

Battery breakthroughs will open the skies to eVTOLs

At a recent air show in Dubai, one image captured the imagination: electric air taxis moving above traffic-congested roads between airports, business districts, and coastal resorts. Known as electric vertical takeoff and landing aircraft, eVTOLs are battery-powered aircraft that promise faster point-to-point travel and a cleaner, more connected urban transport model for Gulf cities.

They are no longer science fiction. Abu Dhabi has partnered with Archer Aviation to launch air taxi services,¹ while Dubai's Roads and Transport Authority is advancing plans with Joby Aviation and Skyports to deploy a commercial aerial mobility network.² In Saudi Arabia, the General Authority of Civil Aviation has signed multiple memorandums of understanding with leading OEMs, including Boeing, to accelerate the development of advanced air mobility across the Kingdom.³

Although commercial-scale adoption is still constrained by today's battery technology, which limits range and hover time, momentum is building. In our view, adoption is likely to accelerate between 2028 and 2030 as battery-energy density improves. The GCC has a narrow window to invest and consolidate its position as a global testbed for advanced air mobility.

Focusing on the real constraints

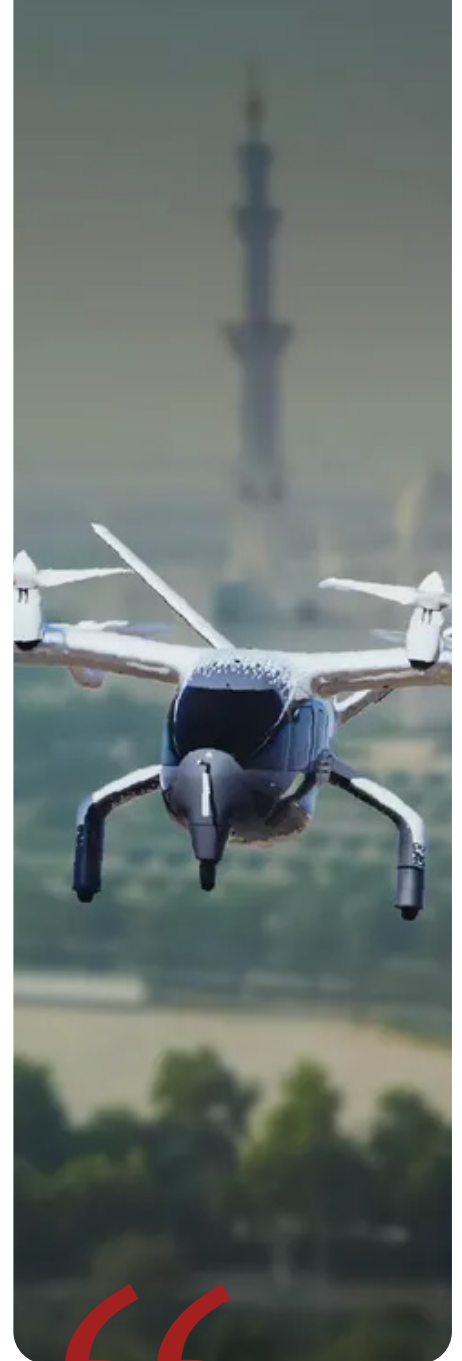
Much of the conversation to date on how to make eVTOLs commercially viable has focused on airframe designs, autonomous technology and vertiports. Yet a key bottleneck today is battery-energy density—the amount of energy a battery can store relative to its weight. Current aviation-grade lithium-ion batteries deliver about 250 watt-hours per kilogram (Wh/kg), far below the energy density of conventional jet fuel of 12,000 Wh/kg.⁴ For eVTOL operators, this Wh/kg shortfall results in three critical operational constraints.

First, range is limited. Once reserves and safety margins are included, today's eVTOLs can typically fly only 60-160 kilometers, restricting their use in regional transport.

Second, hover time is minimal. Hovering is extremely energy intensive, using several times more power than forward cruising, meaning even short periods of vertical flight can significantly reduce total range and leave little margin for contingencies.

Third, to conserve energy, many eVTOLs adopt shallow, airplane-like approaches rather than true vertical descents.⁵

These approaches require extended, obstacle-free corridors to reach landing sites, a challenge in dense urban environments.



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Battery chemistry will change everything

Given today's operational constraints, only a few use cases are commercially viable: airport shuttles along predefined corridors, VIP transfers between high-value districts, and tourist flights. But the widely imagined model—dense networks of on-demand air taxis hopping between rooftop vertiports—is unlikely with today's technology.

The good news is that battery technology is advancing quickly. Next-generation solid-state and lithium-metal batteries are moving from the lab into prototype aircraft. Companies such as CATL, a battery manufacturer based in Ningde, China, have demonstrated 500 Wh/kg cells.⁶ That is about double the energy density of batteries currently in use and they expect to commercialize the batteries before the end of the decade. The mass production of these next-generation batteries will unlock a fundamentally different eVTOL operating model.

As battery energy density improves, aircraft equipped with 400–500 Wh/kg batteries could achieve ranges of 200–300 kilometers, allowing eVTOLs to move beyond short intra-city hops to short regional routes. Additional onboard energy would also allow longer hover times, improving operational flexibility and safety margins. Importantly for cities, higher energy density would enable steeper approach angles, making it more feasible to locate vertiports in dense, high-rise areas rather than relying on long, shallow landing corridors.

Pilot programs anticipate a transition to 400–500 Wh/kg cells around 2028–2030, with scale building into the early-to-mid 2030s. Looking further ahead, NASA studies indicate that pack-level energy densities of 600 Wh/kg and above would enable longer regional travel, while 1,000 Wh/kg would approach parity with single-aisle jets.⁷ At these levels, eVTOLs would have significantly longer hover capability, enhancing the aircraft's ability to manage prolonged hold patterns and emergency scenarios.

How GCC policymakers can lead

With advances in battery chemistry approaching commercial viability, GCC policymakers should be proactive to ensure the region emerges as a global leader in advanced air mobility and captures the promise of eVTOLs.

Rather than waiting for fully mature technology, the GCC can accelerate progress through early, small-scale operations that allow regulators and operators to gather real-world data, build public familiarity, and refine regulatory frameworks. In parallel, vertiports, charging systems, and grid connections should be designed with flexibility in mind, ensuring that today's infrastructure can scale alongside evolving aircraft capabilities.

Clear and predictable regulations will also be critical. By establishing “safe-to-test” environments for advanced air mobility across the region, governments can attract manufacturers and operators while positioning the Gulf as a leading hub for eVTOL certification, operations, and innovation.

¹ Abu Dhabi Government Media Office. (2025, July 2). *In collaboration with Abu Dhabi Investment Office, Archer conducts test flights for Midnight electric vertical take-off and landing air taxi services in Abu Dhabi*. <https://www.mediaoffice.abudhabi/en/economy/in-collaboration-with-abu-dhabi-investment-office-archer-conducts-test-flights-for-midnight-electric-vertical-take-off-and-landing-air-taxi-services-in-abu-dhabi/>

² Skyports. (2024, February 11). *Skyports, RTA and Joby to launch air taxi service in Dubai*. <https://skyports.net/skyports-rt-and-joby-to-launch-air-taxi-service-in-dubai/>

³ Saudi Press Agency. (2025, September 19). *GACA Signs MoU with Boeing in the Field of Advanced Air Mobility*. <https://www.spa.gov.sa/en/N2403042>

⁴ International Council on Clean Transportation. (2022, July 14). *What to expect when expecting electric airplanes*. <https://theicct.org/aviation-global-expecting-electric-jul22/>

⁵ NASA. (2024, March 24). *eVTOL Vehicle-Agnostic Instrument Flight Procedures Test Plan*. <https://ntrs.nasa.gov/citations/20240002788>

⁶ CATL. (2025, May 28). *CATL Achieves Breakthrough in Lithium Metal Battery Research, Published in Nature Nanotechnology*. <https://www.catl.com/en/news/6456.html>

⁷ NASA. (2017). *Technical Challenges and Barriers Affecting Turbo-electric and Hybrid Electric Aircraft Propulsion*. <https://ntrs.nasa.gov/api/citations/20180004252/downloads/20180004252.pdf>

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