industry

STORY BY LINDSEY MCFARREN

McDonald's delivered by unmanned aircraft systems. Electric vertical takeoff and landing aircraft operating in an urban air mobility model to fly passengers from point to point within crowded cities, cutting ground traffic significantly.

If someone told you four years ago that we'd see these evolutions in the aviation industry in our lifetime, you would have laughed. What a difference a few years makes! Not only is eVTOL technology progressing at an incredible pace, but UAS cargo delivery is already occurring.

Pizza is delivered by UAS in New Zealand. AEDs are delivered by UAS to medical emergencies in Reno, Nevada. And with each step of forward progress in the UAS sector, eVTOL manufacturers and operating partners are gearing up to make UAM a reality.

With technology spooling up, how do we evolve operationally to be ready to launch when the technology reaches maturity? Many areas must be addressed from regulatory and practical implementation standpoints.

The Federal Aviation Administration's response to a recent petition for exemption provides some insight into how the agency will handle future eVTOL operations. The FAA may grant an exemption from certain regulations if the petitioner demonstrates an equivalent level of safety. Wing Aviation (a Google company) intends to conduct UAS package delivery under Part 135 and petitioned for exemptions from a number of regulations in Parts 43, 91, 119 and 135.

What lessons can be learned from that exemption petition and the FAA's response?

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Maintenance

Aircraft manufacturers typically draft a maintenance and inspection program while developing and certificating a new aircraft. The same will apply to eVTOL operators as many Part 135 operators default to the manufacturer's maintenance and inspection requirements.

Part 135 outlines two paths for maintenance and inspection requirements. 135.411(a)(1) dictates requirements for aircraft with nine or fewer passenger seats. It includes a few Part 135 requirements but mostly points certificate holders back to Parts 43 and 119. 135.411(a)(2) dictates requirements for aircraft with 10 or more passenger seats, including among other mandates, a continuous airworthiness maintenance program.

Wing requested a number of exemptions from the maintenance requirements in Part 135, including the requirements for submission of service difficulty reports and mechanical interruption summaries to the FAA. These requests were denied.

Wing also requested exemptions from certain qualifications of maintenance and inspection personnel. For example, 119.69(a) requires a director of maintenance to hold a mechanic certificate with airframe and powerplant ratings. Wing sought relief from the requirement for a mechanic certificate. The FAA indicated it is open to considering nontraditional qualifications and experience requirements for the

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director of maintenance but advised 119.71 allows the agency to waive experience requirements – not certificate requirements.

Wing also seemed to question the need for mechanic certification with airframe and powerplant ratings or repairman certification for certain maintenance functions. Although the details of Wing's final maintenance requirements will be outlined in its general maintenance manual and manufacturer maintenance and inspection information, the FAA reiterated that "persons performing maintenance must at least hold an appropriate certification for the performance of maintenance as specified in 43.3, such as an airframe and powerplant or repairman certificate."

The FAA's response to the Wing exemption request indicates the agency expects new entrants, including those utilizing new technology, to the Part 135 space to model their maintenance functions and personnel qualifications in accordance with most existing regulations.

Airman Certification

What will airman qualification and training requirements look like?

Airman certification and qualification might be relatively easy to address in the initial phases of eVTOL and UAM, but when emerging technologies in autonomous flight become viable, new questions will be raised regarding airman certification. Will operators or monitors of autonomous aircraft be required to hold commercial pilot certificates? Where will these airmen come from in an age of increasing workforce challenges in aviation? Even before autonomous flight, what qualifies a pilot to use and monitor all-new propulsion systems, powered by electricity?

Current Part 135 requirements mandate a commercial-rated pilot have at least 500 hours of time as a pilot, including at least 100 hours of cross-country flight time. The FAA approved an exemption for Wing Aviation's pilot qualifications, indicating some exceptions to this requirement may be appropriate, but maintained the requirement for a commercial pilot certificate. Further, it's unlikely major exceptions to pilot experience will be made to passenger-carrying operations.

Part 135 regulations regarding pilot training are fairly general, but the related inspector guidance is extremely prescriptive. Wing Aviation applied for a single-pilot Part 135 certificate. As such, the company was not required to produce for FAA approval or implement a formal training program. This leaves a lot of questions regarding airman training unasked and unresolved.

The implementation of night vision goggles demonstrates one way to address airman qualification in new technologies. An endorsement is required to use NVG under Part 91. That endorsement can be waived if a pilot completes an appropriate check under Part 135 and the Part 135 operator holds an operations specification for NVG use under Part 135. It's possible airman qualifications in eVTOL technology could be addressed in a similar manner.

Business Models

The majority of UAM business enterprises currently being discussed will be flown under Part 135. Many of the UAM models will necessitate per-seat sale of tickets. Traditionally, Part 135 charter involves the sale of use of the entire aircraft, not single seats. In fact, per-seat on-demand business models face some regulatory hurdles – not only with the FAA but also with the Department of Transportation – because on-demand air charter operators are not typically permitted to operate on a schedule.

A schedule is set if the operator determines three factors: date/time of flight, departure location, and arrival location.

Self-aggregation, in which customers essentially set the schedule, may be a way for the operator to avoid setting a schedule. Think of the UberPool function of the Uber app. A passenger requests a ride at a particular time to a specific destination. If another passenger happens to need a ride at the same time to a similar location, the app puts these riders together and the ride occurs. That's a quick look at self-aggregation. However, the DOT recently published regulations regarding air charter brokering, and in the preamble of that rule, expressly declined to comment on legality of self-aggregation.

UAM operators will need to explore some creative options with the FAA and DOT to legally conduct per-seat on-demand operations.

Part 119 management personnel

Part 119 sets specific experience requirements and qualifications for the director of operations, director of maintenance, and chief pilot of Part 135 operations.

Do the existing requirements for Part 119 personnel

make sense for eVTOL and UAM operations? Might it make more sense to have managers familiar with electric technology, especially for the maintenance function?

Wing Aviation requested an exemption from certain Part 119 management personnel qualifications. The exemption was denied, with the FAA saying no exemption is required because the regulations allow for deviations. Technically, that is true – §119.71 allows an operator to request a deviation to the experience requirements, which the FAA may approve if the agency finds the person has "comparable experience." However, in reality, it is difficult to get local FAA offices to approve a waiver on management personnel qualifications.

This is one area that should be looked at from a higher level with a broader application than individual scenarios, especially considering the workforce challenges much of the aviation industry already faces. It might be more appropriate for management personnel – even just the director of maintenance – to have more experience with electric motors and batteries than Part 135 operations.

Air Traffic

Wing Aviation requested a number of exemptions related to airspace and air traffic rules. The FAA declined to approve those exemptions, saying they are not necessary because waivers are permitted by Part 91 and are available through the air traffic system.

It seems untenable for each operator to apply for individual waivers, so as more companies of either UAS or eVTOL aircraft become operational, a longer-term, broader-scope solution is likely needed.

Pilot in command definition

Who or what is the pilot in command? An updated concept of pilot in command and "crew member" will be required for simplified and heavily automated commercial operations, with the pilot in command made up of some combination of an in-aircraft operator (for simplified operations), ground/operations personnel (especially for heavily automated operations), facility personnel, and the vehicle itself.

The Wing Aviation exemption allowed the operator to assign certain responsibilities typically held by the pilot in command to other personnel. Wing Aviation refers to these individuals as visual observers and nest managers. The FAA established certification and training requirements for the pilot in command, visual observers and nest managers, including Part 107 remote pilot certificate for visual observers and nest managers, plus specific training for all three personnel.

One challenge presented by the Wing Aviation exemption is a one aircraft to one pilot ratio. Each aircraft must have a pilot in command who remains the pilot in command for the duration of the flight. In future operational models including autonomous flight technology, a one-to-one ratio is undesirable and would unnecessarily inhibit growth of the industry.

Passenger Compliance

Future operations, especially heavily automated operations with no company employee in the aircraft during the flight and some others, might face challenges ensuring or proving passenger compliance with a number of regulations. Parts 91 and 135 both require passengers to comply with a number of requirements. A few of these include prohibitions on carrying narcotics, dropping items from the aircraft, and carriage of intoxicated passengers. Parts 91 and 135 also address passenger requirements regarding use of seat belts and child restraint systems.

Part 121 airline policies and procedures might set a precedent for ensuring passenger compliance. For example, at check-in, passengers must verify they are not carrying hazardous materials or other items, including narcotics and weapons, prior to being issued a boarding pass. This is often done electronically through an app, website or ticket kiosk, but is sometimes done by ticket agent personnel at the airport.

These are only a handful of the operational issues that will need to be addressed prior to fully implementing eVTOL commercial endeavors. The industry, FAA and DOT will have to work together to address these challenges by establishing consensus standards.

Resolutions will likely come in many forms, including individual exemptions, new operations specifications, FAA-approved training programs and ATC waivers. Inspector guidance, as found in the Flight Standards Information System, will undoubtedly need significant revisions to address the operational environment presented by eVTOL aircraft and UAM.

The FAA's willingness to tackle these challenges head-on has been impressive. The Division of Aircraft Certification Service Policy and Innovation, as well as other divisions, are actively participating in conversations with industry to ensure safe implementation of these new technologies.

While resolving these issues will require significant industry and government collaboration, current engagement levels from both sides indicate practical solutions are on the horizon. ❑