalism community. While reiterating its reluctance to embrace a simple exclusion for drones below a certain weight, as proposed by the UAS America Fund, the agency formally appointed a new industry advisory committee, and gave it an April 1 deadline to develop recommendations for how flight over people by small drones can be made safe.

The most important imperative for this initiative is that it not morph into formal airworthiness certification. If newsgathering drones must receive airworthiness certificates before they can fly over people, it will be years before this newsgathering tool will be a reality. The FAA's February, 2015 drone NPRM recognizes the infeasibility of airworthiness certification.

To avoid airworthiness certification, the FAA must allow self-certification by manufacturers and vendors, as occurs with motor vehicles and consumer products under NHTSA and CPSC regulation. The FAA would articulate performance standards, and manufacturers and vendors would declare that certain models meet those standards.

The first step in any risk-based performance specification is to identify the risks. If a drone flies over one or more people to gather news, stays in the air and responds to appropriate navigational commands from its DROP, it poses no risk of injury.

The risks arise from two possibilities: the drone stops flying and falls, or it flies into people. Either may occur because of a “flyaway”—the drone escapes control by the DROP, usually because it loses its lock on the necessary GPS signals. Then the risks fall into two categories: risks of the rotor blade cutting somebody (the “cutting risk”), and the risks of the impact between the body of the drone and a human body (the “impact risk”).

The cutting risk is significant but not catastrophic. The rotor blades of drones now on the market are not heavy enough, long enough, strong enough, or sharp enough to cut anybody's head or hand off. They can, however, inflict serious lacerations, and, if the stars align in an unlucky way, put someone's eye out.

The best and simplest mitigation of the cutting risk is to install blade guards – "prop guards”-- a widely available accessory for most popular models of drones. A straightforward way to deal with the cutting risk is to have an FAA rule that says, "No one may fly a drone over people unless it has prop guards.”

The impact risk is more complicated, although the physics are straightforward: injury in the form of concussions, fractures, or other tissue damage is proportional to the kinetic energy that must be absorbed by the body in a collision. When a collision occurs between a drone and a human being, some of the kinetic energy is absorbed by the drone, and some by the human. The more kinetic energy absorbed by the vehicle, the less that must be absorbed by the human.

Evaluation of mitigating measures must proceed from quantifying and limiting the kinetic energy and understanding and increasing the mechanisms through which a drone hitting a person can absorb much of it.

Kinetic energy of a moving object is equal to half the mass (weight) of the object, multiplied by the square of its velocity. A lighter-weight drone moving more slowly has less kinetic energy than a heavier one moving faster. Low kinetic energy can be assured by operating rules that restrict flights over people to drones below a certain weight threshold, moving below a certain speed threshold.

That, however, addresses only the horizontal component of kinetic energy, relevant if a drone hits someone from the front, side, or back. What if a drone falls from the sky onto someone because it loses a rotor, exhausts its batteries, or one or more of its motors stop functioning?

Then, the drone will fall at a vertical speed equal to or less than its terminal velocity. Terminal velocity depends on the shape of the drone and the ratio between its surface area and its weight. A balloon or a blimp has a much lower terminal velocity than a steel rod.

The most logical approach to mitigate the impact risk from a falling drone is to require that it have a relatively low terminal velocity. The most straightforward way to do this is to require the drone to be

equipped with parachute that would automatically deploy under appropriate emergency circumstances. It is feasible to equip even small drones with emergency parachutes, although there is a weight and complexity penalty.

Requiring that newsgathering drones flying over people absorb a high fraction of the kinetic energy involved in a collision is more challenging. The NPRM mentions frangibility, which addresses this issue. But frangibility is a better solution when two hard objects collide than when a hard object collides with a person. Soft and elastic are better characteristics for a drone impacting a person. But it is hard to envision a drone design that would incorporate soft and elastic surfaces without sacrificing aerodynamic characteristics necessary to make it useful.

Soft and elastic are less necessary features, however, when the kinetic energy is less. Accordingly, more restrictive speed and weight limitations reduce the need for energy-absorption requirements. Larger parachutes can reduce terminal velocity almost to zero.

In any event, genuine performance standards would let the manufacturer decide how it chooses to meet the standards and to certify its compliance.

Part of the solution is more hospitable treatment of tethered drones. They don’t flyaway; they don't need GPS lock, and their batteries never run down. The FAA has granted some 333 exemptions that cover tethered drones, and has inserted a paragraph on tethered drones some of its more recent standard section 333 exemptions.

The membership of the new committee is diverse, and the newsgathering community is represented through the News Media Coalition, coordinated by Chuck Tobin at Holland & Knight. The journalism community should express its views as the committee puts together its recommendations.

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