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## Flying Ahead of the Pack: Drones in the Agriculture Industry

By Allison I. Fultz

Agricultural operators have been at the forefront of the adoption of drones to carry out a broad range of functions. Drones, also known as unmanned aerial vehicles (UAVs) or unmanned aerial systems (UAS), are remotely-piloted aircraft that, for agricultural use, typically are outfitted with sensing devices such as still or video cameras, or sensors that measure temperature, ground moisture, or the chemical composition of soils. Ongoing advances in technology and recently established federal regulations have lowered previously-existing barriers to using drones for a variety of civilian applications. However, some significant technical hurdles and regulatory limitations remain before the full potential of drones in agriculture can be realized, but a vigorous effort is underway to overcome these current constraints.

Other commercial drone applications include photography and videography for operations as

varied as real estate marketing, cinematography, surveillance, search and rescue, wildlife management, asset management, insurance appraisals, and inspection of large-scale energy and transportation facilities. Drones equipped with radio-frequency identification sensors can quickly and accurately track inventory in large warehouses or production yards.

For agricultural users, drone technology has enabled rapid advances in efficiency in precision crop monitoring and planting through the use of drone-mounted moisture and nutrient sensors. Drones enable the inspection, surveying, and observation of large areas of land more quickly, cheaply, and in greater detail than can be accomplished on foot, in a vehicle, or from an airplane or helicopter. Drones also afford significant safety benefits, because they allow close inspection of areas such as power pylons or tank or silo interiors that may be hazardous for humans to access.

### Current Regulation

Although drones were initially developed as military devices, Congress included provisions in the FAA Modernization and Reform Act of 2012 (FMRA) to transfer the potential benefits of drone technology to civilian aviation. FMRA

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§ 332(a)(1) directed the Federal Aviation Administration (FAA) to “develop a comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the National Airspace System (NAS).” Congress also specified that the plan employ a phased approach to introducing drones into the NAS and that FAA work to: (1) define the acceptable standards for operation and certification of civil unmanned aircraft systems; (2) ensure that any civil unmanned aircraft system includes a sense and avoid capability; and (3) establish standards and requirements for the operator and pilot of a civil unmanned aircraft system, including standards and requirements for registration and licensing.<sup>1</sup>

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As the first step in its multi-phased implementation of the drone provisions of FMRA, the FAA issued a final rule that became effective on August 29, 2016<sup>2</sup> (Final Rule), and opened a new chapter in the development of drone enterprises by authorizing the operation of drones under broad general criteria. The Final Rule eliminates the detailed and time-consuming case-by-case review process by which the FAA reviewed applications for drone operations between the passage of FMRA and publication of the Final Rule, and sets out straightforward parameters for drone use. Now, basic registration and licensing requirements apply to individual aircraft and operators: As long as a certified “remote pilot” flies his or her FAA-registered drone in compliance with the criteria set forth in FAA’s regulations, no additional authorization or licensing is required.

The ultimate goal of FMRA’s phased approach to integrating remotely-piloted aircraft into the NAS is that manned and unmanned aircraft will share the nation’s skies. Currently, the Final Rule permits only small UAS (sUAS), defined as drones weighing under 55 pounds, including any payload, to be operated in civilian use. Over the next few years, the FAA will be issuing rules governing the use of larger drones, including for freight and passenger use, and to extend the use of drones beyond existing regulatory limitations.

## Vehicle and Operating Requirements

The Final Rule establishes the technical and registration criteria drones must meet and the bounds within which sUAS operators are permitted to fly.

Operators must register any sUAS larger than 0.55 pounds and lighter than 55 pounds (including any payload) with the FAA.<sup>3</sup> The remote pilot must perform a preflight visual and operational check of each sUAS before each flight to ensure that safety-pertinent systems are functioning properly. This includes checking the communications link between the control station and the UAS.<sup>4</sup>

Significantly, because the technology to ensure that drones can independently “sense and avoid” other objects to prevent collisions is not sufficiently developed, operators cannot fly a drone beyond the visual line of sight (BVLOS) of the operator and/or a spotter without specific authorization from the FAA.<sup>5</sup> Nighttime operations also are forbidden without express authorization.<sup>6</sup> These existing limitations have constrained the adoption of UAS for various commercial uses, particularly in agriculture, because the prohibition of flight BVLOS significantly hinders the use of drones over a broad geographic area, and the limitation on nighttime operations restricts the numerous uses of drones for agricultural monitoring that do not rely on visual inputs. However, an operator who is able to demonstrate that his or her proposed operations will meet FAA safety criteria can obtain a waiver from the FAA for operations that go beyond the constraints defined in the Final Rule. Particularly for agricultural users who will be operating drones over property they own, lease, or otherwise control, and not over populated areas, a waiver of the Final Rule’s BVLOS or nighttime limitations may provide the desired scope of operations.

Additional operating parameters established in the Final Rule require:

- An operator **may never operate in a careless or reckless manner**. Careless or reckless operation is that which endangers the life or property of another person or allows an object to be dropped from a sUAS in a manner that creates an undue hazard to persons or property.<sup>7</sup>
- Drones **cannot be operated over persons who are not directly involved in flight operations**, unless those persons are under a covered structure or inside a stationary vehicle that provides protection from a falling sUAS.<sup>8</sup>
- **No operations from a moving vehicle are allowed unless in a sparsely populated area**. Part 107 does not define “sparsely populated area.”<sup>9</sup> The FAA observes that determining whether an area is sparsely populated is “typically fact dependent.”<sup>10</sup> It is reasonable to assume that for most agricultural applications, use of a vehicle as the base of drone operations likely will not require a waiver from FAA.

Allowable use of a moving ground-based vehicle may overcome some of the limitations imposed by the restriction on flights BVLOS.

- The operator must **keep his or her drone within sight without the use of visual aids** such as binoculars.<sup>11</sup> A drone operator may use a **visual observer** to extend observation of flight operations beyond the operator's visual line of sight as long as the operator and visual observer maintain uninterrupted contact.<sup>12</sup> An operator or team may only operate one drone at a time.<sup>13</sup> As discussed above, an operator may seek a waiver of these requirements, which would allow flight BVLOS of the operator or visual observer, and would allow the operation of more than one drone at a time. The limitation on BVLOS operations without a waiver is one of the most significant impediments to the expansion of sUAS use. The rapid advance of UAS technology and intense interest from a wide range of industries seeking BVLOS operations suggests that relaxation of this restriction is likely to be one of the next revisions of the Final Rule.
- Minimum weather visibility must be at least three miles from the operator's control station.<sup>14</sup> **The maximum allowable altitude is 400 feet above the ground** or higher if the drone remains within 400 feet of a structure.<sup>15</sup> The maximum speed for sUAS operations is 100 mph (87 knots).<sup>16</sup>

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One of the essential future requirements of safe autonomous drone flight is to prevent collisions through the capability to "sense and avoid" other aircraft or obstacles. Current technology does not reliably allow drones to do this, which is why maintaining a visual line of sight and continuous communication between the operator and an observer are critical. Developing robust sense and avoid capacities is a difficult technical task, and much current UAS research is focused on developing this technology. BVLOS flight will likely become the norm for drone operations once sense and avoid technology is fully developed.

## Pilot Certification

To operate the controls of a sUAS under the Final Rule, an operator must obtain a remote pilot airman certificate with a sUAS rating from the FAA,<sup>17</sup> or be under the direct supervision of a person who holds such a certificate.<sup>18</sup> A person must be at least 16-years-old to be licensed, and may obtain a remote pilot certificate by taking a written aeronautical knowledge examination<sup>19</sup> and submitting to a background check. Licensed operators must update their knowledge test every two years.<sup>20</sup> Study guides and testing opportunities are available through a variety of providers.

## Practical Considerations

For those considering using drones as part of their own agricultural operations or as a contractor providing services to others, remote pilot certification for the operator and registration of any drones are the basic prerequisites. If use beyond the limits of the Final Rule is necessary, the operator may apply to the FAA for a waiver from specific limitations on a case-by-case basis upon a demonstration to the FAA's satisfaction that the proposed use will be safe. The waiver process, by which the FAA evaluates waiver requests on a case-by-case basis, can take anywhere from a few weeks for routine requests (*i.e.*, nighttime operation) to several months for more novel proposals.

Insurance needs for persons operating a drone for commercial purposes are similar to those for other types of contracting, including commercial general liability, automobile liability, and non-owned aircraft liability (if operating drones owned by others), in addition to specialized physical damage/hull coverage and UAV operations liability coverage. The novelty of drone technology and lack of an extensive history of use and claims has spurred insurance providers to offer creative and flexible solutions, including insurance coverage on a flight-by-flight or hourly basis. Such products may help control the cost of coverage.

Whether you plan to operate a drone yourself, have an employee conduct drone operations, or hire someone to perform drone-based services on your property, a few strategies are worth bearing in mind:

- If you allow a third party to perform drone operations on your property, require the drone contractor to sign a waiver of claims and assumption of liability.
- Obtain UAS liability insurance and require all third-party drone users to provide proof of such coverage.
- Require third-party drone operators to provide their remote pilot credentials, drone registration

information, and any special operating authority the operator may have obtained from the FAA. If you obtain a waiver for your own purposes, keep careful records of the application, backup documentation and all communications from FAA.

Operating a drone on one's private property for personal use constitutes a recreational use that requires registration of the drone but not pilot certification. Be aware, however, that if you use a personally-owned drone in connection with your commercial operation, the FAA may consider such flights to be a commercial use. Even though the FAA's analysis to date of whether drone operations are commercial or recreational have focused on whether the drone operations themselves are being conducted for hire, a business owner flying his or her own drone in furtherance of a commercial enterprise may fall into the category of commercial users required to comply with the Final Rule.

## What's Next?

The FAA is the federal agency with broad responsibility to regulate the NAS to ensure the safety of persons and property in the air and on the ground, and to prevent collisions between aircraft and between aircraft and other objects.<sup>21</sup> The FAA also is charged with ensuring the safe flight of civil aircraft in air commerce, which it accomplishes through regulations and the establishment of minimum standards for safe operations.<sup>22</sup>

The intersection of the FAA's jurisdiction with state and local law is an area of open debate. The FAA's regulation of drones focuses on maintaining the safety of the NAS and of all types of flight operations. On a somewhat different track, emerging public concerns about harms arising from drone use have centered on issues such as trespass or invasion of privacy, and have sparked legislative activity at the state and local level across the United States. Generally, however, if drone operations are alleged to have caused cognizable harm, existing legal theories providing relief in tort, nuisance, and trespass typically are sufficient to support actions under state law, in addition to any safety enforcement proceeding the FAA may separately institute. State or local criminal penalties also may apply, depending on the context of the alleged drone-caused harms. The FAA has concentrated its regulatory efforts on the technical and operational facets of drone regulation, and disclaims any authority to define privacy protection standards in connection with drone operations. In addition, expect to see litigation addressing the scope of federal preemption of state or local police powers under which a state

or municipality may seek to regulate aspects of drone use not directly related to aviation safety.

The FAA has been preparing a rule to govern sUAS flights over people or crowds, and release of a preliminary rule for public review and comment is anticipated to be the FAA's next regulatory action on sUAS. Although the Final Rule forbids sUAS operations over people or in densely populated areas, operators may apply for a waiver of this limitation.

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As discussed above, standards for BVLOS operations are another near-term goal, which will depend on how quickly reliable sense and avoid technology develops.

Finally, although likely still years off, the FAA will develop rules to allow much larger UAS to operate in the NAS to carry large cargo loads and passengers. In this case, large UAS have been in use for over a decade for military purposes and the technology is mature. FAA's task is to develop rules appropriate for civilian purposes. The operational characteristics of these larger aircraft more closely resemble those typical of piloted airplanes, so the need to accommodate large UAS in close proximity to people and human activities will not drive the development of rules as it has for sUAS.

We can expect agricultural use to continue as one of the leading areas for drone innovation as BVLOS and autonomous flight technology advances, enabling efficient surveying, soil measurement, precision planting and crop monitoring—along with applications that are yet to be developed.

## Notes

1. FMRA § 332(a)(2).
2. Operation and Certification of Small Unmanned Aircraft Systems, 81 Fed. Reg. 42,063 (June 28, 2016) (codified primarily at 14 C.F.R. parts 101 and 107).
3. 14 C.F.R. §§ 91.203(a)(2), 107.13.
4. 14 C.F.R. § 107.15.
5. 14 C.F.R. § 107.31.
6. 14 C.F.R. § 107.29.
7. 14 C.F.R. §§ 107.23, 91.13.
8. 14 C.F.R. § 107.39.

9. 14 C.F.R. § 107.25.
10. 81 Fed. Reg. at 42,115.
11. 14 C.F.R. § 107.31.
12. 14 C.F.R. § 107.33.
13. 14 C.F.R. § 107.35.
14. 14 C.F.R. § 107.51(c).
15. 14 C.F.R. § 107.51(b).
16. 14 C.F.R. § 107.51(a).
17. 14 C.F.R. Part 107, Subpart C.
18. 14 C.F.R. §§ 107.12, 107.63.
19. 14 C.F.R. § 107.67.
20. 14 C.F.R. § 107.65.
21. 49 U.S.C. § 40103.
22. 49 U.S.C. § 44701(a).

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