The past two months have been a turning point in electric-powered transportation.

On March 31, Tesla Motors unveiled the all-electric Tesla Model 3 five-seat compact sedan, starting at a base price of $35,000. Tesla, which shipped 50,000 cars worldwide in 2015, expects to sell more than 80,000 in 2016, but the first Model 3 cars aren't expected to arrive until the end of 2017. Nonetheless, by April 7 — within the first week — more than 325,000 people had put down $1,000 deposits for cars that might take years to deliver. For Tesla, these deposits, which raised $325M, correspond to about $14B in implied future sales.

In contrast, traditional car manufacturers — with top-selling all-electric models such as the Nissan LEAF, the Chevy Volt and the BMW i3 — have sold fewer than 400,000 total vehicles globally in the past five years combined.

Just like with the announcement of next generation Apple iPhones, the almost primal demand is hard to understand for the entrenched automotive industry. Automotive News noted that, “If Tesla is the automotive equivalent of Apple, the industry will be forever changed.”

Also on April 7, the CEOs of Airbus Group and Siemens AG signed a collaboration agreement in Munich, Germany, to work towards demonstrating the technical feasibility of aircraft hybrid/electric propulsion systems by 2020, building on last year’s English Channel crossing of all-electric E-Fan aircraft. Both companies worked with Austria’s Diamond Aircraft on a hybrid aircraft in 2011. Since then, Siemens has been developing an electric engine for aircraft with five times the power at the same weight.

Airbus and Siemens now plan jointly to develop prototypes of various propulsion systems with power classes ranging from a few hundred kilowatts to 10 MW (hundreds of horsepower to 13,400 hp) and beyond for short, local trips with aircraft below 100 seats, helicopters or UAVs — up to classic short and medium-range journeys. The joint development team consists of some 200 employees. “We believe that by 2030 passenger aircraft below 100 seats could be propelled by hybrid propulsion systems,” said Tom Enders, CEO of Airbus Group.

Airbus is not alone, as several other organizations — including Pipistrel in Slovenia, the Japan Aerospace eXploration Agency (JAXA) and Rui Xiang in China — are also flying small fixed-wing electric aircraft. In Germany, e-volo’s Volocopter VC200 began the first manned flights of the world’s first certified electric VTOL aircraft on March 30. The two-seat VC200 is a multicopter with 18 propellers that has been flying unmanned since 2013.

NASA’s GL-10 Greased Lightning, using 10 electric propellers on a 10 ft (3 m) tilting wing, demonstrated the feasibility in the United States of distributed electric propulsion for high cruise efficiency vertical flight. In parallel, several American companies are working on transformative VTOL concepts that leverage the promise of distributed electric propulsion.

Meanwhile, the Defense Advanced Research Projects Agency (DARPA) announced on March 3 that it had awarded the Phase 2 contract for its VTOL X-Plane Program to Aurora Flight Sciences (see “Lightning Strikes at Aurora,”). Aurora’s LightningStrike will use the 6,150 shp (4.6 MW) Rolls-Royce T406/AE 1107C Liberty turboshaft engine found on the V-22 Osprey. Aurora uses the engine to provide 3 MW (4,000 shp) of electrical power to drive two dozen ducted fans for vertical lift and forward flight at speeds of more than 300 kt (555 km/h).

The following week, on March 8-9, a Joint NASA-FAA Workshop on On-Demand Mobility and Emerging Technology was held in Arlington, Virginia, outside of Washington, D.C. This was the second NASA-FAA ODM workshop, and leveraged many of the themes developed at the first two joint AHS-AIAA-SAE-NASA Transformative Vertical Flight Workshops, held in August 2014 and August 2015.

The objective of the ODM workshops is to enable industry, academia, professional societies, FAA, NASA and other government organizations to share perspectives on — and formulate the outline of a 15-year national roadmap for — the technologies enabling safe, efficient and accessible small aircraft-based, on-demand mobility.

ODM is defined as “personal transportation capabilities in which the specifics of a trip (origin, destination and departure time) are chosen by the user,” like a personal automobile. High-Speed ODM — achieving door-to-door trip speeds of two to four times faster than existing regional transportation solutions — is enabled by personal, air-taxi and high-frequency commuter aircraft (“Thin-Haul”), which could be manned or unmanned (i.e., passengers or cargo that are piloted or autonomous). ODM missions include short-distance urban VTOL solutions to offer alternative distributed transportation solutions in metropolitan areas suffering from high congestion.
and an increasing percentage of the population performing daily commutes greater than 100 miles (160 km).

ODM offers early adopter markets to take advantage of NASA’s New Aviation Horizons (NAH) initiative — an ambitious undertaking beginning in Fiscal Year 17. The initiative plans to “develop a series of transformative hybrid electric propulsion demonstrators, starting at small scale for risk reduction, learning, and for early applications” and “Advances aeronautics research bringing transformational advances in the safety, capacity, and efficiency of the air transportation system while minimizing impacts on the environment.” In particular, hybrid-electric offers the potential for reduced operating costs, carbon emissions and community noise for shorter distance missions in the near-term.

NASA’s renewed focus on its Aeronautics Research Mission, doubling the annual investment from $642M in FY15 to $1,287M in FY21, is welcome news — particularly after years of decline and neglect of the potential of both fixed-wing and rotary-wing vertical flight. The New Aircraft Horizons initiative is NASA’s golden opportunity to explore and develop VTOL ODM concepts. The transformative hybrid electric propulsion demonstrations that NASA has planned should be aimed at novel fixed-wing vertical flight approaches, as these are the most revolutionary and driving technologies. Electric propulsion is uniquely suited for fixed-wing vertical flight due to the opposing power requirements for vertical take-off and landing versus cruise flight, while offering the opportunity to enhance cruise efficiency by three- or fourfold.

Considering the rapid change taking place in the automotive world, it’s natural to wonder what the next decade of vertical flight will offer. Combine this rapid change in technologies with even more rapid changes in business models, with companies such as Uber going from start-up to a $60 billion valuation in less than six years through ride-sharing approaches, which a path away from private ownership to high rates of vehicle utilization. Now layer on top, not only electric, but also autonomous technology applications being worked feverously at essentially every automotive company, a realization seems to be taking hold that autonomous small aircraft and helicopters are likely less complex of a solution than autonomous cars. While this would require an enormous investment, the benefits of opening up air transportation in this way would fundamentally change the aviation marketplace, and could be the combination of technologies that moves the global industry away from hand production of fewer than 2,000 rotorcraft built annually, and into an era of higher production volumes and less expensive vehicles, such as seen with automotive mass production.

At her annual Heli-Expo address on March 2, MD Helicopters CEO Lynn Tilton, who also owns automotive supply companies, warned the vertical flight community that “We’re living in a changing world. . . . We need to change how we work as an industry. We can’t get comfortable with our [high] barriers to entry, that we can move slowly, that we can create at a slower pace than other industries. We’ve not yet had a Tesla come and rev our engines and show us who we need to be. I’d rather out-innovate myself than wait for someone to show me that. And I think this has to be an industry-wide push.”

Join AHS International at the 72nd Annual Forum and Technology Display for a Special Session on Transformative Vertical Flight. The session features leaders from NASA, DARPA, Aurora, Boeing, Joby, Karem, Sikorsky and other companies discussing their vision of electric propulsion, innovative configurations and novel approaches to vertical flight. More information on the ongoing AHS efforts on Transformative Vertical Flight can be found at www.vtol.org/transformative.

What do you think? Let us know at director@vtol.org.