

Aviation's Greatest Evolution

By Lindsey McFarren

We are witnessing one of aviation's greatest evolutionary periods. Aside from the Wright Brothers and maybe the beginning of the jet age, this is it. While much of the recent buzz is about the revolutionary Unmanned Aircraft Systems (UAS), electric Vertical Takeoff and Landing (eVTOL) aircraft, and Urban Air Mobility (UAM), some of the technologies and concepts behind eVTOL and UAM have broader implications for the aviation industry and, in fact, are less revolutionary and more evolutionary—a gradual development of aviation, versus a revolution—a sudden or radical change or a paradigm change.

There is no doubt, certain aspects of the technology are cutting edge. But, in many ways, these are the next logical steps for aviation. Some in the traditional segments of aviation wonder how these new technologies and ways of thinking fit in their worlds and others are just disbelieving of the ultimate goals of autonomous flight, fully electric aircraft, and UAM. There also exists a fear, in many traditional sectors, of competition from new technologies. But the models proposed for UAS, VTOL, and UAM don't replace traditional air transportation—they actually enhance it by replacing ground transportation needs.

Consider these areas:

Operational Structure

The UAM model's success may depend on per-seat charter sales. Per-seat, on-demand charter services are a sticky wicket with the Department of Transportation. An operator has to avoid instituting a "schedule" to operate on-demand, meaning the operator cannot establish the departure location, arrival location, and date/time of

departure. That restriction makes it tricky to sell single-seat tickets under an on-demand authority.

That said, every few years, a company comes up with a new and improved business model to sell charter on a per-seat basis. In the early 2000s, DayJet operated a per-seat, on-demand service in Eclipse 500s. DayJet avoided a schedule by using technology to allow passengers to self-aggregate.

Self-aggregation is essentially how Uber's "pool" system works. A passenger requests a ride from A to B, and, if that passenger chooses the "pool" option, Uber's system looks for another pool passenger requesting a similar trip, then pairs those passengers together to save money.

Many people were hopeful the DOT's recent rulemaking regarding air transportation brokers would provide some insight into per-seat, on-demand—especially self-aggregation. Instead, the preamble to the final rule simply said self-aggregation is too subjective to be included in the rulemaking. The DOT will consider self-aggregation models on a case-by-case basis.

Per-seat, on-demand is really a natural progression of the industry. Some operators, like Hyannis Air Service, Inc. (dba Cape Air), have been conducting commuter operations under Part 135 for years. In recent years, more operators have applied for commuter authority and begun scheduled routes, allowing per-seat sales.

Uber Copter recently began operations through HeliFlight in New York, offering short-haul transportation from city locations to major New York-area airports. BLADE Urban Air Mobility, Inc. actually beat Uber to the punch on this one with a similar service using crowd-sourcing to sell seats.

Jet Linx has taken a membership-based approach through its OpenSeat Exchange program. Their new flightsharing app allows Jet Linx clients to share the cost of a flight on a per-seat basis. Similar models were already in use by Wheels Up and XO (previously Vista Global, XO Jet, and JetSmarter).

The move to UAM using VTOL aircraft is not a significant paradigm shift—it's a natural progression of existing models. Although each business and operational model will likely need to work with the FAA and DOT for approval, there will be no need to create fire to make the UAM model work.

Ground Operations

Some UAM operators won't stray far from traditional aviation services for assistance with ground operations. For example, at the 2019 Uber Elevate Summit, Uber announced Signature Flight Support would provide ground service management. Here again, the industry is experiencing an evolution—using a familiar organization with procedures familiar to the aviation industry to support a new form of air transportation.

Hybrid and Electric Technology

Most of the world is trying to limit its reliance on oil, whether for environmental or economic reasons. The aviation industry has spent considerable time focusing on sustainable aviation fuel (SAF). In May 2019, several general aviation manufacturers fueled up on SAF at airports across Europe and the United States to demonstrate the viability of a sustainable alternative to jet fuel.

In the meantime, most of the VTOL designers are focusing on fully electric motors and high-capacity batteries. A few are working on hybrid models, which ultimately result in longer range. If any of the recent trends are revolutionary, then this is it. The progress made in battery technology is incredible. It is a natural progression of automobile electric motors and battery technology and the aviation industry's desire for alternative fuel sources.

Autonomy

The first aircraft autopilot was invented over 100 years ago in 1912. Consider that for a moment. The Wright Brothers flew in Kitty Hawk in 1903 and autopilot was invented less than a decade later.

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EVOLUTION
the gradual development of something, especially from a simple to a more complex form

REVOLUTION
a sudden, radical, or complete change; a change of paradigm



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Since then, technology has continued to lessen the workload on pilots and improve safety. Night vision goggles and enhanced vision systems are increasingly prolific. These too are a natural evolution from existing technology—some of the first night vision devices were used in World

War II. Later, Flight Management Systems (FMS) began showing up in aviation in the late 1980s/early 1990s.

These technologies are natural steps towards autonomous flight. Consider automobile technologies. Years ago, automakers introduced systems to sense stopped or conflict traffic and to produce an alert. Now vehicles can stop themselves if they sense stopped traffic ahead. Vehicles also have self-parking features. A car purchased 10 years ago likely had none of this technology. A back-up camera was the sign of a luxury vehicle or fancy upgrade.

Obviously, automobile technology can advance at a rapid rate because the regulatory barriers are lower. Aircraft technology faces—appropriately—a very high level of scrutiny during the certification process.

That said, the path of automobile technology advancement provides a clear look at where aviation technology can go—first autopilot, then night vision or enhanced vision, then FMS—autonomy is not far off.

We may be a long way from full autonomy in aircraft, but it's not difficult to see it as an eventuality. Public perception and regulator concerns will be the biggest barriers to autonomous flight—not the technology itself. Current UAS operations demonstrate the precise



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autonomy technology available today. The jump to VTOL isn't really much of a jump at all.

Autonomous flight technology will inevitably find its way into more traditional segments of aviation, but not overnight. The progression will probably look more like enhanced vision systems.

Some parts of the media like to make today's aviation advances sound revolutionary—a whole new and possibly scary world. But in reality, these business models and technology advancements are natural progressions over 100 years of flight.

If there is a revolution, then it won't be in the mechanics of UAS, VTOL, and UAM. It will be in their application—the ability to move millions, or billions, of people around the world in a manner that is kinder to the environment, reduces ground congestion, and saves countless hours.

If you work in traditional segments of aviation, then don't be quick to discount these upcoming models and technology. The innovators in UAS, VTOL, and UAM are creating technologies that will benefit the entire aviation industry if we're willing to learn from them. And before long, UAM could have a direct impact on your own quality of life.

Keep an eye on this evolution in the aviation industry. **A**

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