Drone Deliveries Face Technological, Legal Hurdles

By **Caroline Gentry**

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After years of anticipation, a handful of companies are getting closer to delivering packages in the United States by drone (also known as unmanned aerial systems, or UAS). Referred to as "last-mile deliveries," these drone flights are expected to occur over a distance of 10 miles or less, with an average flight time of 20 minutes.

Drone deliveries are already being made in other countries — medical supplies in Rwanda, food in Australia, pizza in New Zealand, packages in Germany and the United Kingdom — so their debut in the United States seems more than a little overdue. At long last, domestic drone delivery is moving (slowly) toward takeoff.

One reason for the delay has been the lack of regulations authorizing drone delivery. Three years ago, the Federal Aviation Administration issued regulations allowing remote pilots to conduct commercial operations. But those rules imposed limitations on drone deliveries.

In the FAA Reauthorization Act of 2018, Congress directed the FAA to pass rules allowing drone deliveries and, in the meantime, to authorize drone deliveries under air carrier rules. Earlier this year, Wing Aviation LLC, a former subsidiary of Google, became the first company authorized by the FAA to make drone deliveries. Pending petitions have been submitted by Amazon Prime Air, UPS Flight Forward Inc. and Uber Elevate Inc. If the FAA handles those petitions with the same speed that it handled the Wing Aviation petition, then we can expect the agency to rule on them sometime next year.

Regulatory barriers are not the only hurdles, however. Several technological obstacles must also be overcome before drone delivery becomes routine. Without a human pilot on board, drones must rely on sense-and-avoid (also called detect-and-avoid) technology to avoid collisions. This technology exists, but needs to be further developed — as well as made less costly and more widely available — to allow most drones to fly beyond the remote pilot's visual line of sight.

Also needed is a UAS traffic management system or service that will enable remote pilots to simultaneously broadcast their drone's location and receive the location of all nearby manned and unmanned aircraft. The FAA is working with industry and the National Aeronautics and Space Administration to develop UAS traffic management technology, which will likely be rolled out on a regional or local basis. Other technological obstacles that need to be addressed include operating in GPS-denied environments, flying safely in inclement weather and improving the reliability of automation.

Safety, of course, is a paramount concern. The FAA's mission is to provide the safest, most efficient aerospace system in the world. That mission has been greatly complicated by the introduction of civil unmanned aircraft into our national airspace system.

Drones are relatively inexpensive and widely available. They fly at low altitudes, and many can be launched and landed without a runway. With a little practice, anyone can fly a small drone — even a young child — and recreational operators may not think of themselves as pilots, or realize that legal requirements apply to them. To maximize safety, government and industry must ramp up their efforts to provide education and guidance to all types of drone operators.

Other safety concerns arise because of the unique features of drones. Unlike manned pilots, remote pilots lack situational awareness — they cannot turn their head to see what is above or behind them, and they cannot use their sense of smell or hearing to detect and diagnose mechanical problems.

Remote pilots must rely on satellite communication links that can become unreliable without warning, including in congested urban areas where drone deliveries will likely be made. And there is a built-in time delay between the remote pilot giving a command and the drone receiving and acting upon that command. Although all of these issues can be addressed, the necessary technologies must improve and become less costly over time.

The designs of today's drones also raise safety concerns. By law, manned aircraft must use FAA-approved parts and include redundant systems that reduce the risk of an accident if one system fails (e.g., if an engine flames out). The added costs of regulated parts and redundant systems, as well as the weight of those redundant systems, can be absorbed by manned aircraft.

Drones, by contrast, operate on small power sources (usually batteries) that typically allow for flight times measured in minutes, not hours. The added weight of even a few extra pounds of redundant systems could shorten those flight times. And because drones are relatively cheap, they are less able to absorb the increased costs of FAA-approved parts and redundant systems. Nevertheless, the FAA and industry are working to establish risk-based consensus safety standards for the design, production and modification of drones, so some FAA-approved parts and/or redundancies may be required in the near future.

Security concerns must also be addressed. Law enforcement officials have long pressed for remote identification technology that will tell them who is flying and allow them to identify drones that are unauthorized, flying unlawfully or displaying malicious intent. The FAA is working with the U.S. Department of Defense and U.S. Department of Homeland Security to develop counter-UAS technology to detect and counter errant or hostile drones.

The protection of critical infrastructure is an ongoing concern. And remote pilots must be able to prevent bad actors from jamming their signals or hacking into their systems, either to disable their drones or to take control of them.

Another concern is privacy. A commonly asked question is how people can protect their personal privacy from drones flying over backyards or loitering near windows. To date, no federal agency has assumed responsibility for regulating and ensuring privacy in the context of drone operations.

Section 378 of the 2018 FAA Reauthorization Act requires every commercial drone pilot to have a written privacy policy that is regularly updated and is made publicly available. Section 375 of the Act provides that a violation of such a privacy policy is an unfair and deceptive practice in violation of the Federal Trade Commission Act, 15 U.S.C. § 45(a). Businesses that make drone deliveries will need to develop and enforce these privacy policies. They also will need to comply with state and local laws that protect the right to

privacy, including both general laws and laws that specifically address drones and privacy.

Finally, drone deliveries are likely to prompt state and local governments, homeowners and remote pilots to grapple with more fundamental questions. Who has the right to regulate drones? After the Wright Brothers invented flight, Congress declared that the United States owns the national airspace — but some states reserved their sovereignty over airspace in their own aviation laws. While manned flights at 30,000 feet did not require this dispute to be resolved, drone flights at 100 feet may do so.

Local governments, too, have a legitimate claim to regulating low-altitude airspace based on the exercise of their traditional police powers. And what rights do property owners have? The ancient rule of cuius est solum, eius est usque ad coelum et ad inferos ("whoever's is the soil, it is theirs all the way to Heaven and all the way to Hell") was curtailed by manned aviation, but no hard-and-fast rule establishes how low a drone can fly without violating property rights. Moreover, some state laws allow remote pilots to argue that a "right of flight" permits them to fly lawfully over private property. These and other conflicts will likely lead to legal skirmishes that must be resolved by the courts.

In sum, although drone deliveries are finally on their way, numerous other issues must be addressed before they become commonplace and we achieve the goal of fully integrating drones into the national airspace. Stay tuned … and in the meantime, keep an eye out for a drone delivering packages near you.

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