PitchBook

EMERGING TECH RESEARCH

Mobility Tech

Q3 2021 VC update

Report preview

The full report is available through the PitchBook Platform

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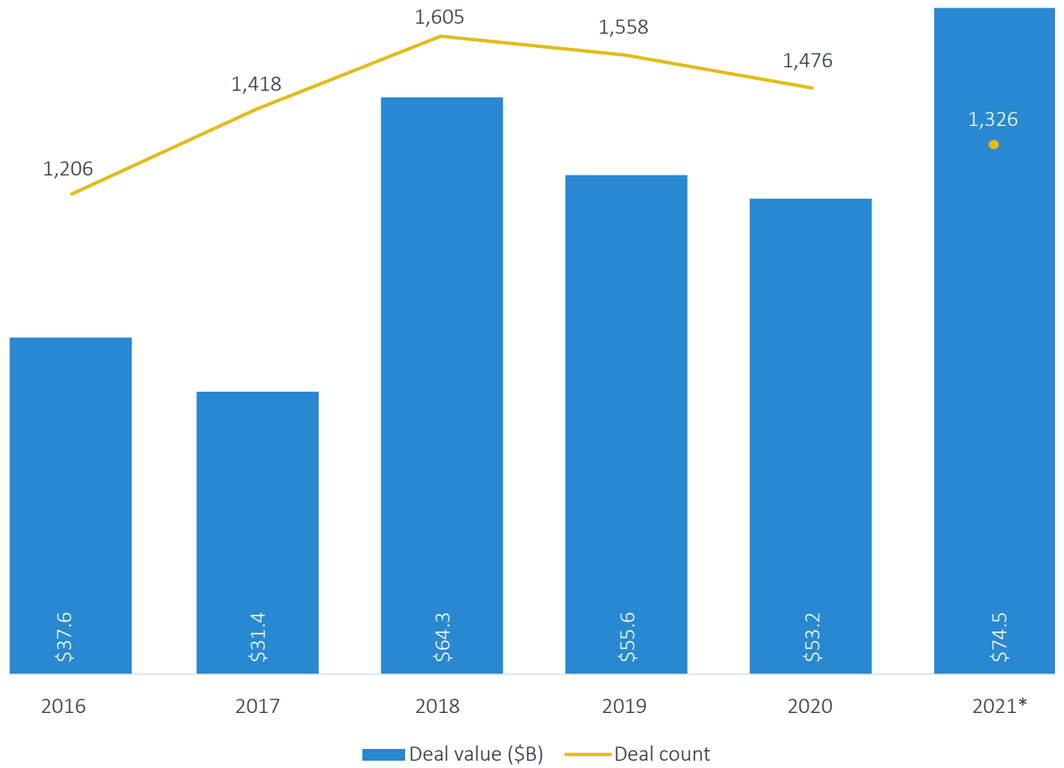
Vertical overview

The mobility industry represents a sprawling ecosystem of startup-driven technologies that address both the growing list of transportation-related problems stemming from urbanization—such as congestion and emissions—and the increased demand for affordable, convenient, and environmentally friendly transportation. While ridesharing, micromobility, and carsharing startups generally connect people to vehicles through mobile and digital platforms, industrial startups are manufacturing new types of vehicles, such as e-bikes, scooters, autonomous cars, electric cars, and even flying cars. Another subset of startups is designing numerous enablement technologies to power and support these budding mobility ecosystems.

Over the past two years, the mobility tech industry experienced increased investment flows as the COVID-19 crisis exposed many underlying problems with existing transportation systems. The growing focus on climate change also drove investment, as consumers continue to demand electric vehicles (EVs) and governments pass more decarbonization initiatives. Encouraged by these developments, venture investors poured a staggering $74.5 billion into mobility tech startups in the first three quarters of 2021—breaking a record for mobility investing. In addition, mobility tech companies raised a combined $33.1 billion in 2021 through reverse mergers with special purpose acquisition companies (SPACs).

We believe demand for low-cost, convenient, and environmentally oriented mobility tech solutions will continue to drive long-term industry growth. Industry support from governments and investors—as well as growing consumer demand—is boosting adoption of mobility tech services, while autonomous, connected, and EV technologies are making significant advancements.

Figure 1. MOBILITY TECH VC DEAL ACTIVITY ($B)

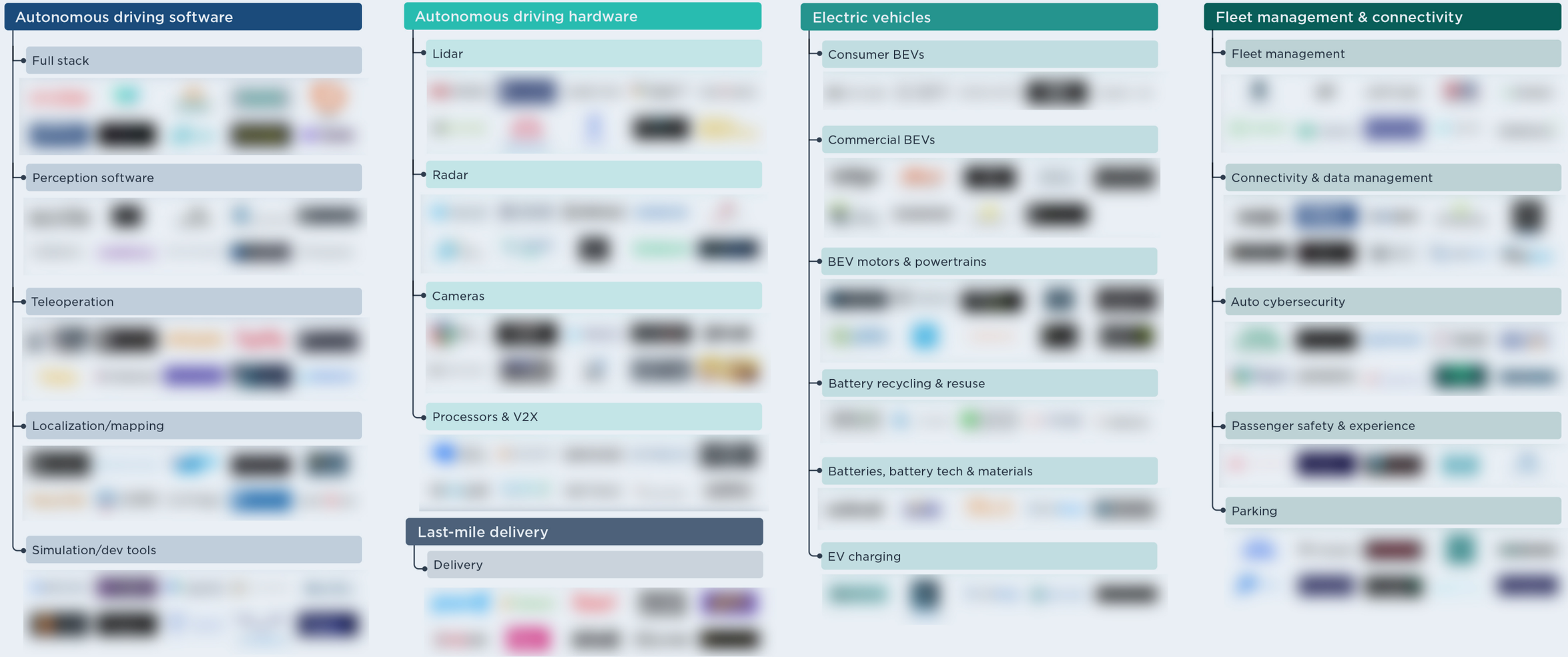


Source: PitchBook | Geography: Global | *As of September 30, 2021

Mobility tech VC ecosystem market map

Click to view the interactive market map on the PitchBook Platform.

Market map is a representative overview of privately held providers in each segment and excludes companies merging with SPACs.



Mobility tech VC ecosystem market map

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Micromobility

- Network operators
- Vehicle suppliers
- Management & analytics platforms
- Subscription services
- Other micromobility

Ridehailing

- Ridehailing platforms
- Augmented interior & exterior
- Other ridehailing

Public mobility solutions

- Shuttle, bus & multimodal booking
- Transit system software

Auto commerce

- Digital marketplaces
- P2P carsharing
- Fleet-owned carshare
- Financing & subscriptions
- Repair & maintenance

Advanced air mobility

- eVTOL passenger aircraft
- Drones & eVTOL air logistics
- eCTOL & eSTOL aircraft
- Electric propulsion & motors
- Autonomous autopilot & airspace management
- Roadable & single seat aircraft

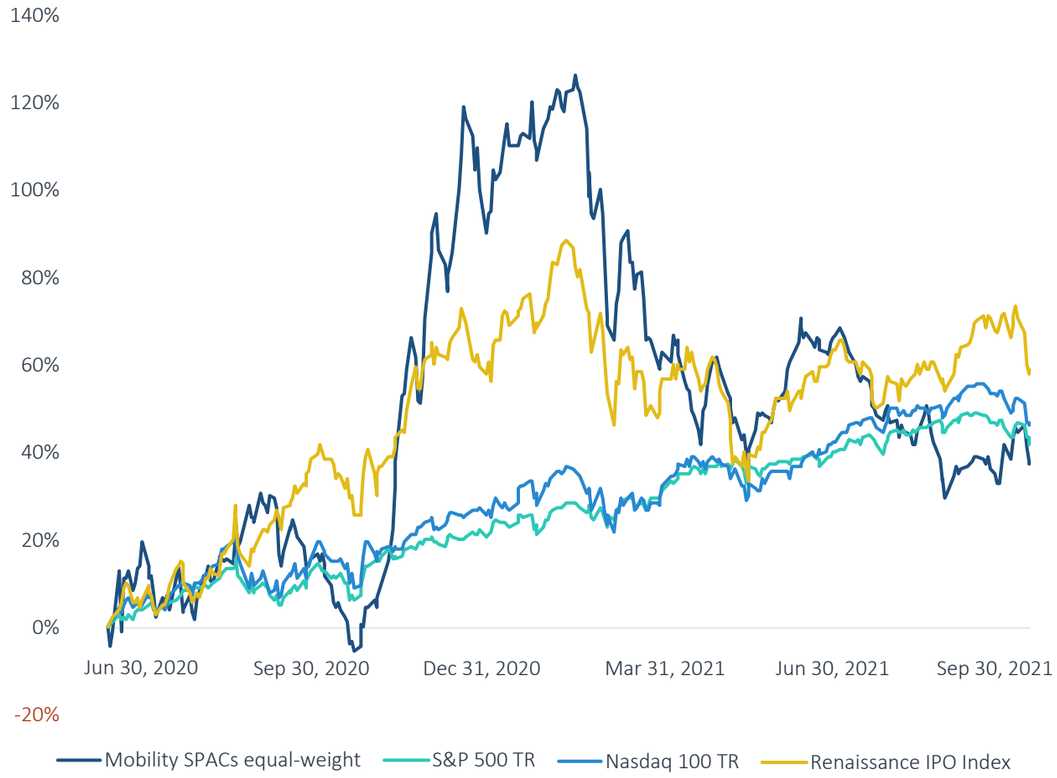
VC activity

Mobility SPACs continued their underperformance in the public markets in Q3 2021. Our EV/Mobility SPAC Price Change Index recorded a -20.5% loss in the quarter—significantly underperforming the S&P 500 which was relatively flat over the same period.

Although public market volatility is affecting the stock prices of public mobility companies, it has not constrained the investment boom in private mobility startups. Indeed, as more pre-revenue companies are able to go public often via SPACs, this is likely driving more investment in private startups.

After previously shunning investments in transportation technologies such as EV batteries and charging, generalist VC investors and large asset managers such as Fidelity, T. Rowe Price (NASDAQ: TROW), BlackRock (NYSE: BLK), and Wellington have become increasingly active in the mobility sector. Collectively, they have deployed billions of dollars into dozens of late-stage mobility companies in the EV, autonomous driving, and last-mile delivery segments.

Figure 2. EV/MOBILITY SPAC PRICE CHANGE INDEX



Source: PitchBook | Geography: Global | *As of September 30, 2021

Figure 11.

Key mobility tech early-stage deals

COMPANY	CLOSE DATE	SEGMENT	SUBSEGMENT	DEAL TYPE	DEAL SIZE ($M)	LEAD INVESTOR(S)
SVOLT	July 30, 2021	Electric vehicles	Batteries, battery tech & materials	Series B	$1,586.1	BOCGI Zheshang Capital
DeepRoute.ai	August 25, 2021	Autonomous driving	Full stack	Series B	$300.0	Alibaba Group
Inceptio Technology	August 3, 2021	Autonomous driving	Full stack	Series B	$270.0	JD Logistics, PAG, Meituan
Onto	July 27, 2021	Auto commerce, electric vehicles	Financing & subscriptions, other elecric vehicles	Series B	$241.6	Alfvén & Didrikson
Semidrive	July 25, 2021	Autonomous driving	Processors	Series B	$154.4	China V Fund, Puluo Capital
EmergeTech	September 23, 2021	Freight tech	Supply chain tech, freight tech	Series B	$130.0	Spruce House Investment Management, 9Yards Capital, Tiger Global Management
Kovi	August 18, 2021	Auto commerce	Fleet-owned carshare	Series B	$124.0	Prosus Ventures, Valor Capital Group
Verkor	July 6, 2021	Electric vehicles	Batteries, battery tech & materials	Series B	$119.8	Groupe Renault, EQT Ventures
AutoFlight	September 18, 2021	Advanced air mobility	eVTOL passenger aircraft	Series A	$100.0	N/A
QCraft	August 16, 2021	Autonomous driving	Full stack	Series A1	$100.0	Yunfeng Capital, Genesis Capital

Source: PitchBook | Geography: Global | *As of September 30, 2021

eSTOL aircraft gain momentum

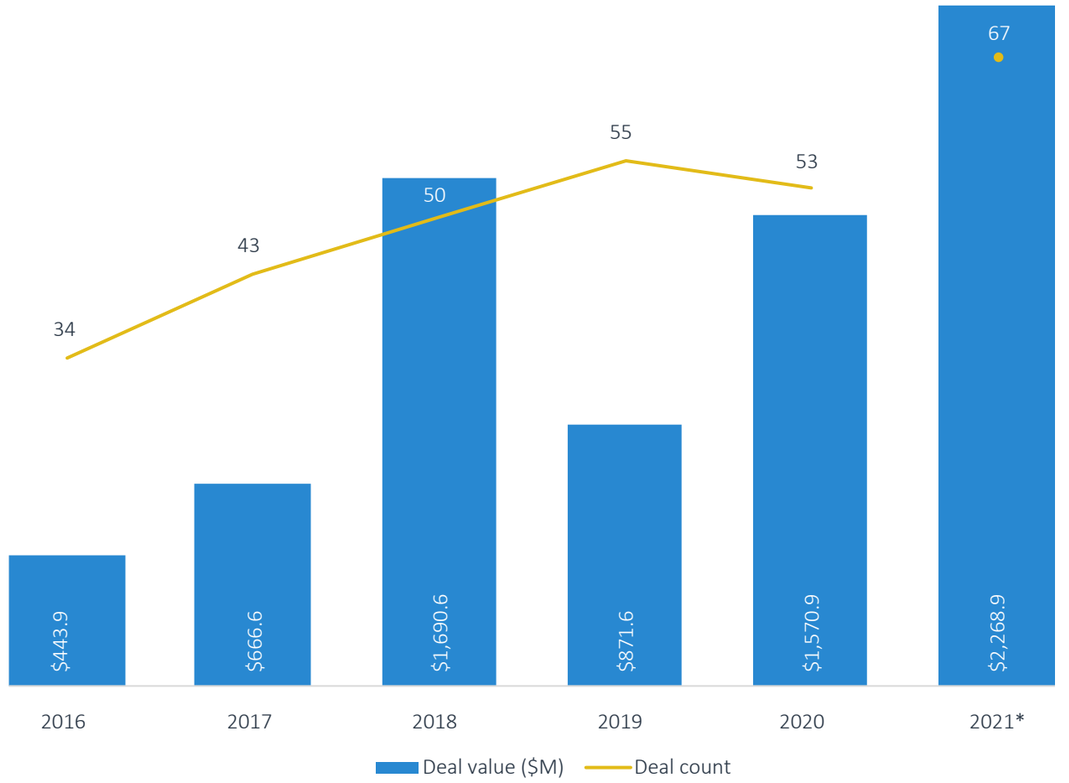
The advanced air mobility industry promises to reduce cost and emissions in the aviation industry by electrifying light aircraft. The sector has attracted significant capital from investors. So far in 2021, VC investors poured $2.3 billion into startups in the space. Much of the focus has gone toward electric vertical take-off and landing (eVTOL) aircraft. Startups in this space include **Joby Aviation**, Archer, and **Lilium**—all of whom have debuted on public markets through SPAC mergers at multibillion dollar valuations.

While most investment has gone toward eVTOL, a less complex technology—electric short take-off and landing (eSTOL) is gaining ground. Like eVTOL, eSTOL aircraft use battery or hybrid electric motors. However, while eVTOL aircraft are designed to take off and land vertically, eSTOL aircraft take off and land horizontally over a short distance, often using an aerodynamic technique known as "blown lift"—which uses propulsors to blow air over wings, thereby increasing dynamic pressure and lift. Developers of eSTOL aircraft include startups **Electra**, **Airflow**, and **Airmorph**.

Relative to eVTOL, eSTOL holds several advantages, including improved performance, reduced operating costs, ease of certification, and ease of use with existing infrastructure.

eSTOL aircraft are likely to have improved payloads, range, and speed due to their smaller propulsion systems and lower energy requirements. Taking off and landing horizontally requires significantly less energy than taking off and landing vertically. An MIT study

Figure 20. ADVANCED AIR MOBILITY VC DEAL ACTIVITY ($M)



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ESTOL AIRCRAFT GAIN MOMENTUM

concluded that with a ground roll of 100-150 feet, an eSTOL aircraft could carry 1.9x–2.2x the payload of an eVTOL for the same maximum take-off weight, range, and speed.[2]

Reduced power requirements for eSTOLs could provide economic benefits. For example, eSTOL aircraft could leverage cheaper, less energy-dense batteries. Alternatively, eSTOL batteries may not need to be charged as often, lengthening the lifecycle of each battery.

eSTOL aircraft could face a less costly pathway to certification with regulatory authorities such as the Federal Aviation Administration (FAA) and the European Union Aviation Safety Agency (EASA). In our **Air Taxi Startup Handbook** note (which focuses on eVTOL air taxis), we estimate the cost of certifying new eVTOL aircraft could exceed $1.0 billion, including design work and setting up production facilities. eSTOL is a more established technology than eVTOL, meaning the cost of certification could be reduced. **Airflow** estimates development and certification costs for its eSTOL aircraft will be in the range of $200 million.[3] That said, the timeline for eSTOL certification lags the major eVTOL manufacturers which plan to certify in the early to mid-2020s. eSTOL developer **Electra** plans to complete certification with the FAA in 2026.[4]

In our view, eSTOL aircraft could be an ideal fit for middle-mile cargo missions. Using existing runway infrastructure should enable these vehicles to connect warehouses and industrial locations. Short runways could even be incorporated onto warehouse roofs. **Airflow** plans to operate a logistics network using its eSTOL aircraft. Middle-mile logistics is also the focus of eVTOL aircraft developer **Beta Technologies**, which raised a $425.6 million Series A from Fidelity, Amazon, and others in May 2021.

However, there are downsides to eSTOL aircraft relating to passenger air mobility in urban areas. The technology may not be suitable for taking off in dense environments—where vertiport infrastructure may require vertical approach and departure. While proponents of eVTOL argue that eSTOLs will require more runway space than possible for rooftop landings, proponents of eSTOL argue that eVTOL aircraft are unlikely to land vertically most of the time due to the steep energy requirements of doing so, and infrastructure should be designed to accommodate both. In addition, eSTOL aircraft tend to be less stable during wind gusts, which could make automating trips (especially in urban areas) more difficult. Finally, eSTOL blown lift propulsors may produce more noise than eVTOLs—making them less attractive for high-frequency flights in residential areas.[5]

2: "A Performance Comparison of eSTOL and eVTOL Aircraft," MIT International Center for Air Transportation, Christopher B. Courtin, et al., August 2021.
3: "Airflow Launches eSTOL Electric Cargo Aircraft," AINonline, Charles Alcock, June 10,2020.
4: "Electra Starts FAA Certification Process for eSTOL Type," Airways Magazine, Helwing Villamizar, August 18, 2021.

5: "Is the Electric Air Taxi Market Big Enough for eSTOLs and eVTOLs?" Aviation Today, Kelsey Reichmann, August 19, 2021.

SELECT COMPANY HIGHLIGHT | AMPLE

Founded
2014

Employees
75

Total raised
$225.7M

Last financing
Raised $160.0M Series C

Last financing valuation
$890.0M

Lead investors:
Shell Ventures, Moore Strategic Ventures, Eneos Innovation Partners, MKB

Overview

Ample is a developer of autonomous robotics technology that enables EV battery swapping. EVs fitted with **Ample**'s modular battery packs can use the company's battery swapping stations to swap to a new battery in minutes, rather than waiting hours for a full charge. Unlike previous forays into the space—most notably, that of **Better Place**—**Ample** focuses on swapping battery cells, not battery packs, significantly reducing the cost of infrastructure and improving unit economics and scalability. Currently, **Ample** battery stations take about 10 minutes to swap batteries, but the company plans to reduce swapping time to under five minutes. The company works with several automakers including Nissan and Kia.

We believe battery swapping could be an attractive option for fleet operations such as ridehailing. Depleted electric taxis could swap out batteries and be back on the street generating revenue instead of sitting on a lot charging. Battery swapping technology could enable e-mobility providers to operate fewer cars per fleet—thereby improving profitability. **Uber** has partnered with **Ample** to operate five battery swapping stations in the Bay Area for **Uber** drivers of Nissan LEAFs and Kia Niro EVs.

Leadership

Co-founder and CEO: Khaled Hassounah
Co-founder and President: John de Souza

Financing timeline

The company raised $160.0 million through the combination of debt and Series C venture funding in a deal led by Moore Strategic Ventures on August 19, 2021, putting the company's pre-money valuation at $740.0 million. Shell Ventures, Eneos Innovation Partners, PTT Public Company, SMRT Corporation, Rose Park Advisors, and Disruptive Innovation Fund also participated in the round. Previously, the company raised $34.73 million of Series B venture funding from Eneos Innovation Partners, MacKinnon, and Bennett & Company on April 26, 2021, putting the company's pre-money valuation at $178.0 million. Transform VC, VAS Ventures, Energy & Environment Investment, and Prefix Capital also participated in the round.

About PitchBook Emerging Tech Research

Independent, objective and timely market intel

As the private markets continue to grow in complexity and competition, it's essential for investors to understand the industries, sectors and companies driving the asset class.

Our Emerging Tech Research provides detailed analysis of nascent tech sectors so you can better navigate the changing markets you operate in—and pursue new opportunities with confidence.

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