INRIX RESEARCH

Electric Passenger Drones Could Relieve Housing Costs and Spread Growth in Nation's Booming Cities

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OVERVIEW

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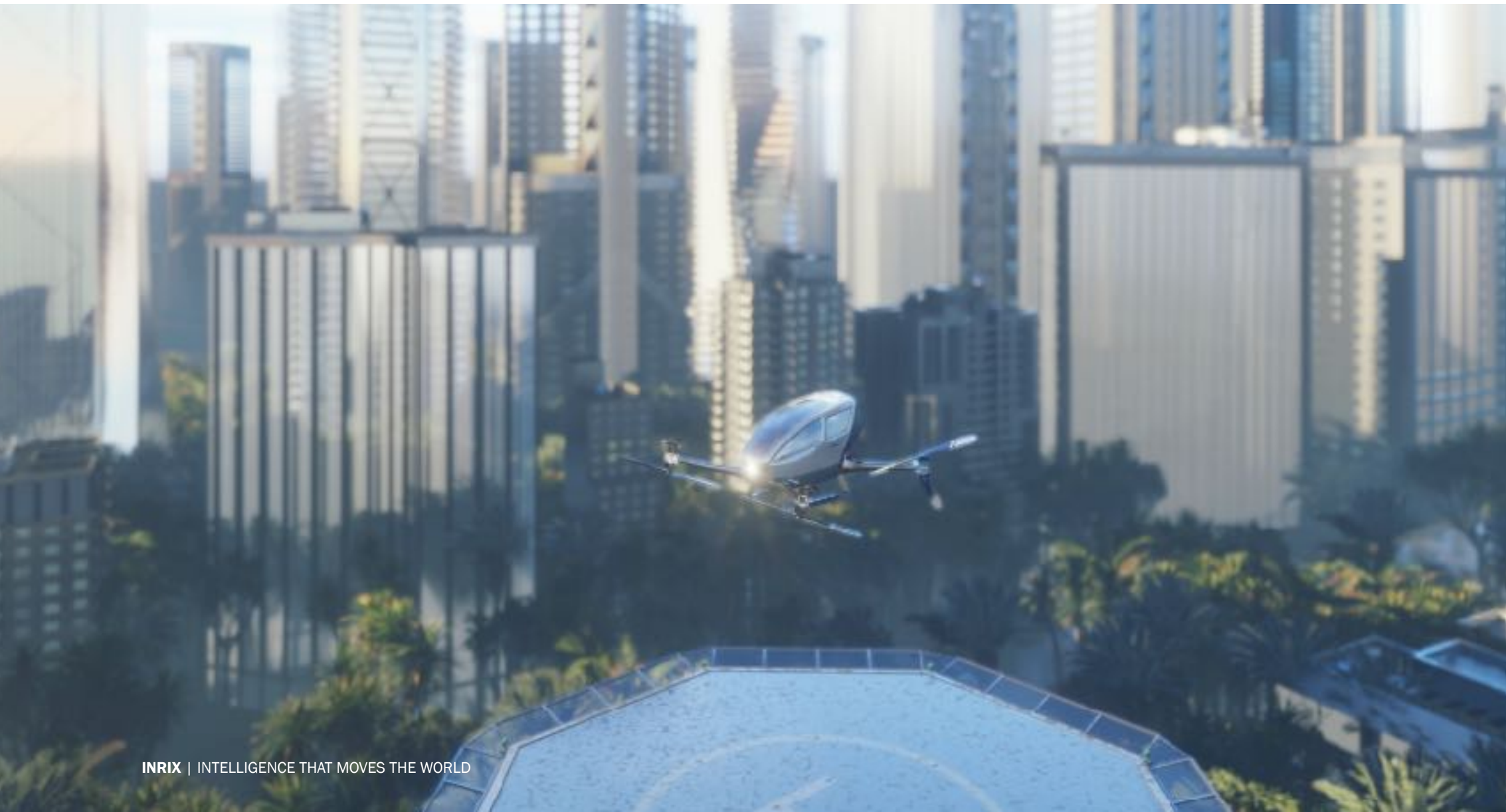
Electric Vertical Take-Off and Landing (VTOL) services stand to revolutionize urban mobility by providing fast, reliable trips to a broader geographic area.

While it is still early in the development of personal flying vehicles, based upon current industry concepts, this paper assumed capacity for 1-4 people, a top speed of 150 MPH, and a range of 60 miles. The benefits of VTOL will accrue in the the near-term to long-distance commuters from city centers. Long-term VTOL will redefine what constitutes a metropolitan area by dramatically reducing travel times between communities in a region.

A driving factor behind this potentially revolutionary disruption is the universal rule of commutes, Marchetti's constant, which states people on average will spend one hour per day commuting. Any further and commuters will likely seek a change in employment or living locations. Whereas under ideal conditions one could live approximately 25 miles away for a car-based commute, with a VTOL service 60 miles away would become reasonable. Given the fact that for every doubling of a radius, the area of a circle quadruples, enabling commuters to go 60 miles instead of 25 would mean almost 6x larger a geographic area would be within 30-minute commute of a city's downtown.

The expansion of the feasible commutable area could have incredible impacts in terms of economic growth and housing affordability. With passenger drones, towns currently too far from cities to be a part of their economies could be viable commuter communities.



FINDINGS

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While the market is still in its infancy, the potential is massive over the long run to reshape commuting and development patterns.

Using INRIX Analytics for trip and road performance data, combined with census data, INRIX Research identified the current routes with the greatest market potential in the Atlanta, Austin, Boston and San Francisco metropolitan areas.

During peak hours, VTOL exhibits significant time savings compared to cars, and in Boston's case, a time benefit over rail during all hours. However, realizing these benefits also depends on where heliport facilities are located. In order to optimize this new technology, landing pads will need to be located within current employment hubs, otherwise the benefits may be squandered traveling to and from the heliport.

The study employed a number of assumptions in calculating time savings. Time savings were calculated using 150 MPH as the assumed cruise speed of a VTOL platform, with a 5-minute buffer for takeoff preparation and acceleration to cruising speed.

ATLANTA

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Atlanta represents a far different city typology than Boston or San Francisco, which are both coastal, denser, older, and have mature public transit systems.

Atlanta typifies suburban sprawl, characterized by low density suburbs, expansive highway networks, and low transit user-ship. Three exurbs stood out in analysis based upon volume and congestion severity: Kennesaw, Apharetta, and Buford. While closer destinations along these corridors are good candidates for E-VTOL too, these destinations capture how the massive time savings from E-VTOL would make even the furthest communities close to the downtown core.

Corridor Name	Drone Savings Versus Peak Car Hours (Minutes)*	Drone Savings Versus Off-Peak Car Hours (Minutes)*
Alpharetta/Atlanta	-41	-6
Kennesaw/Atlanta	-19	-3
Buford/Atlanta	-32	-9

*All travel savings are one way, during peak hours

AUSTIN

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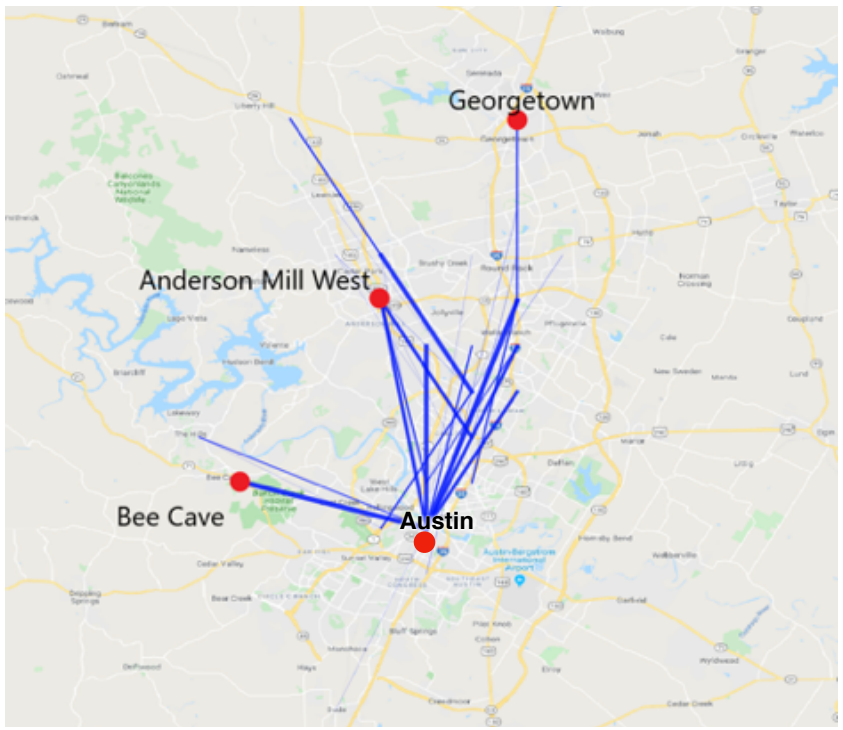
Similar to other cities, in Austin the presence of major water features has impacted the ability of residents to effectively navigate the area, in this case it is Lake Travis and the Colorado River.



The river effectively splits the western portion of Austin into two major corridors on Highway 183 and State Route 71. E-VTOL users could have much more direct routes on these routes throughout Austin and avoid chronic congestion in the downtown area.

Corridor Name	Drone Savings Versus Peak Car Hours (Minutes)*	Drone Savings Versus Off-Peak Car Hours (Minutes)*
Bee Cave/Austin	-28	-13
Georgetown/Austin	-31	-8
Anderson Mill West/Austin	-25	-7

*All travel savings are one way, during peak hours

BOSTON

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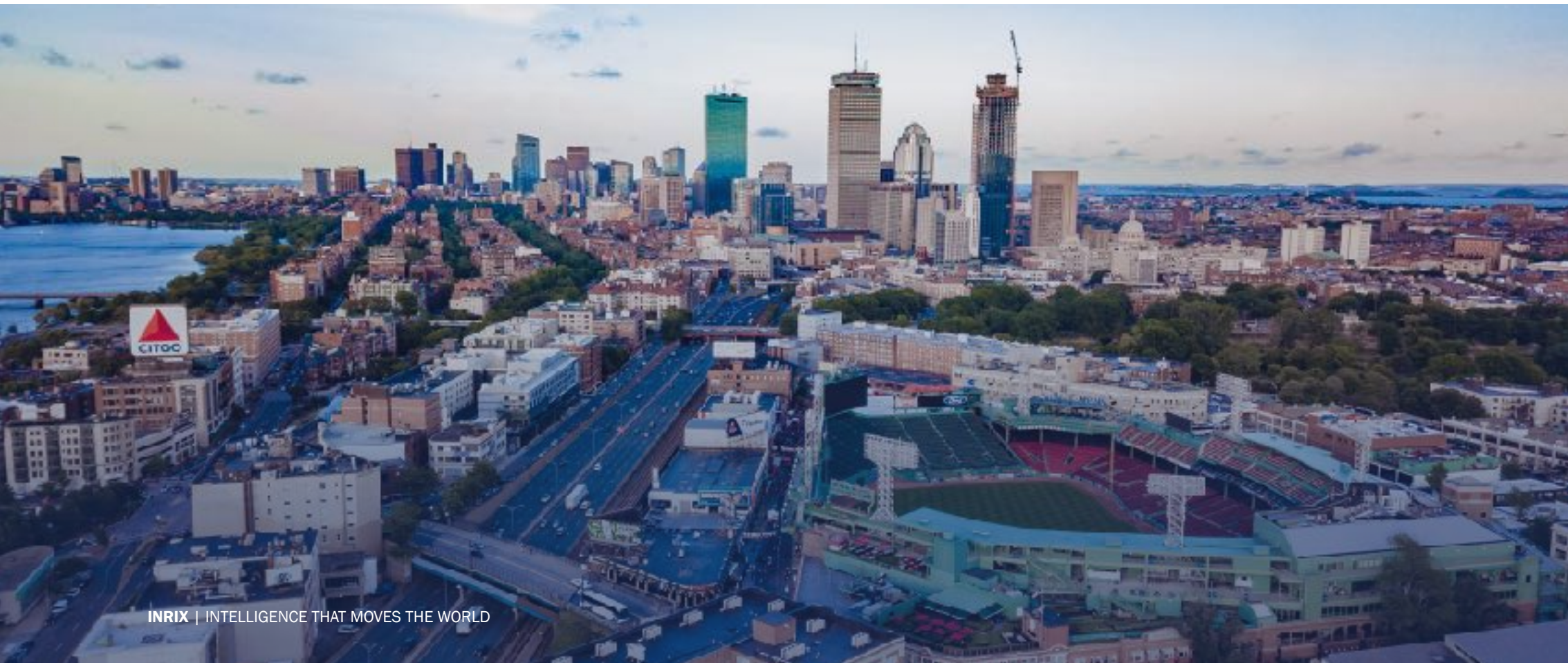
Unsurprisingly, the greatest proportion of trips in Boston occur on major highway or Interstate corridors, in particular I-90 and I-93.

Coincidentally, these destinations are typically higher income commuter suburbs, the demographic most likely to have the financial means to afford a premium drone-based commute solution. Travel times for several of these high volume corridors were analyzed, Needham, Reading, and Wellesley to Boston. These cities also have commuter rail access to downtown Boston. The table below reveals the massive time savings potential for VTOL users both during peak and off peak periods.

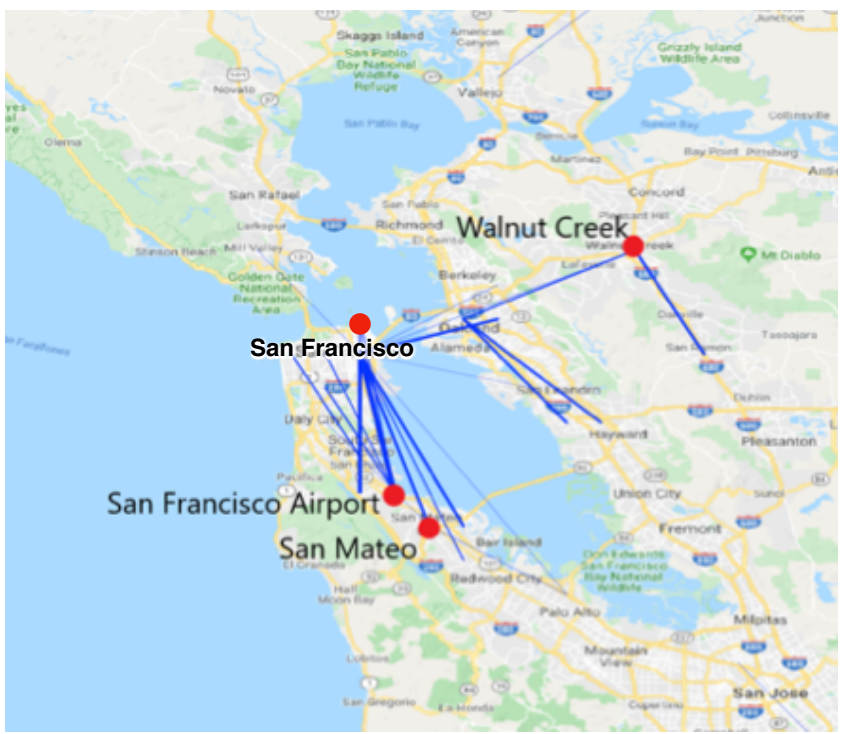
Corridor Name	Drone Savings Versus Peak Car Hours (Minutes)*	Drone Savings Versus Rail All Hours (Minutes)*	Drone Savings Versus Off-Peak Car Hours (Minutes)*
Boston/Needham	-29	-41	-11
Reading/Boston	-34	-23	-6
Wellesley/Boston	-30	-22	-16

*All travel savings are one way, during peak hours



SAN FRANCISCO

Unlike Boston where the most viable routes follow Interstate 95 in a radial pattern from downtown, San Francisco's geography defines high potential corridors.



The distribution of start and end locations, by volumes, in San Francisco varies significantly from Boston. High-demand destinations follow Highway 101 to Silicon Valley and Interstate I-80 to Oakland and Walnut Creek. E-VTOL services could provide congestion relief along the 101 in particular. In contrast to Boston's suburbs, San Francisco's suburbs around the 101 corridor are low density and car centric, impeding alternatives to driving. Diffuse settlements, high incomes, and major congestion make the corridor ideal for E-VTOL services.

Corridor Name	Drone Savings Versus Peak Car Hours (Minutes)*	Drone Savings Versus Off-Peak Car Hours (Minutes)*
San Mateo/San Francisco	-31	-6
San Francisco Airport/San Francisco	-24	-2
Walnut Creek/San Francisco	-22	-10

*All travel savings are one way, during peak hours

GENERAL FINDINGS

Overall, VTOL has massive potential, and a large existing potential market. Its probable early adoption will occur in wealthier suburbs going into downtown cores.

However, in the long run as the feasible commute area increases and costs decline, passenger drones could provide growth relief to expensive cities. The lower capital costs of VTOL could also make small- and medium-sized cities attractive to businesses and residents. Inserting a VTOL facility in a small town is far more economical than investments in rail or road infrastructure. While still early, the potential for VTOL services is just now being realized, by employing data, and prudent planning, this exciting new technology could significantly improve society's wellbeing.

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