The Rise of Commercial Drones

# Emerging sUAS Manufacturer Concerns

By Theodore Dorenkamp III

**Today's regulations focus responsibility on the owner, the operator, and the remote pilot in command, and the comments suggest ways that drone manufacturers may help them comply with those regulations.**

The shift in the regulatory landscape regarding drones has been and continues to be nearly as rapid as the rise in their popularity. As is typical of transformative technologies in a highly regulated environment, new and emerging commercial applications of drone technology have outpaced Congress' and the Federal Aviation Administration's ability to keep up. However, the new Federal Aviation Regulation Part 107 eases up on the brakes and heralds the beginning of widespread commercial drone applications. This article provides a primer on the development and current state of commercial drone regulation, provides a preview of the likely future of regulation in this area, and offers some analysis on the legal implications for operators and manufacturers of drones.

## Drone Development and Commercial Applications

The first radio-controlled, unmanned aerial vehicle successfully flown is understood to have been a modified U.S. Navy seaplane in 1924. John F. Keane & Stephen S. Carr, *A Brief History of Early Unmanned Aircraft*, 32 Johns Hopkins APL Tech. Digest 558 (2013), *available at* http://www.jhuapl.edu. The use of radio-controlled bi-planes by the British military for gunner target practice started to flourish in the 1930s, giving rise to the term "drone." Vintage Wings of Canada, *The Mother of All Drones: How the Pilotless De Havilland Queen Bee Spawned the Nemesis of Al Qaeda*, http://www.vintagewings.ca (last visited Oct. 18, 2016). But while radio-controlled drones were largely the province of militaries, interest in recreational "model aircraft" took off among the public. These model aircraft from the 1930s—made mostly of balsa wood, powered by tiny gasoline engines, and controlled by guide wires—have given way to today's lightweight lithium-ion battery-powered multi-rotor small unmanned aircraft systems (sUAS). *See Aeromodeling History*, Academy of Model Aeronautics, http://www.modelaircraft.org (last visited Oct. 18, 2016). The term "small unmanned aircraft" means an unmanned aircraft weighing less than 55 pounds, while the term "unmanned aircraft system" includes the aircraft and ground control elements used to control

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the unmanned aircraft. *See* FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126. Stat. 11, §331.

Sales of sUAS have increased exponentially in recent years, and the trend upward is expected to continue. According to the Consumer Electronics Association (CEA), the global market for consumer drones would approach $300 million in revenue in 2018, with sales nearing a million units, increasing from the CEA's forecast for 2014 of $84 million in global revenues based on sales of 250,000 units. Press Release, Consumer Technology Association, Let Them Fly: CEA Applauds FAA's Ruling on Drones (Sept. 25, 2014), https://www.cta.tech (last visited Oct. 18, 2016). The FAA stated that its projections of market growth could be understated, and that "overall demand for commercial UAS will soar once regulations more easily enable beyond-visual-line-of-sight (BLOS) operations and operations of multiple UAS by a single pilot." *Id.* at 33. Beyond consumer and recreational drones, the commercial sectors with the most investment in commercial sUAS are industrial inspection, real estate and aerial photography, agriculture, and insurance. *See id.* 32–33.

The growth in sUAS use by individuals, businesses, and public agencies has fueled significant media and regulatory attention, raising concerns about safety and privacy, and leading to calls for new rules and regulations. At the same time, unmanned aircraft are of increasing commercial importance. They are used to inspect agriculture, pipelines, power lines, and wind turbines; industrial, production, and construction sites, and highways and bridges; to make movies; and to sell, inspect, and insure real estate. Universities are interested in sUAS for environmental research and monitoring. Press Release, University of Nebraska-Lincoln, Drone Use for Environmental Monitoring Studied in Great Plains Research (Apr. 23, 2015), http://newsroom.unl.edu (last visited Oct. 18, 2016). News agencies are replacing expensive helicopters with sUAS. Luke Jones, *In Arkansas, Drones Take Place of News Choppers*, Arkansas Business (Apr. 21, 2014, 12:00 AM), http://www.arkansasbusiness.com/ (requiring subscription). The benefits to disaster relief and search-and-rescue operations are obvious.

On June 21, 2016, the Federal Aviation Administration (FAA) finally issued its long-awaited set of rules for civil sUAS. Those regulations, titled Operation and Certification of Small Unmanned Aircraft Systems, and codified at 14 C.F.R. §107 *et seq.* (Part 107), set forth rules for pilot certification and civil (commercial) sUAS operations, but they do not impose any airworthiness or certification requirements on manufacturers of sUAS. Nevertheless, the 624-page comment and rulemaking and a concurrently issued advisory circular contain important guidance for operators and manufacturers of sUAS.

## Development of Commercial Drone Regulations

Before 2005, the FAA did not pay much attention to drones. In 2005, the FAA issued a memorandum introducing the term "unmanned aircraft" to the FAA's public policy lexicon, and defining it as "a device that is used or intended to be used for flight in the air that has no onboard pilot… UA is an aircraft as defined in 14 C.F.R. 1.1." FAA Mem., Unmanned Aircraft Systems Operations in the U.S. National Airspace System–Interim Operational Approval Guidance, AFS-400, UAS Policy 05-01 (Sept. 16, 2015). The memorandum noted that prospective commercial drone operators could not operate under the 1981 advisory circular applicable only to recreational model aircraft, could not obtain a waiver of Federal Aviation Regulations, and would be required to follow the standard airworthiness certification process." *See* FAA Advisory Circular 91-57, Model Aircraft Operating Standards (June 9, 1981).

In 2007 the FAA issued a notice clarifying its policy concerning operations of civil (commercial), public (government), and recreational (consumer) unmanned aircraft. Unmanned Aircraft Operations in the National Airspace System, 72 Fed. Reg. 6689 (Feb. 13, 2007). The notice clarified that no person would be permitted to operate a drone without specific authority. For prospective commercial drone operators, that authority would arise only through a special airworthiness certificate in the experimental category, which is limited to an extremely narrow scope of applications. In addition, "UAS issued experimental certificates may not be used for compensation or hire." *See id.* Consequently, the 2007 effectively banned commercial sUAS operations.

## The FAA Modernization and Reform Act of 2012

The FAA Modernization and Reform Act of 2012 (FMRA) directed the FAA to "develop a comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the National Airspace System." *See* FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, 126. Stat. 11, §332(a)(1). The National Airspace System (NAS) is "the common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material. Included are system components shared jointly with the military." Pilot/Controller Glossary (Dec. 10, 2015), *available at* http://www.faa.gov. The plan would establish "standards for operation and certification of" civil sUAS that also ensure sense-and-avoid capability, as well as standards and requirements for sUAS pilots. Although the process was supposed to have been completed by September 30, 2015, the FAA finally issued its proposed rules for commercial sUAS in February 2015, which as amended are now codified at Part 107.

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Many Federal Aviation Regulations, designed to apply to manned aircraft, have no application to drones. Consequently, and in accordance with FMRA Section 333, upon petition under 14 C.F.R. Part 11, the FAA has issued exemptions to Federal Aviation Regulation compliance to permit commercial operations of sUAS. These exemptions allow operators to avoid compliance with regulations regarding aircraft and airworthiness

certifications, pilot certifications, and operational requirements that otherwise apply to manned aircraft. In conjunction with approvals of such petitions, the FAA ordinarily also placed operational limitations on sUAS consistent with the 2015 proposed rules.

Section 333 also outlined operational restrictions, the most prevalent being restrictions concerning operations around non-participating persons and structures. However, before Part 107 was issued, the FAA had been gradually loosening restrictions on commercial sUAS operations around and over people, eventually arriving at four standardized exemption rules governing operations around people. *See, e.g.*, *In re Brim Equipment Leasing, Inc.*, Docket No. FAA-2015-5897, Exemption No. 15392, at 7 (Mar. 16, 2016) (setting forth four standardized categories of proximity to people and structures rules: (1) "Over or near people directly participating in the operation"—no restriction; (2) "Near but not over people directly participating in the intended purpose"—requires briefing, consent and filing a plan; (3) "Near nonparticipating persons"—requires protective barriers; and (4) "Near vessels, vehicles and structures"—requires prior permission). In addition, Section 333 exemptions typically limited commercial operators to daylight operations. In April 2016 the FAA granted a Section 333 exemption permitting night sUAS operations subject to numerous requirements and restrictions, including requiring the operator to have at minimum a private pilot license, a current medical certificate, lighted take-off and landing areas, and anti-collision lighting on the aircraft. *In re Industrial Skyworks (USA), Inc.*, Docket No. FAA–2014–1060, Exemption No. 16341 (Apr. 18, 2016). *See also* Federal Aviation Administration Rule 8900.1, Vol. 16, Ch. 5, §3(7)(I)(2) (setting forth general operating requirements for sUAS, noting that "[n]ight operations may be considered if the operator/applicant provides a safety case and sufficient mitigation to avoid collision hazards at night." ).

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The trend toward easing restrictions under Section 333 exemptions carries over into Part 107. For example, and as discussed below, operations over non-participating, unprotected people and operations at night are still prohibited, but Part 107 allows waivers of these and other operating restrictions that may inhibit commercial sUAS use.

Part 107 may not entirely substitute for Section 333 exemptions. Derived from the defunct FAA Reauthorization Act, the FAA Extension, Safety, and Security Act of 2016 (FESSA) seeks to promote and reduce barriers to the use of commercial sUAS in areas perceived to have the greatest public benefit. FAA Extension, Safety, and Security Act of 2016, Pub. L. 114-190, 130 Stat. 615 (July 15, 2016). FESSA requires the FAA to create guidelines and procedures for granting emergency exemptions for civil or public operations of sUAS in response to disasters, search and rescue, firefighting and utility, and infrastructure restoration efforts. *Id.* §2207. FESSA directs the FAA to create explicit "safety requirements," including specifically for beyond-visual-line-of-sight and night operations. *See id.* FESSA also requires streamlined approvals under Section 333 (not Part 107) for beyond-visual-line-of-sight and nighttime sUAS operations in conjunction with inspections, repair and protection of critical infrastructure, including pipelines, oil and gas facilities, and electrical energy infrastructure. *Id.* §2210.

## Drone Operations After Federal Aviation Regulation Part 107

As noted, the FAA's long-awaited set of rules for civil sUAS are known as Part 107. Part 107 came into effect on August 29, 2016, and established rules for pilot certification and civil (commercial) sUAS operations. Part 107 is expected to have a "significant positive economic impact because it enables new businesses to operate small UAS for hire and will stimulate a manufacturing support industry." Operation and Certification of Small Unmanned Aircraft Systems, 81 Fed. Reg. 42,064, 42,203 (June 28, 2016).

### General Rules

Part 107 allows commercial operations of a registered sUAS in the National Airspace System by or under the supervision of a remote pilot in command (RPIC), subject to certain operational and vehicle limitations. Equipment requirements are few, and there are no airworthiness standards. Drones subject to this rule continue to be limited to those weighing less than 55 pounds fully loaded at take-off. 14 C.F.R. §107.3. The only explicit equipment requirement relates to anti-collision lights if the aircraft is to be operated in low-light (civil twilight) conditions. 14 C.F.R. §107.29.

Part 107 restricts sUAS flights to a 100 mph maximum speed limit, an altitude limit of 400 feet above the ground or above of a structure. 14 C.F.R. §107.51. Minimum flight visibility as observed from the sUAS control station is three statute miles, and the aircraft must be operated no closer than 500 feet below and 2,000 feet horizontal distance from cloud level. *Id.* The FAA decided against imposing a fixed operational boundary around airports in favor of simply prohibiting operations of sUAS in certain airspace designated for an airport without prior authorization from the local air traffic control. 14 C.F.R. §107.41. The rule otherwise allows sUAS operations around airports provided they do not interfere with "operations and traffic patterns at any airport, heliport, or seaplane base." 14 C.F.R. §107.43.

### Operations Over People

sUAS may not be operated over people not participating in the operation unless they are under a structure or within a stationary vehicle, significantly relaxing the 500-foot buffer zone between drone operation and non-participating persons that the FAA often imposed in Section 333 exemptions. 14 C.F.R. §107.39. The FAA agreed with advocates of performance-based criteria that

a "performance-based set of operational mitigations may be appropriate" for certain sUAS that may allow less restricted operations over people. 81 Fed. Reg. 42,064, 42,125. However, the FAA noted that "mechanical reliability issues" that might otherwise be addressed by an airworthiness certification or a more extensive maintenance process drive the risk calculus. *Id.* Because of the limited reported operational history, the "FAA has no data establishing how that risk could be mitigated through operational constraints (whether performance-based or otherwise), other than a prohibition on flight over people." *Id.* As discussed further below, the Part 107 waiver process may allow less restricted operations over people, and the FAA expects to develop data sets from that experience to inform future rulemaking. *Id.*

**Beyond Visual Line of Sight**

The comments to Part 107 indicate significant debate regarding the proposed rule to restrict sUAS operations to visual line of sight, or enable operations beyond visual line of sight through mandated equipment requirements. FMRA Section 332 directed the FAA to develop rules that will "ensure that any civil unmanned aircraft system includes a sense-and-avoid capability." FAA Modernization and Reform Act §332(a)(2). "Sense-and-avoid capability" means "the capability of an unmanned aircraft to remain a safe distance from and to avoid collisions with other airborne aircraft." *Id.* §331(5).

Many stakeholders lobbied for a rule permitting the use of first-person view technology to satisfy the "sense-and-avoid" rule. First-person view (FPV) works by transmitting video feed from the drone's on-board camera, or cameras, to the RPIC's ground control station or to a wearable display or goggles. The FAA rejected the proposal because it "does not have validated data to indicate whether FPV can be used to safely conduct operations beyond visual line of sight and if so, what FPV performance specifications are required to support those operations." 81 Fed. Reg. 42,064, 42,093. In addition, "FPV cameras have technical limitations and the FAA does not possess the data necessary to support a regulatory standard at this time." *Id.*

Consequently, at least until the FAA obtains further data, Part 107 provides that a drone must be kept within the visual line of sight of the RPIC and the person manipulating the flight controls, or within visual line of site of an assistive visual observer. 14 C.F.R. §107.31. The rule clarifies its purpose by mandating that the RPIC or operator not only know where the drone is, but also be able to determine the aircraft's attitude, altitude, and direction of flight and be able to observe the surrounding airspace to avoid hazards and determine that the flight does not "endanger the life or property of another." *Id.* In other words, the RPIC or operator may not rely upon on-board technology to substitute for the visual acumen of the operator on the ground. Indeed, the FAA's summary of the major provisions of Part 107 notes that a "first person view camera cannot satisfy [the] 'see-and-avoid' requirement but can be used as long as [the] requirement is satisfied in other ways." 81 Fed. Reg. 42,064, 42,201.

**Part 107 Waivers**

One of the "other ways" to satisfy the sense-and-avoid requirement is through a Part 107 waiver. Sections 107.200 and 107.205 open the door to first-person view technology by giving the FAA discretion to waive the "see-and-avoid" requirement and Section 107.31 for sUAS operations other than cargo delivery. *See* 14 C.F.R. §§107.200, 107.205. However, applicants for a Part 107 waiver will need to demonstrate that the sUAS operation can be conducted safely beyond visual line of sight under the proposed conditions and employing the proposed technology.

To get there, applicants will be required to set forth a "complete description of the proposed operation and justification that establishes that the operation can safely be conducted." 14 C.F.R. §107.200. The justification may depend on supporting data and documentation "that establishes that the proposed operation can safety be conducted under the terms of a certificate of waiver." 81 Fed. Reg. 42,064, 42,206 The FAA "expects that the amount of data and analysis required as part of the application will be proportional to the specific relief that is requested." *Id.* at 42,072. This is in keeping with the FAA's approach of integrating lower-risk sUAS operations into the National Airspace System to provide experience and data that supports later integration of higher-risk sUAS operations. *Id.* at 42,071. As more data become available regarding technology and operating procedures, the FAA indicated that it may consider categories of sUAS that may make beyond-visual-line-of-sight operation feasible without a waiver. *Id.* at 42,072.

Deviations are limited by Section 107.205, which specifies the rules that are subject to waiver. Waivable rules include those prohibiting operations from a moving vehicle, restricting operations to daylight only, requiring visual line of sight, limiting a visual observer, prohibiting a single operator from operating multiple vehicles, requiring operators yield right of way to all other aircraft, limiting operations over people, imposing airspace restrictions, and other rules imposing operation limitations such as speed and altitude restrictions. *See id.* The extent to which a deviation request will be granted—and the time that it takes to process the application—will depend on the level of risk that the proposed operation presents to the National Airspace System and persons and property on the ground. Another important factor will be the nature of the activity, including whether it implicates "critical infrastructure" as set forth in FESSA, and whether the proposed operation presents an oppor-

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tunity to reduce human risk in the absence of the operation.

Another factor in a decision to waive an operational rule may include the specific sUAS proposed for use during the operation. Although the FAA may not at least initially consider "blanket" equipment-specific authorizations or waivers for a given operation as it began doing under the Section 333 exemption process, the FAA may find a level of administrative ease with Part 107 waivers when certain types of proposed operations will use the same makes and models of unmanned aircraft. *See, e.g.*, *In re Brim Equipment Leasing, Inc.*, Docket No. FAA-2015-5897, Exemption No. 15392 (2016). The FAA reiterated, however, that equipment-specific authorizations and manufacturer self-certification for certain waivable activities will have to wait for future rulemaking. 81 Fed. Reg. 42,064 42072.

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### Commercial Delivery Operations

Part 107 puts the brakes on commercial transportation operations, for the time being. Part 107 implicitly allows commercial transport operations, provided that an aircraft weighs less than 55 pounds fully loaded at take-off, does not carry hazardous materials, and the dropping of an object from the aircraft does not create an "undue hazard to persons or property" below. 14 C.F.R. §§107.23(b), 107.36. However, Section 107.1 notes that Part 107 does not apply to air carrier operations. *See also* 49 U.S.C. §40102(a)(2). Consequently, Part 107 commercial carriage operations must remain wholly intra-state to avoid implicating the stricter regulations applicable to air carriers. In any event, Section 107.205 practically limits commercial package delivery by disallowing waiver of the visual-line-of-sight rule. *See* 14 C.F.R.§107.205(c). The FAA set this rule knowing that it in effect limits commercial package delivery operations to about one mile from the RPIC. 81 Fed. Reg. 42,064, 42,076. Moreover, Section 107.25 prohibits sUAS operations from a moving land or water-borne vehicle, effectively preventing commercial operators from "extending" delivery operations beyond the implied one-mile scope of operation. 14 C.F.R. §107.25.

### Operator Requirements

The FAA recognized that while "airman certification requirements are necessary for manned aircraft operations, they impose an unnecessary burden" on sUAS operators. 81 Fed. Reg. 42,064, 42,069. Much of the aeronautical experience and flight training under Part 61 is simply not applicable to sUAS operations, which is most evident with respect to issues unique to sUAS operations, such as sense and avoid and loss of positive control.

Consequently, Part 107 requires that a person operating an sUAS must either hold a remote-pilot airman certificate with an sUAS rating or be under the direct supervision of a certificated person. 14 C.F.R. §107.12. To get the certificate, prospective RPICs are required to be at least 16 years old, understand English, be vetted by the Transportation Security Administration (TSA), and pass an aeronautical knowledge test. *See* 14 C.F.R.§107.61. Pilots holding a current Part 61 pilot certificate are exempt from the aeronautical knowledge test and the TSA vetting, but will be required take a short online training course specific to sUAS. 14 C.F.R. §107.63.

There is no performance test, and the general test is not specific to any particular type of sUAS. However, the test includes sections on loading and performance generally, determining vehicle performance, and "maintenance and preflight inspection procedures." 14 C.F.R.§107.73. The FAA noted that "the addition of maintenance and inspection knowledge test topics will consist of small UAS basic maintenance and inspection knowledge that is common to all small UAS regardless of complexity." 81 Fed. Reg. at 42,168. The FAA suggests (but does not mandate) that maintenance and inspection best practices would include, among other things, inspecting for structural cracking, delamination, leaks, evidence of electrical shorts, changes in vehicle sounds, control input problems, and diminishing flight times. *See* FAA Advisory Circular 107-2, app. C (2016).

The RPIC is ultimately responsible for ensuring that the sUAS is in safe operating condition. 14 C.F.R. §107.15. That also means ensuring that "all control links between ground control station and the small unmanned aircraft are working properly," there is sufficient power available for the duration of the flight, and any object attached or carried by the vehicle is secure and "does not adversely affect the flight characteristics or controllability of the aircraft." 14 C.F.R.§107.49. Although the FAA has not imposed any requirements upon sUAS manufacturers, vehicle and component manufacturers recognize that operators will increasingly rely on them to provide information that will allow RPICs to comply with Part 107. Indeed, "while the FAA will not mandate that manufacturers provide instructions to determine if the aircraft is in a condition for safe operation, the agency encourages this practice." 81 Fed. Reg. 42,064, 42,182. This will include information about maintenance and inspection, loading, vehicle performance, and preflight inspection requirements.

Although there was a significant push by some commentators to impose requirements upon manufacturers to provide detailed inspection and maintenance information and checklists, Part 107 places the burden of ensuring that the UA is in safe operating condition solely upon the remote pilot in command. *See id.* at 42,152. In its rulemaking, the FAA noted that manufacturer-developed manuals, checklists, and instructions can provide guidance about how to maintain sUAS in safe operating condition, but such guidance may not contain the only or even the best methods for an RPIC to meet the rule. Instead, the RPIC is responsible for adopting a maintenance and inspection program that may rely upon, or incorporate, the manufacturer's recommendations, the FAA's best practices checklist, and ASTM or the Academy of Model Aero-

nautics standards. *Id.* at 42,152–153. *See, e.g.*, ASTM 2909, setting forth a standard practice for the maintenance and continued airworthiness of sUAS.

Advisory Circular 107-2 also recommends that sUAS owners and operators keep a record of any repair, modification, overhaul, or replacement of a system component, which should include the time in service for the component. FAA Advisory Circular 107-2, at 7-4. As Advisory Circular 107-2 notes, this record will be important evidence in analyzing any UA system failure events. Nevertheless, the FAA decided not to incorporate record-keeping requirements into Part 107 due to the likely significant cost and burden that it would impose on owners and operators without a clear benefit. 81 Fed. Reg. 42,064, 42,151. Indeed, manufacturers and owners and operators will also take notice that Part 107 does not impose Part 43-style maintenance rules, but the FAA "encourages the use of certificated maintenance providers." *Id.*

The FAA recommends that a preflight inspection "should be conducted in accordance with the sUAS manufacturer's inspection procedure when available (usually found in the manufacturer's owner and maintenance manual) and/or an inspection procedure developed by the sUAS owner or operator." FAA Advisory Circular 107-2, at 7. Even if an sUAS manufacturer includes a preflight inspection checklist with the sale of the machine, the FAA recommends that RPICs incorporate a 21-item best practices checklist into their preflight inspection routine. *See id.* at 7-2 and 7-3.

With respect to sUAS performance limitations, Advisory Circular 107-2 encourages manufacturers to provide "operational and performance information that contains the operational performance data for the aircraft such as data pertaining to takeoff, climb, range, endurance, descent, and landing." *See id.* at B-1. Understanding this information is important for the RPIC "to be able to make practical use of the aircraft's capabilities and limitations," which is essential for safe and efficient operation. *Id.* Consequently, although the FAA is not requiring manufacturers to publish standardized performance data, including such information with operation manuals will make it easier for RPICs to comply with Part 107, and it may reduce RPIC reliance on potentially unreliable or outdated information from third parties.

sUAS manufacturers should review owner and operational manuals to ensure that operation instructions, performance limitations, and maintenance and inspection recommendations, if provided, adequately describe how to determine whether the vehicle is in safe operating condition.

**Design, Equipage, and Airworthiness**

The FAA recognized early that "it is not practically feasible for many small UAS manufacturers to go through the certification process required of manned aircraft." Operation and Certification of Small Unmanned Aircraft Systems, 80 Fed. Reg. 9544, 9549 (Feb. 23, 2015). By the time that an airworthiness certification process is complete, within three to five years, the vehicle would likely be technologically outdated. As a result, Part 107 does not impose any sUAS airworthiness certification requirements upon manufacturers.

Part 107, however, does impose an "airworthiness" requirement in that it requires the RPIC to ensure that the sUAS is in a safe operating condition—but only the RPIC can make that determination because the sUAS may have been damaged after the vehicle left the manufacturer. 81 Fed. Reg. 42,064, 42,072. The FAA offered that "safe operation" relates to mechanical reliability predicated on the overall condition of the sUAS. The RPIC must conduct that evaluation "based on the make, model, age, type and completeness of continued maintenance and inspections" of the sUAS. *Id.* at 42,151. But that does not mean that the FAA will not continue to consider airworthiness certification programs from a design and manufacturing perspective. Indeed, "the FAA encourages industry organizations to set voluntary standards for small UAS to further develop the industry." *Id.* at 42,138.

The FAA considered but rejected suggested design and equipage requirements, including, among others, requiring that sUAS incorporate sense-and-avoid technologies, geofencing software, flight termination software, lighting and conspicuity, electronic identification, communication, and power and fuel reserve capacity. Drone manufacturers and suppliers, depending on the make and model, voluntary equip sUAS with technologies to "sense and avoid" objects, automatically prevent entering restricted airspace, and automatically return to the RPIC in the event of a low battery, low fuel, or a loss of control link.

However, mandating some of these technologies would require a costly airworthiness certification process to ensure reliability or to impose replacement costs for sUAS not capable of being retrofitted with the technology. Other proposed technologies impose prohibitive weight, power, and cost burdens in excess of their comparative benefits. The FAA noted that the "risk associated with certain small UAS operations can be mitigated through operational restrictions without any equipage requirements." 81 Fed. Reg. 42,064, 42,110. Thus, the only equipage requirement for sUAS is anti-collision lighting for operations in civil twilight. 14 C.F.R. §107.29.

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Arising out of concerns about sUAS interfering with manned aircraft, Section 2202 of FESSA directs the FAA to work with stakeholders to develop "consensus standards" for remotely identifying operators and owners of sUAS and the aircraft itself. *See* FAA Extension Safety and Security Act of 2016, Public Law 114-190, 130 Stat. 615, §2202. Consequently, the FAA may be forced to revisit the idea of mandating transponder technology for certain sUAS.

Consistent with its incremental approach to rulemaking for sUAS, and recognizing that technological advancement would likely render technology-mandates obsolete and slow technology development, the FAA indicated that these technologies are test beds for data collection at this point. However, the FAA also stated that it may consider these technologies in conjunction

with requests for waivers from some Part 107 operational restrictions:

> This waiver process is intended to allow for case-specific mitigations that could take many different forms or combinations. These mitigations could even be based on technology that does not exist at this time. Because prescriptive requirements imposed on the waiver process as part of this rulemaking may limit the FAA's flexibility to consider new or unique operational circumstances and safety mitigations, the FAA declines to add more prescriptive requirements to this process.

81 Fed. Reg. 42,064, 42,073.

For example, commentators noted that the development of technologies consistent with emerging industry-developed consensus standards in conjunction with ASTM to ensure reliability would significantly mitigate risks involved in operations over people. *See, e.g.*, ASTM F2910-14, Standard Specification for Design and Construction of a Small Unmanned Aircraft System (sUAS) (ASTM International, 2014) (establishing design, construction, and test requirements for a sUAS); ASTM F2911-14e1, Standard Practice for Production Acceptance of Small Unmanned Aircraft System (sUAS) (ASTM International, 2014) (defining production acceptance requirements for a sUAS); ASTM F3003-14, Standard Specification for Quality Assurance of a Small Unmanned Aircraft System (sUAS) (ASTM International, 2014) (establishing quality assurance requirements for the design, manufacture, and production of a sUAS). The FAA suggested that manufacturer compliance with this "airworthiness standard" could form the backbone of an airworthiness certification, which it would consider "as mitigation to support an application for waiver that would allow a small unmanned aircraft to operate over unprotected non-participants." 81 Fed. Reg. 42, 064, 42,126. The FAA has made clear that future rulemaking may account for technology advancements as more data becomes available.

## Instructions, Manuals, Operational Guidelines, and Statements

sUAS manufacturers should be sure that written instructions, manuals, and operational guidelines are consistent with Part 107 and Advisory Circular 107-2. Manufacturers will be challenged to incorporate instructions, operational guidelines, and warnings that are both specific enough to satisfy the rules and adequately inform of safety risks and generic enough to avoid misrepresenting the unmanned aircraft operational margins and capabilities.

In addition, FESSA introduces a new "safety statement" requirement to take effect within the next year. *See* FAA Extension Safety and Security Act of 2016 §2203. The statement will be required to include (1) information about, and sources of, laws and regulations that are applicable to sUAS; (2) recommendations for using sUAS in a manner that promotes the safety of persons and property; (3) the date that the safety statement was created or last modified; and (4) language approved by the FAA regarding the legal distinction between model aircraft operations and all other sUAS operations, including a statement about the potential civil penalties for breaking the rules. *See id.* sUAS manufacturers will be subject to a civil penalty for failing to include this "statement" with the sale or distribution of their sUAS. It remains to be seen whether the FAA introduces guidance on the language to be used for complete compliance with the rule, or just for Section D.

## Looking Ahead

The now-defunct Federal Aviation Administration Reauthorization Act of 2016 (FAARA), as amended and passed by the Senate in April 2016, sought to impose "risk-based consensus safety standards" for small unmanned aircraft systems. Federal Aviation Administration Reauthorization Act of 2016, H.R. 636, Title II, Section 2126 (114th Congress, April 19, 2016). Under the proposed rule, the FAA would work with other government agencies and industry groups to set "airworthiness standards related to the safe integration of small unmanned aircraft systems into the National Airspace System." *Id.* These standards would consider technologies or standards related to geographic and altitude restrictions, as well as sense-and-avoid capabilities, return-home capability in the event of communication problems, detectability and identifiability, and other mechanisms that would promote aviation safety. *Id.* §2124. Once these standards are in place, the bill directed the FAA to establish a process for approval of small UAS makes and models without requiring type certification. The bill's requirements would all but end the nascent home-built small UAS industry by making submission of operating instructions, a manufacturer statement of compliance (discussed below), and an FAA aircraft inspection prerequisite to FAA approval.

FAARA sought to establish numerous rules for sUAS manufacturers, many of which constituted traps for the unwary. To obtain FAA approval without having to go through a cumbersome type-certification process, a manufacturer would have to submit a "statement of compliance" attesting that a vehicle "conforms to the manufacturer's design data, using the manufacturer's quality assurance system that meets the identified consensus standard" and is manufactured in a way that "ensures consistency in the production process" so that every unit produced meets the safety standards. *See id.* And not only must the manufacturer make available to "any interested person" the vehicle's operating instructions and maintenance and inspection procedures, the manufacturer must have a process to identify and correct ongoing safety issues, and allow the FAA to inspect its facilities. *See id.* The bill would have made it unlawful to sell sUAS that have not been FAA-approved. sUAS manufacturers should expect that variations of these proposed "safety standards" will continue to be considered for statutory implementation.

Risk-based performance and safety standards will likely be introduced with new rules regarding micro-UAS operations (sUAS under 4.4 pounds). *See, e.g.*, Micro Unmanned Aircraft Systems Aviation Rulemaking Committee (ARC), ARC Recommendations: Final Report 4 (Apr. 1, 2016), *available at* http://www.suasnews.com.

As sUAS-deployable technology matures and more uniform performance standards emerge, the FAA is expected to introduce rules gradually that set higher design and performance standards for commercial sUAS operated in certain environments, such as in closer proximity to persons or

**sUAS**, continued on page 99

**sUAS**, from page 50
manned flight operations, under certain operating methods, such as beyond visual line of sight, and under certain operating conditions, such as during emergency situations, night operations, or operations using multiple sUAS.

Although not binding, the FAA's comments to Part 107 and Advisory Circular 107-02 should be considered by manufacturers in the design, testing, manufacture, and labeling of drones and their accompanying literature. The guidance also directs manufacturers to other sources, including ASTM and the Academy of Model Aeronautics. These sources, to the extent that they set forth applicable industry standards, are often used as guideposts when considering the applicable standard of care for manufactures in the design, testing, manufacture, and labeling of products and literature. The "standards" considered in FAARA may also be considered by sUAS manufacturers as a roadmap for the kinds of issues that may be considered by juries in determining whether an sUAS manufacturer met an applicable standard of care in the design, manufacture, testing, distribution, and warnings of a particular sUAS.

## Conclusion

Part 107 finally opened the door to significant commercial drone applications and provides hints of things to come. Today the regulations focus responsibility on the owner and operator and the RPIC of the sUAS, while the comments only suggest ways that drone manufacturers may help RPICs comply with those regulations. Even though Part 107 sets no airworthiness standards, the FAA's comments suggest that manufacturer compliance with the applicable standards related to airworthiness may be considered in Part 107 waivers. And both Congress and the FAA are pointed in the direction of performance and safety standards for certain commercial drone operations. While work on these rules continues, and data sets from Part 107 operations are collected, manufacturers should be sure to review their practices and procedures for consistency with emerging standards while ensuring that their products and materials are consistent with Part 107 and Advisory Circular 107-2. FD