‘FLY IF YOU CAN’

URBAN AIR MOBILITY COULD HELP COMMUTERS GET ABOVE IT ALL, BUT MANY QUESTIONS REMAIN

By Eric Tegler

A year ago, airframers, infrastructure designers, air traffic management developers and regulators came together for Uber’s Elevate summit in Dallas, hailing the idea of urban air mobility and promising that its reality is “closer than you think.”

If true, Uber, which announced that it will begin commercial eVTOL or air taxi flights in 2023, will make history alongside competitors such as Bell, Airbus and Boeing, all of whom displayed their wares or talked about their plans at this year’s Xponential in Chicago.

They’ll only do it, however, if the necessary conditions to facilitate a market which doesn’t exist are in place in four short years. To these must be added public acceptance and public willingness to foot the bill for it to work.

Unmanned Systems spoke with Bell, Boeing and Airbus about the potential and the reality of an urban air taxi market. Is a mass urban air mobility, or UAM, really that close?

Congestion

Attendees at Xponential this year had a chance to go inside Bell’s Nexus concept vehicle, and the company’s website also has videos depicting how it would operate. In one, the viewer is placed inside the air taxi for a night flight. A live local news traffic update plays on a screen in the autonomous vehicle’s center console. City-wide traffic is snarled a newscaster laments. “If you need to be somewhere in a hurry, my advice — fly if you can.”

Wafting above gridlock is appealing. Airbus suggests it will be key to reducing congestion from future urbanization in videos of its own CityAirbus concept. Boeing seizes on the idea too, asserting that “we’re running out of space to build” ground transport infrastructure in an animated video for its NeXt portfolio of mobility concepts, a point that company Chairman, President and CEO Dennis Muilenberg also made from the keynote stage at Xponential.

Airbus’ four-passenger UAM concept, CityAirbus, scheduled to begin full-scale flight testing this year. **Photo: Airbus**

If congestion is the demand signal for urban air taxis, how many of the four-passenger hybrid/electric multi-copters currently being proposed would have to dot city skylines to make an appreciable difference?

Let's consider Dallas, one of several cities where Uber plans to stand-up its on-demand Uber Air service. According to the U.S. Census Bureau, 681,233 people commute by car in the Dallas area every morning. Uber posits a remarkable 200 Uber Air flights per hour. But even that would only take about 6,400 people off the road during an eight-hour day.

"I don't believe you're going to wake up tomorrow and it's going to [look like] the Jetsons or a Star Wars scene," says Steve Nordlund, general manager of Boeing's NeXt division.

The closest thing to an air taxi that Boeing has offered is its Passenger Air Vehicle (PAV), a pure electric combination pusher/quadcopter with a wing, developed by subsidiary, Aurora Flight Sciences. The two-passenger aircraft has thus far hovered autonomously just above the ground.

Airbus is developing a four-passenger eTOL demonstrator called CityAirbus. The eight-rotor, quad-boom, ducted-fan aircraft is envisioned as autonomous and joins Airbus' other single-passenger Vahana demonstrator.

Bell is further along a specific air taxi path with its optionally manned hybrid-electric Nexus. With six ducted tilt rotors and a jet turbine generator feeding six electric motors, Nexus is slated to fly in 2023 and be operational by 2025.

Could a fleet of Nexus aircraft start generating profit for Bell's partner, Uber, that soon? Carey Cannon, chief engineer of innovation for Bell, is hesitant about Uber's vision.

"The hill in front of us is aircraft certification and airspace management. I will say that, to me, the spookiest part of this is the airspace management. I don't know that there's a clear solution yet and that may be the throttling piece of this whole ecosystem."

Airbus agrees that any sort of mass urban air taxi system — which would theoretically share airspace with hordes of small UAS — quickly hits a density roadblock.

"There will be no commercial UAM operations without regulations, regarding the certification of vehicles and flight operations in an urban environment," says Gregor V. Kursell, Airbus head of press, Germany. "We believe that such regulations will not be in place before the second half of the next decade."

He adds that taking to the sky won't relieve congestion on the ground.

"Urban Air Mobility will not make the traffic jam disappear, it is not a replacement for earth bound private or public transport. It is an additional option, which can be significantly faster."

Airbus' single-seat Vahana concept, which had its first full-scale flight test last year. **Photo: Airbus**

Business cases

Among the many questions raised by a future eTOL air taxi market is what constitutes a workable business case?

A number of metrics could apply but one of the most basic is annual flight hours needed for one air taxi to generate sufficient return. Large aerospace firms like Boeing and Airbus have done their own preliminary flight-hour studies. So has Bell.

According to Bell's Cannon, 2,000 hours is "a good round number that most people use in their business case analysis."

Given the 15-minute urban flight segments that most engineers envision, achieving 2,000 hours would require a Nexus to make 8,000 flights a year. That's approximately 22 flights per day, every day, without fail.

For comparison, taxi cabs in Las Vegas make an average of 18.8 trips per 12 hour shift according to a 2017 study. Given the above numbers — and things like recharging, refueling, embarkation, debarkation, security, air traffic, and simple competition — Cannon was asked how a Nexus could achieve 2000 hours per year.

"That's not day one," he says. "I still think it's a great bar for us to set." Cannon adds, "We're not basing our business case on 2,000 hours per aircraft annual flight time," although he declined to say what a minimum would be.

Boeing's Steve Nordlund wouldn't discuss business case metrics. Boeing asserts that technology, economics and safety must converge first. How that will play out and how it affects what sort of aircraft Boeing/Aurora ultimately produce isn't yet known, Nordlund says.

"There are lots of complexities in this. We're putting in some modeling and simulation around some of those problem sets to gather data. That will drive technology requirements … I don't take what we're doing with prototyping and advancing some technologies as the end product."

Many Questions

An end-product air taxi has yet to be fully defined.

Bell's Nexus is a hybrid because battery storage and charging technology have not advanced enough to enable pure eTOL flight. A hybrid — despite Uber's desire for an all-electric solution — gets around such limitations and gives Nexus enough flexibility to perform other potential commercial and military missions, including carrying cargo.

Security is another challenge. Urban takeoff and landing spots for air taxis, called "vertiports," will have to be secured. Would the Transportation Safety Administration do that? Bell suggests that operators such as Uber may be responsible for facility security as well as construction.

Air taxis will almost certainly have pilots to start with. Bell's Nexus has a pilot seat centered in the cabin right in front of the passengers. What if, for whatever reason, a passenger decided to harm the pilot? Cannon concedes it's a valid question and says Nexus may need some sort of airliner-like partition to keep the passengers away from the pilot.

The position, navigation and timing technology (GPS) underpinning it all is neither secure nor environmentally impervious as the U.S. military openly acknowledges. There are questions of micro-weather, air/ground sensors, spectrum allocation, noise and more.

Which consumers?

In recent weeks, two of America's "big four" auditors released their takes on the prospects of urban air mobility. Both conclude that it is likely to be a premium service for a small segment of the population when it emerges.

In a blog for Deloitte ("Elevating The Future of Mobility") the authors note that, "passenger drone operators may have to provision the fleet either by owning or leasing the vehicles, and be directly responsible for the full set of operational requirements, much like the on-demand executive jet market operates today."

A study from KPMG ("The Market for Urban Air Mobility") projects 50 large megacities and mega-regions around the world which could account for 400 million annual passenger enplanements by 2050. KPMG notes that cost pressure on the UAM market will continue to mount from increasingly cheaper ground transportation including autonomous transport. The study is summed up by a call to "deliver an 'affordable speed' promise to high-income and business populations."

Airbus essentially shares this view, says Kursell.

"We want to offer vehicles which are cheaper in acquisition and operation [life cycle costs] than a classical helicopter. An 'air taxi' will be more expensive than the cost of a classic cab, especially in the beginning. We believe that there is a group of people — business travelers — who would be willing to pay that price in order to get to their destinations quickly.

"Some manufacturers give very ambitious timelines," he says. "We recently had a meeting with Prof. Manfred Hajek from Munich Technical University who stated that he sees the technology mature rather in 2050 than in 2025."

Kursell acknowledges that public investment to create the infrastructure for UAM will be significant but in Europe, it may be less than the cost of installing a new subway system in a particular city.

"I believe you'll see this in emerging markets more so than [developed] markets," Boeing's Nordlund contends. "I believe we're very U.S.-centric in some of the conversation. Emerging markets will probably be the early adopters."

As for a timeline, "We don't know the answer to that yet," he says.

For air taxi makers, operators and consumers, the opportunity to "fly if you can" may be limited for some time. US