Introduction to EVA & BETA TECHNOLOGIES
What is an EVA?

**Electric Vertical Aircraft:**

- **Electrification** allows for reduced costs
  - Aviation is 12% of transportation CO2 emissions
  - Energy costs 90% lower than conventional aircraft
  - Maintenance costs are significantly lower
- **Vertical** flight enables point-to-point delivery
  - Unlocks new use cases
  - Can also leverage existing GA airports

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**UPS Plans To Start Zero-Emissions Deliveries Via eVTOL By 2024**

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IHS Markit forecasts global EV sales to rise by 70% in 2021

**Bloomberg**

**France Moves to Ban Short-Haul Flights, Paving Way Toward Cleaner Aviation**

April 13, 2021, 7:03 AM EDT
Who is BETA TECHNOLOGIES?
Speaker Introduction

Herman Wiegman, PhD

20+ years with GE
2nd employee of BETA Technologies
Focus on Electric Power & Propulsion Systems
Experience with Energy Storage Systems

BETA Technologies
4 years old...
250+ team members
Design, Build, Test Experimental eVTOL aircraft
Mapping path to certification and production
Recharge Infrastructure, Pilot Training, Drones, ...
Mission: Create the world’s most elegant electric aviation solution, enabling our customers to move people and cargo around the world safely, cost-effectively, and with minimal environmental impact.
VISIONARY ENTREPRENEURS

Kyle Clark
BETA Technologies, Founder & CEO
• More flights in EVA than anyone else in the world
• Test Pilot & Certified Flight Instructor

• Extensive background in electric battery power and propulsion
• Founded and sold iTherm, Director of engineering at Dynapower

• Harvard University, Dept of Engineering and Applied Sciences
• Former Professional Hockey Player in Washington Capitals Org.

Supported by Experienced Advisors

Dr. Martine Rothblatt - Director
Founder of Sirius XM radio and United Therapeutics.

John Abele – Senior Advisor
Founder of Boston Scientific

Chuck Davis - Director
Founder of Stone Point, Board of Hershey’s and Progressive.

Dean Kamen - Director
Founder of DEKA Research and inventor of the Segway.
ALIA 250

250 Nautical Miles
145 mph
Enabling point-to-point logistics

1500 lbs, 250 ft³ payload
Three standard cargo pallets
Recharging in less than 1 hour

CARGO

6 large and accessible seats
Passenger visibility, safety and experience makes flying pleasurable

45 dB outside, nearly silent inside
ALIA cruises at 5000ft propelled by a silent electric motor with hyper efficient design

PASSENGER

ZERO EMISSIONS
VERSATILE AIRCRAFT

- Cargo Capacity
- Point-to-Point Delivery
- Operating Costs

- Fuel Independence
- National Security
- Flexibility

- All Weather
- Range
- Certification

- Noise
- Convenience
- Sustainability

CARGO/LOGISTICS
GOVT.
MEDICAL
PASSENGER
CUSTOMER VALIDATION

• Contracts with early adopters and large industry participants accelerates BETA on path to broader acceptance

• Announced contracts in 4 verticals (Govt., Medical, Cargo, Passenger) demonstrates versatility of BETA solution

• Operational experience in Govt. and Cargo drives large opportunity in passenger

Source: Morgan Stanley Research,

Dates represent BETA’s expectation of the early stages of adoption as informed by its own customer relationships and market research.
PROVIDING AN INTEGRATED SOLUTION

CHARGING

LESS THAN 1 HR CHARGE
Harmony between the aircraft and charging systems enable safe supercharging

480 CHARGING SITES NATIONWIDE
Customer led deployment, utilizes existing airports & heliports to unlock new, time saving routes
Safe and high-rate UL certified charging systems strategically placed.

LARGEST CHARGING NETWORK AND GROWING

BETA is quietly covering the eastern US in 2021 and has architected a customer-centric plan to deploy nationwide charging infrastructure by 2025.
TRAINING & SIMULATION

**Aircraft Test:** BETA uses proprietary simulation software as part of ALIA 250 testing.

**Internal IP:** Developed in house by the team that created X-Plane.

**Education:** Deployed simulators are introducing the ALIA aircraft to customers, policy makers, regulators and pilots in: Washington, D.C., South Burlington, VT and Springfield, OH.

**Pilot Training:** Certified curriculum developed to meet demand for EVA pilots.
FLIGHT TEST PROGRAM

✔ 3+ years of full-scale flights
✔ 100+ test flights on ALIA-250 PoC
✔ 130+ nmi flight demonstrated
✔ 500+ scale model flights (1/5th scale)
✔ 3 training grade simulators
✔ Thousands of flight simulation hours
✔ 3+ years of FAA engagement
✔ Streamlined path to certification
BETA has built an elegantly simple air mobility platform with the most direct path to Part 23 FAA certification.

Pathway informed by former FAA Designated Engineering Representatives (DER’s) on staff.

First to certify, enables the first to commercialize.
Energy Storage for EVA
Cell Requirements for EVA

- Safety
- High specific energy
- High specific power
- Low failure probability
- Long cycle life
- Robust quality management
Certification and Safety Requirements

Examples of FAA requirements

- Multi-cell thermal runaway mitigation
- Stringent crashworthiness robustness
- Environmental considerations
  - Temperature, high altitude, humidity and salt fog

Supplier Requirements

- Similar to the best automotive quality processes
- Lot and component traceability
- Design change notifications
Ideal Performance for EVA Success

- **EVA mission:**
  - Low average power
  - High power takeoff and land
  - Fast recharge

- **Ideal Cell:**
  - Low internal impedance to maximize usable energy
  - High specific energy - every gram is critical
  - High cycle life
Cell Performance Requirements

- Aircraft performance dominated by specific energy density (Wh/kg)

- High energy cells are necessary
  - Limited by VTOL landing at low SOC
  - Safety & thermal runaway characteristics dictate packaging
  - Need to minimize in-flight thermal management

- Volume and Mass Constrained

maximize pack specific energy to revolutionize aviation
Operational cost is an industry driver

Useful battery cycle life drives OpEx

Longer cycle life improves value proposition

Aging characteristics must be well understood
  - May permit longer service life
  - FAA rules on battery replacement not well documented.

Relative Annual Operating Costs

- Battery Cycle Cost
  - Fuel ~ kWh
  - Pilot
  - Maintenance