
# Electra – Beyond Vertical

## AUVSI AAM EXPO

JP Stewart, VP & GM

Newport News, VA | Sept 28, 2023

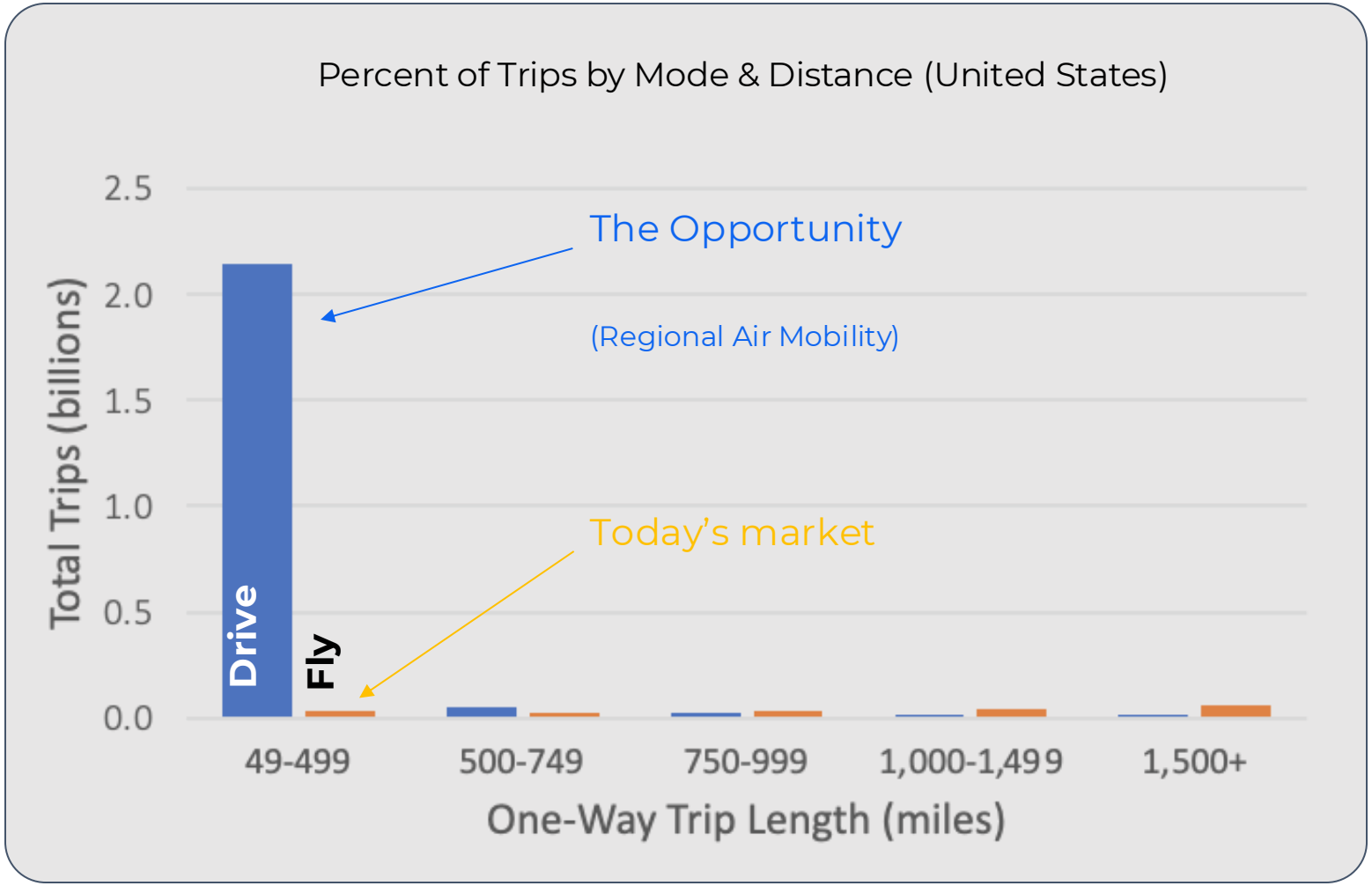

# ELECTRA BUILDS ELECTRIC AIRPLANES THAT MAKE SENSE

# Show of hands

How many of you are more than 50 miles away?

Of those, who flew here?

# Short haul aviation is a huge opportunity




Source: National Household Travel Survey, BTS, US DOT

# Why don’t we fly more? Manassas – Newport News

**Drive:**
Time:
- 0:05 Load Car
- 2:35 drive house to hotel
- 0:05 Unload car

= 2:45 Total

Cost:
157 mi @ $0.655/mi = $103

**Fly:**
Time:
- 0:05 Load Car
- 0:05 Drive to Airport
- 0:50 Start/Taxi/Fly/Taxi/Shutdown
- 0:05 Put plane up/wait on taxi/load
- 0:05 Drive to destination

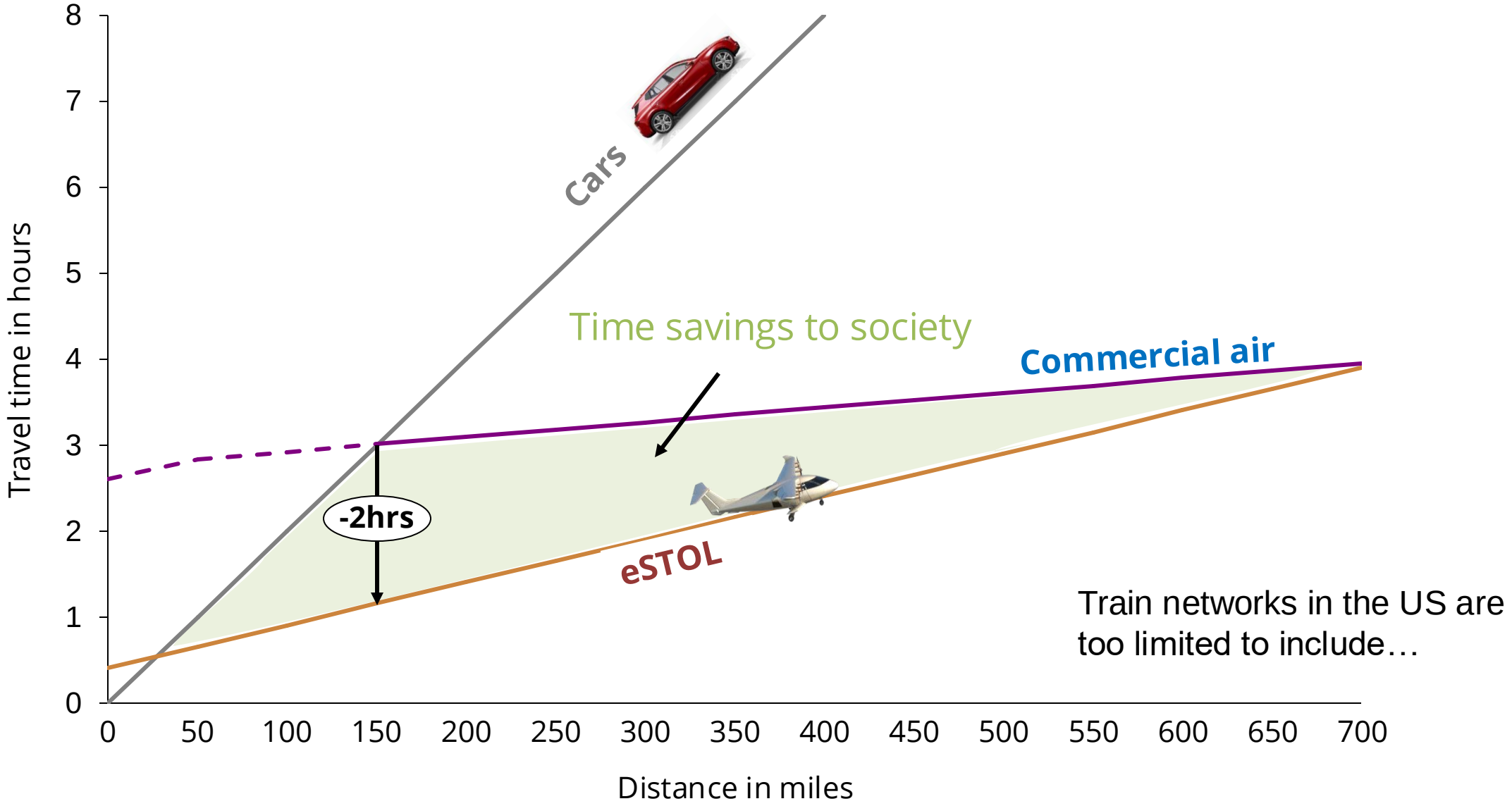
= 1:10 Total
Savings of 1:35…

Cost:
0:50 hr @ $200/hr = $167 (or similar ticket price if not self flown)
$64 dollars for 95 min = $40/hr

How do you get around on the ground?
What about the preparation/proficiency required?
Bad weather (precip, convective, IMC, ice)?
Break downs?

Takeaways:
- Must save meaningful time
- Comparable cost
- Reliable and robust

# In the general case?



# Why don’t we fly more? HEF-PHF Example

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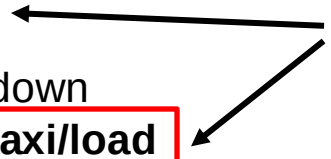


Minimizing friction is critical!

# Enter: The Vertiport & eVTOL

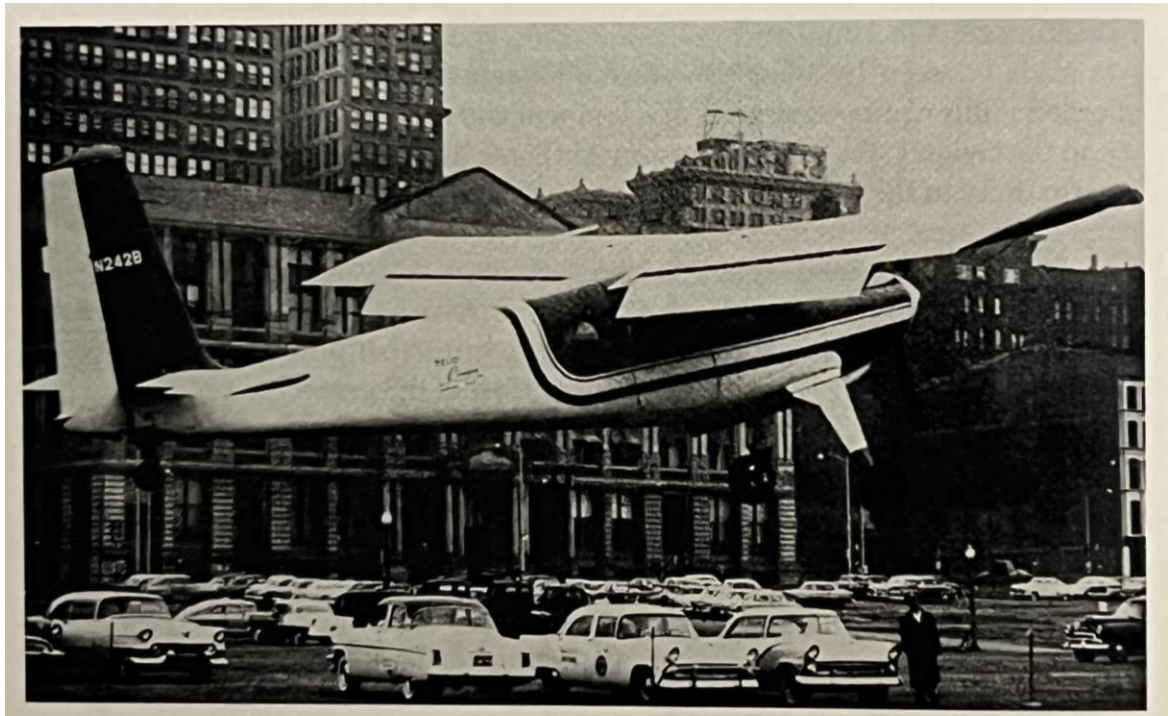


# Great capability comes at a cost


# Question your assumptions: Do you need to be VTOL to access small places?

Helio demonstration using a tennis court for an airstrip.


Helio H-395A (N4160D) at the Pentagon with Helio company officials.




H-391B using downtown St. Louis, Missouri, parking lot as an "airfield" during slow-speed landing demonstration. Bob Casebeer.

# Team With Deep Aerospace Experience

## Business Leadership

**John Langford**
Founder & CEO
*Founded and led Aurora and Athena, MIT PhD*

**JP Stewart**
VP/GM
*Led Aurora/Boeing-Porsche eVTOL development team*

**Oliver Masefield**
Chief Engineer
*Former chief engineer of Pilatus PC-12 / PC-24 and Eclipse 500*

**Randy Griffith**
Certification
*Former Director of Certification at Eclipse, Honda, Mooney, and Aerion*

**John Hansman**
Senior Tech Advisor
*MIT Aero Professor, certification expert, FAA R&D Committee Chair*

## Board

**Jim Albaugh**
*Advisor*
Former CEO Boeing Commercial, serves on board of American Airlines and Howmet

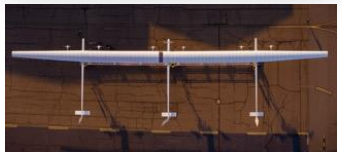
**Allan McArtor**
*Advisor*
Former Chairman, Airbus Americas, FAA Administrator, FedEx senior mgmt.

**Paul Kaminski**
Independent Director
Former Undersecretary of Defense for Acquisition and Technology, Recipient of National Medal of Technology

**Doug Brown**
USAF (ret), *Director*
Retired 4-star General US Army, former commander USSOCOM







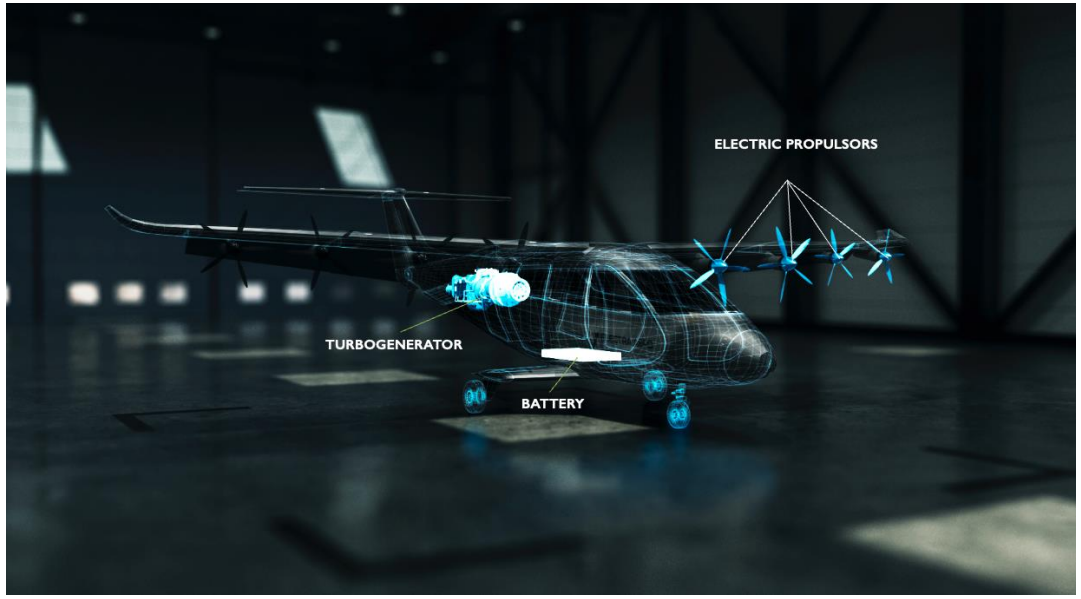


# How can we achieve this?

## Blown lift → ultra short takeoff


- Blown wing increases lift by >3x
- Take off and very slow speeds (~35 mph)
- 300x100ft ground footprint including margin

## Hybrid-electric propulsion → range




- All-electric propulsive power
- Hybrid-energy source (battery + turbogenerator)
- No infrastructure required

# Electra's eSTOL Aircraft

Operational flexibility of a helicopter with operating costs below conventional aircraft

+ Highly redundant propulsion & fly-by-wire flight controls (safer)

+ IFR & Flight Into Known Icing


**9** PASSENGERS
2,500 lbs + 1 Pilot

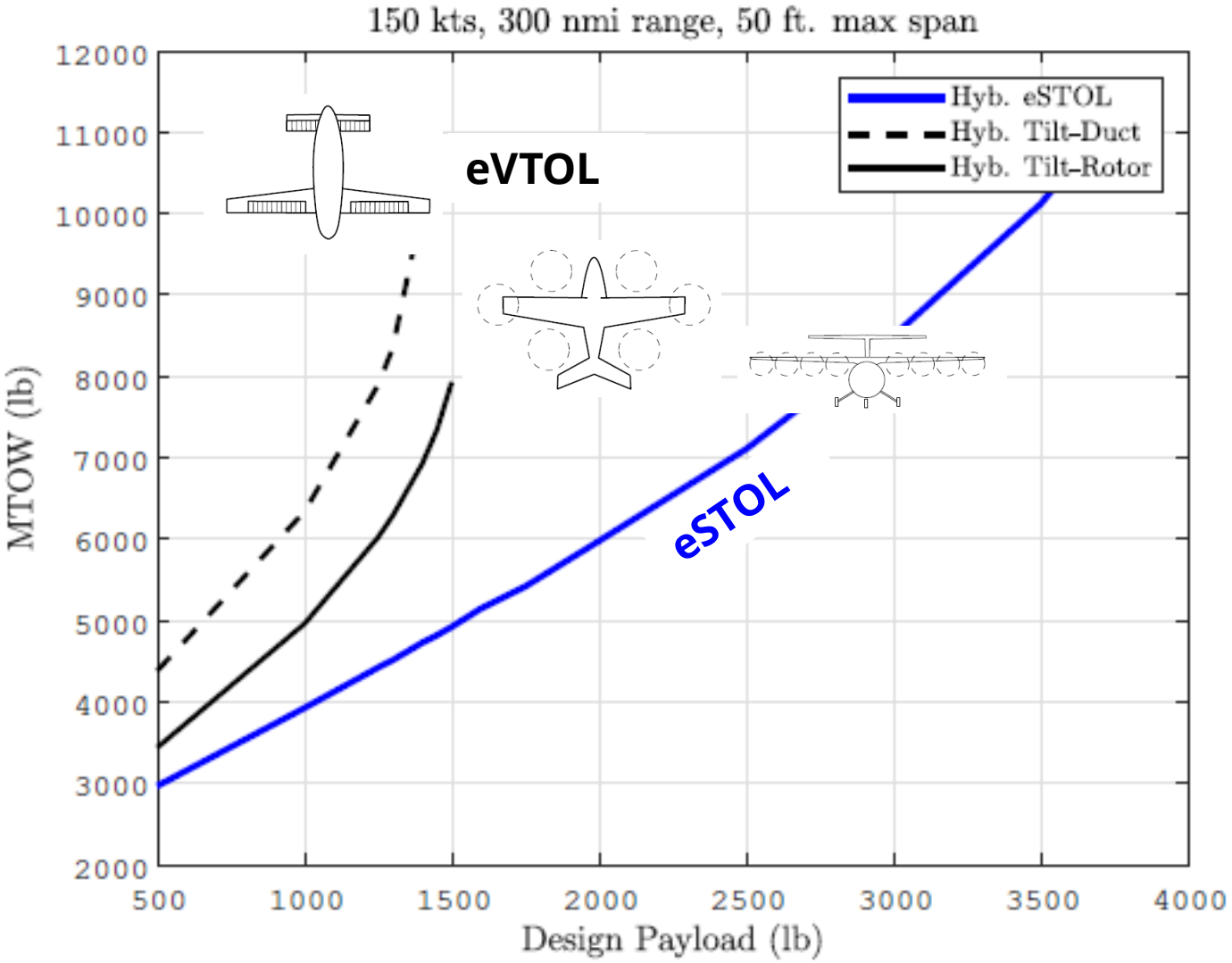
**500** MILES
@ 1,800 lbs
plus 45 mins reserve

**175** KTS
Cruise Speed
@10,000 ft

**300**FT **x 100**FT
Ground Footprint

**75** dBA AT **300**FT
Quiet Takeoff
@ max weight, sideline

# The technology tradeoff

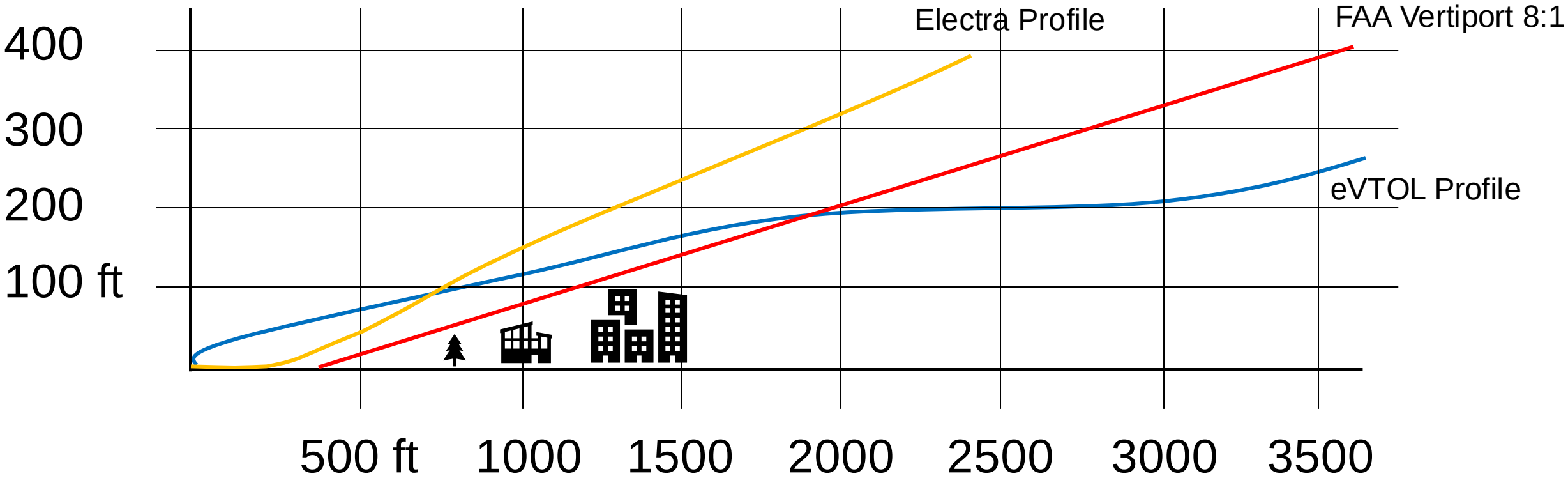



**2.6x payload increase** with eSTOL

**10.2x range increase** with hybridization

*Results from a new MIT paper entitled, "A Performance Comparison of eSTOL and eVTOL Aircraft" published by the American Institute of Aeronautics & Astronautics*

# But what about the takeoff/landing distance?



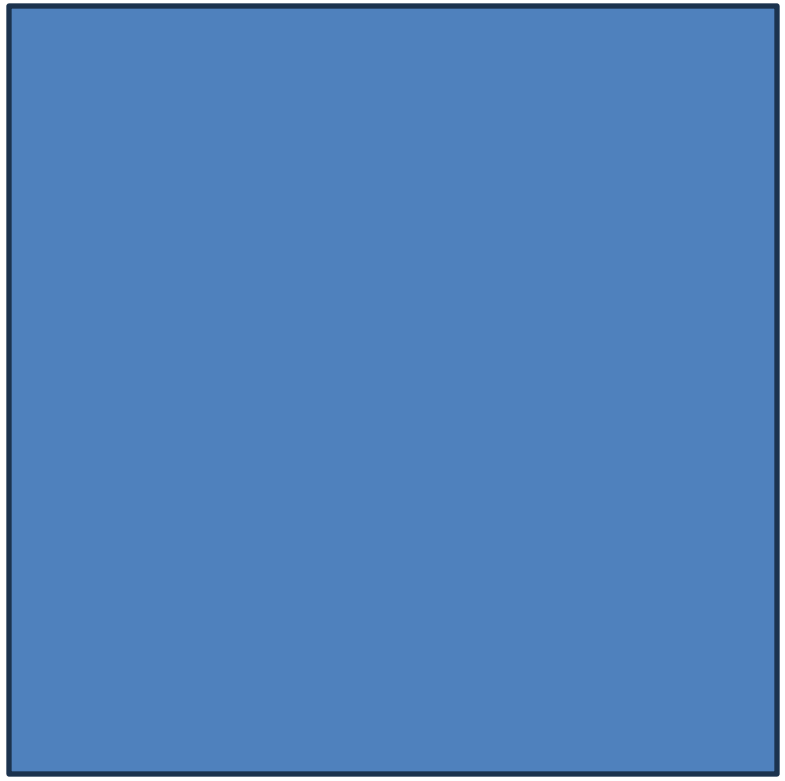

Our departure profile exceeds VTOL profiles

FAA Vertiport Design: https://www.faa.gov/sites/faa.gov/files/eb-105-vertiports.pdf
eVTOL Profile:https://ntrs.nasa.gov/citations/20220006729

# Why hybrid electric?

**Jet A/SAF (Electra)**

~12,000 Wh/kg

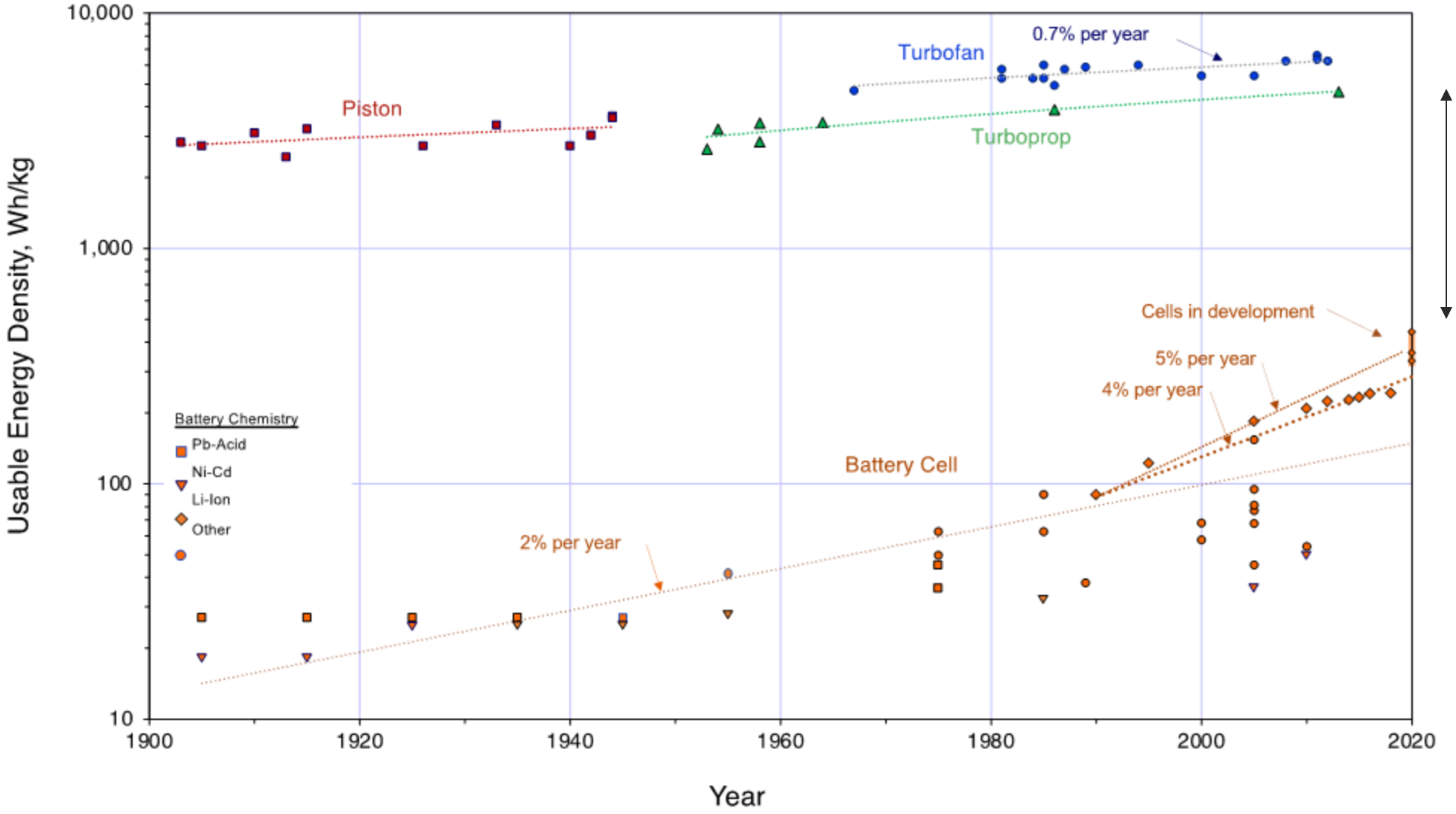


**Lithium Batteries**

~300 Wh/kg

Requires major charging infrastructure changes

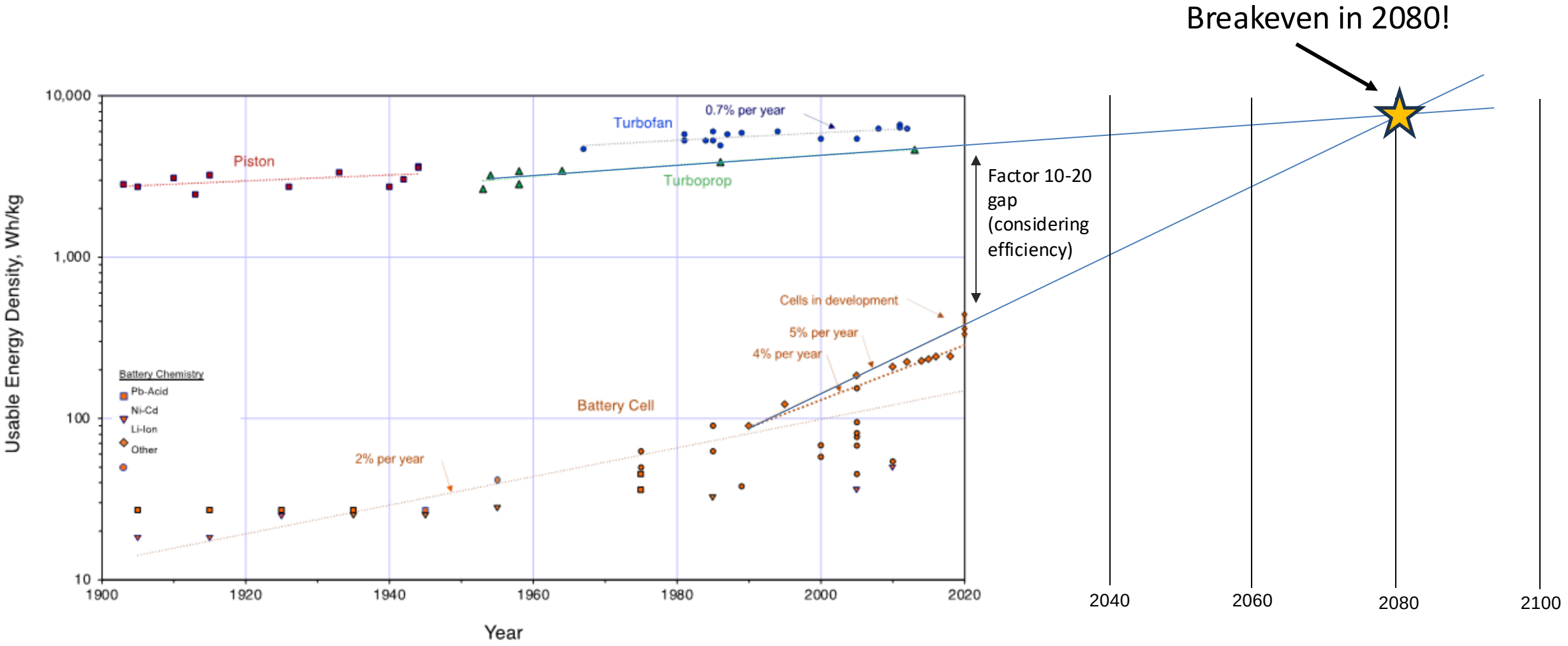
# Batteries are getting better…



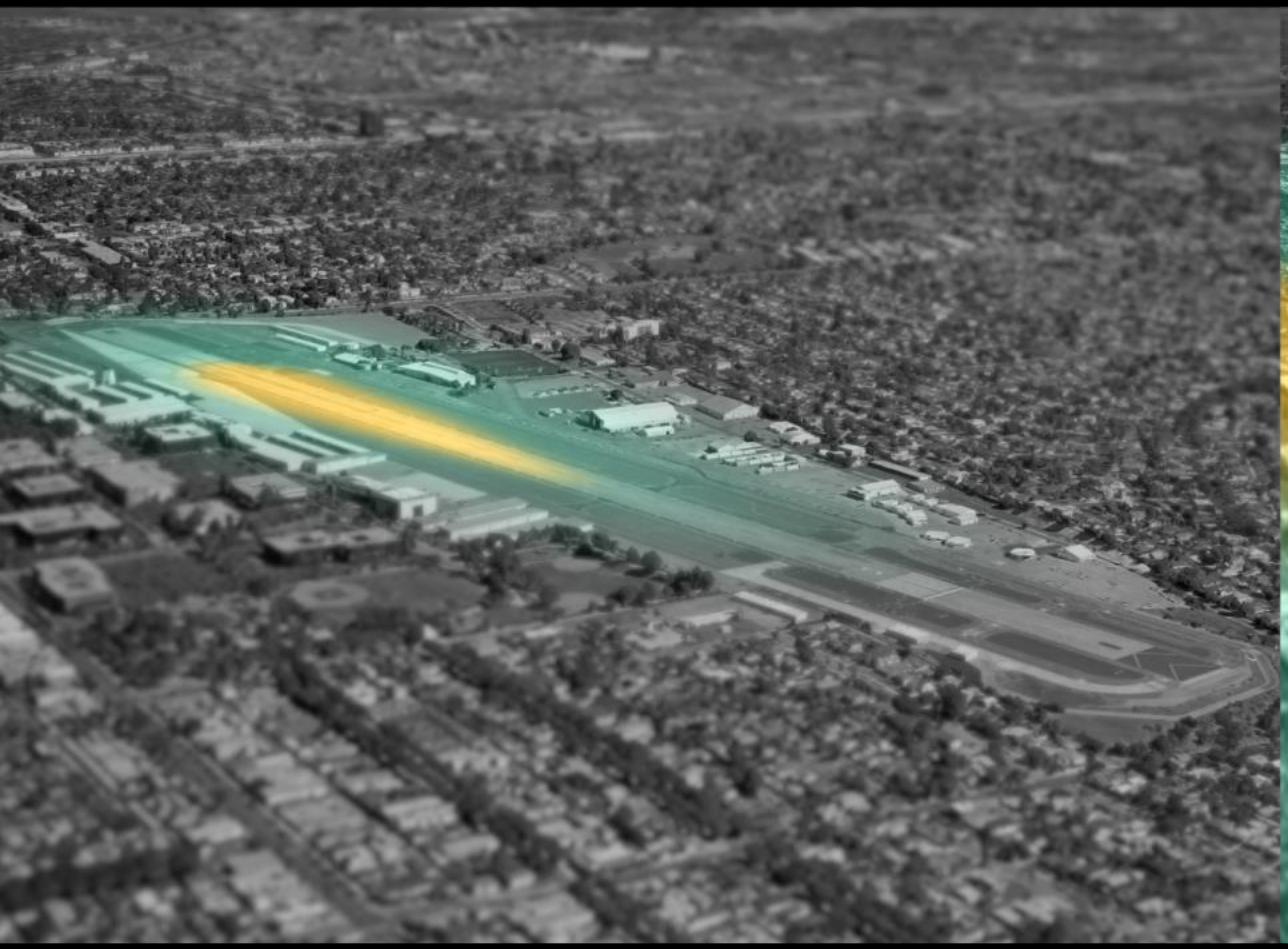

Factor 10-20 gap (considering efficiency)

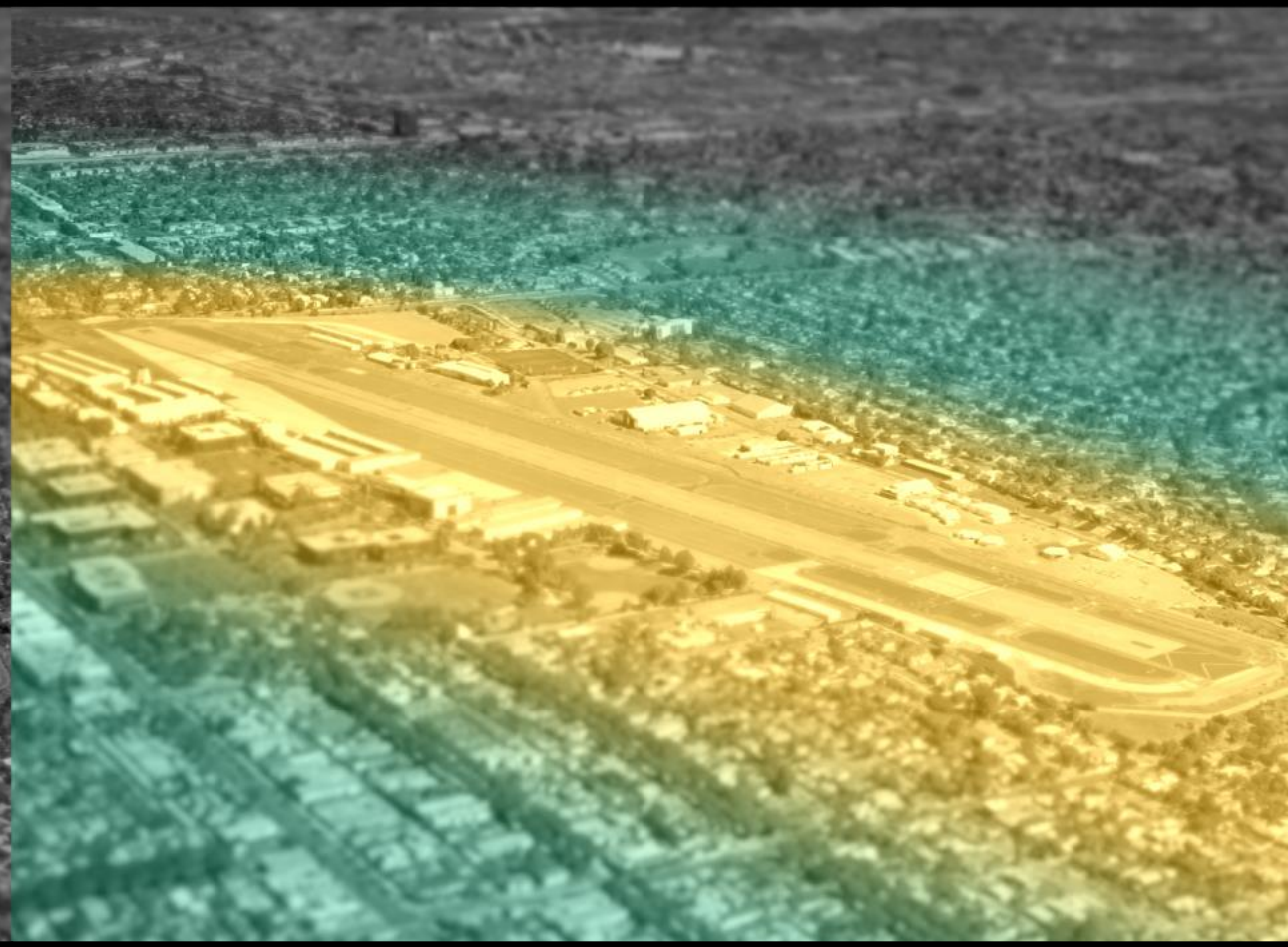
Source: Langford

# … but not quickly enough




Source: Langford





Green: 65 dBA contour
Yellow: 75 dBA contour

## eSTOL NOISE PROFILE

ELECTRA eSTOL

**SANTA MONICA AIRPORT**

Source: ANOPP2 models calibrated with test data

## CTOL NOISE PROFILE

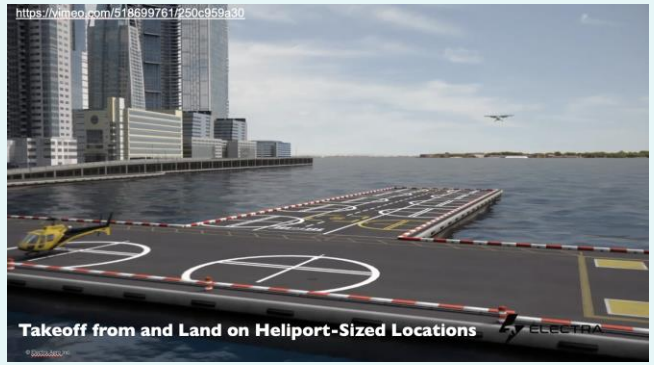
SINGLE ENGINE TURBOPROP

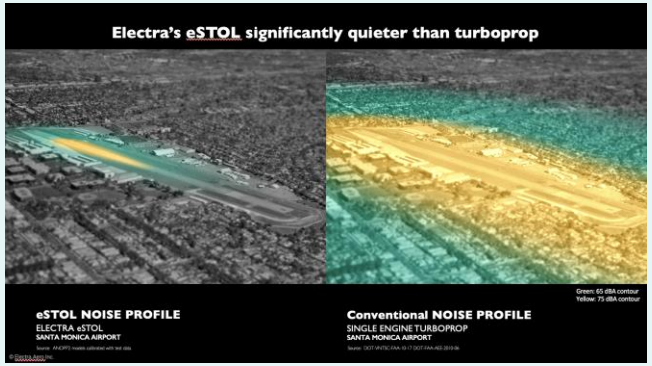
**SANTA MONICA AIRPORT**

Source: DOT-VNTSC-FAA-10-17 DOT-FAA-AEE-2010-06

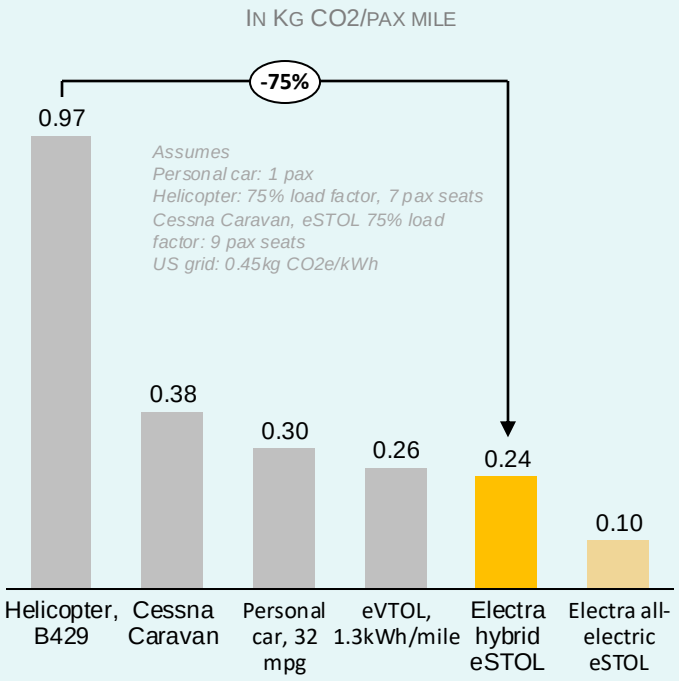
# Electra eSTOL value proposition

## Serve locations previously inaccessible due to runway or noise constraints



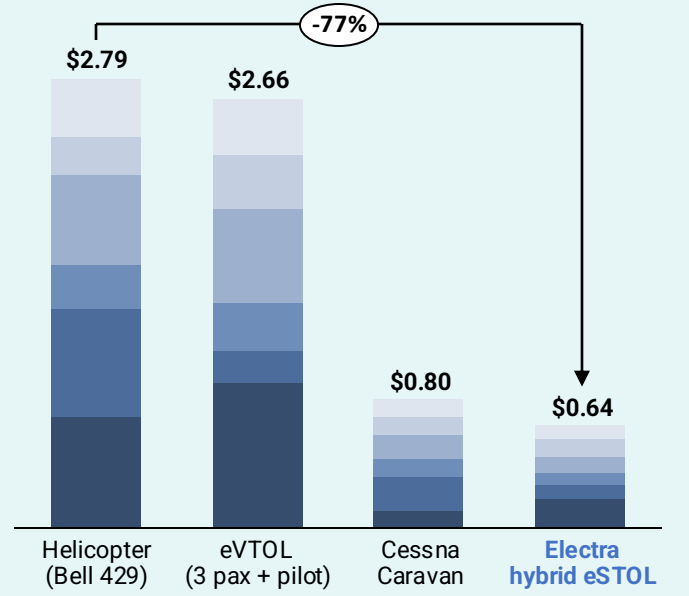

## Decarbonize transportation




- -75% over helicopter
- -30% over fixed-wing turboprop
- >20% over conventional car*

* Benefit increases with distance overhead on ground route and load factor

## Step reduction in operating cost




- -77% over helicopter
- -20% over fixed-wing turboprop

# Our initial market: Existing operators, flying existing routes, to existing airports.

Current in-service **fixed-wing aircraft** <20 seats **12,000**

de Havilland Beaver, 1947

de Havilland Otter, 1951

Cessna Caravan, 1985

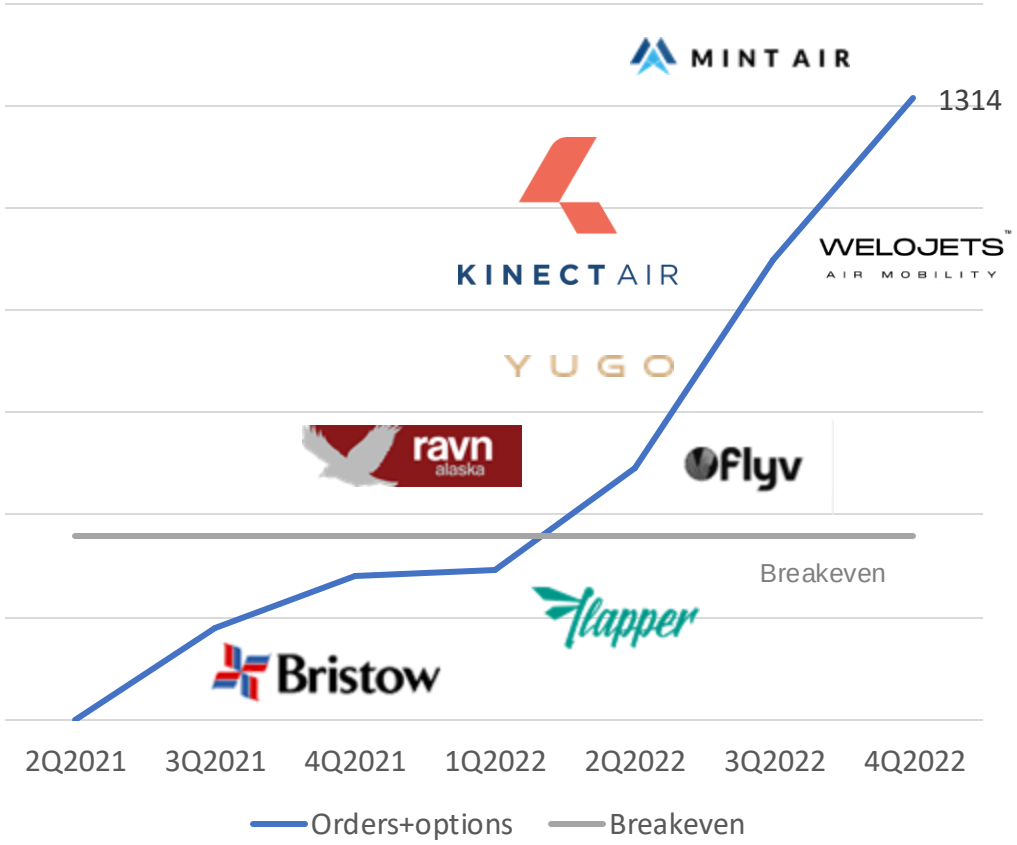
Current in-service **helicopters** (civil and commercial) **26,000**

Airbus H125

Bell 206

AW 139

Source: 2019 GAMA report




**Electra aircraft** pre-orders **1314**





*Note: Customer logo list not exhaustive*

# We are systematically reducing risk in a 5-stage process

Electra **founded**

2020

**Hybrid-electric propulsion** system

2021

2-seat **technology demonstrator aircraft**

2023

9-seat pre-production **prototype aircraft**

2025

**Certified product aircraft**

2028

LOCKHEED MARTIN

VIPC | VIRGINIA INNOVATION PARTNERSHIP CORPORATION

*Connecting Innovators with Opportunity*

BARZAN AERONAUTICAL

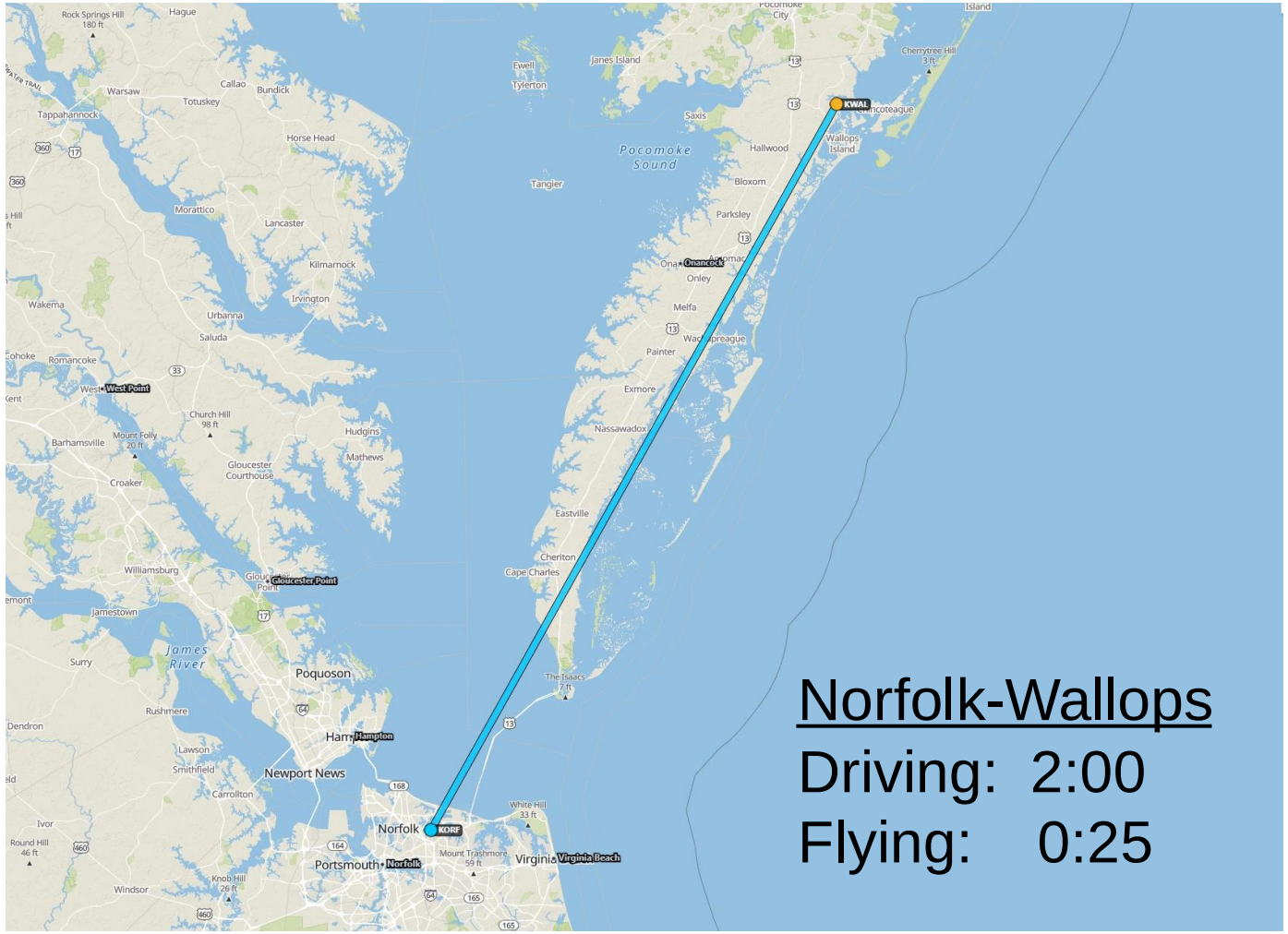
Statkraft

AFWERX


EL-2 Goldfinch First Taxi
Manassas, VA
2023/09/10

# Up Next: Planning Demos & Initial Routes






## Norfolk-Wallops

Driving: 2:00

Flying: 0:25

Where else should we go?

# If you only remember three things from today…

1. AAM includes hybrid electric and regional aircraft

2. Hybrid electric aircraft like Electra's eSTOL have regional range, require no new infrastructure, and get you closer to where you want to go

3. You can save time and money with aircraft while being a good neighbor to the community and steward of the environment

# Thank you


**JP Stewart**
VP & GM

✉ Stewart.James@electra.aero

**www.electra.aero**

# Electra Board of Directors and Advisors with deep ties into the commercial and aerospace defense markets

**John Langford**
Electra.Aero *CEO, Director*
*Founded & led Aurora and Athena, member National Academy of Engineering, former AIAA president*

**Paul Kaminski**
Independent Director
Former Undersecretary of Defense for Acquisition and Technology, Recipient of National Medal of Technology

**Laura Ott**
Barzan Aero, *Director*
former Deputy Assistant Secretary for Legislation US Dept of Health

**Doug Brown**
USAF (ret), *Director*
Retired 4-star General US Army, former commander USSOCOM

**Peter Joseph**
*Director*
Chairman of Trenton Biogas, former private equity investor

**Kirsten Bartok Touw**
*Director*
Managing Partner, AirFinance Co-founder New Vista Acquisition Corp.

**Jim Albaugh**
*Advisor*
Former CEO Boeing Commercial, serves on board of American Airlines and Howmet

**Allan McArtor**
*Advisor*
Former Chairman, Airbus Americas, FAA Administrator, FedEx senior mgmt.

**Jeff Cunningham**
*Board Observer*
Investment Manager Lockheed Martin Ventures

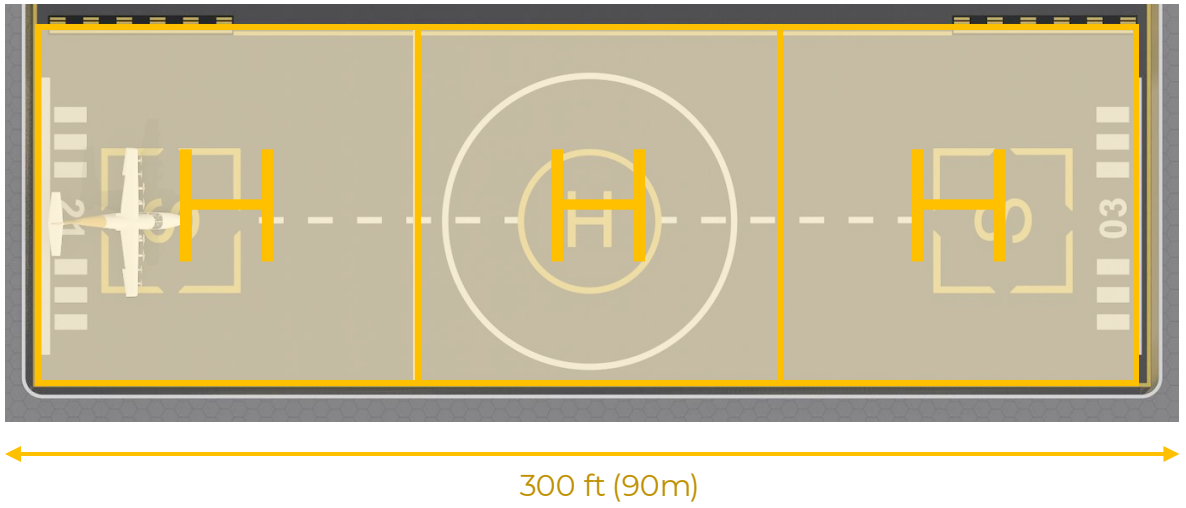
**John Hardwick**
*Board Observer*
CEO Barzan Aeronautical

**Ike Kier**
*Board Observer*
Founder & CEO KG Funds Management, technology and impact investor

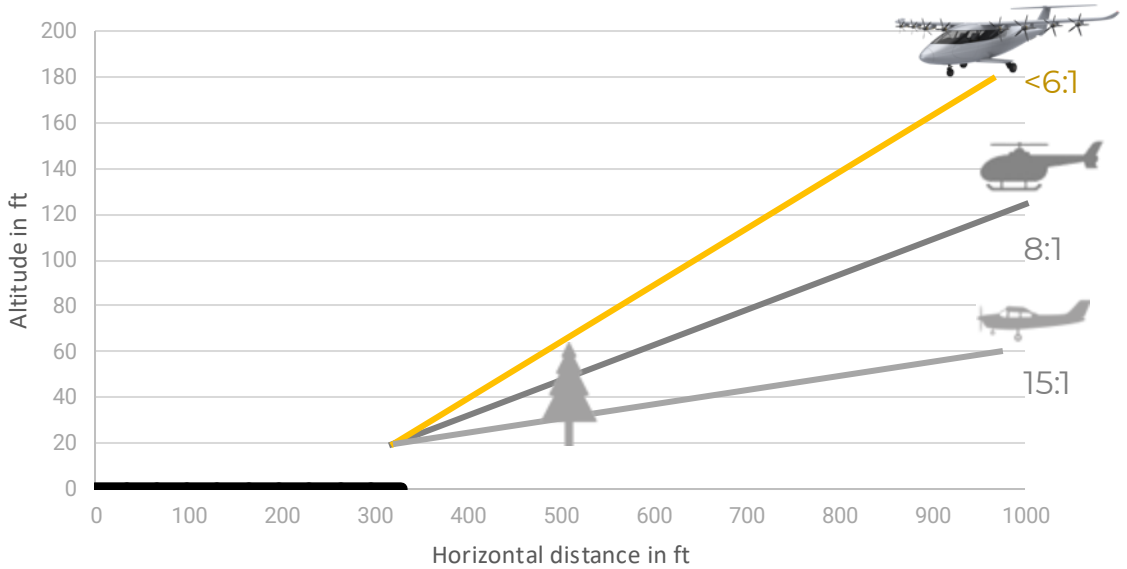
**Marco Rubin**
*Board Observer*
Investment Director, Virginia Innovation Partnership Corp.

**Mallory Elbert Langford**
*Observer*
Manager, Langford Industries President, Estes Industries

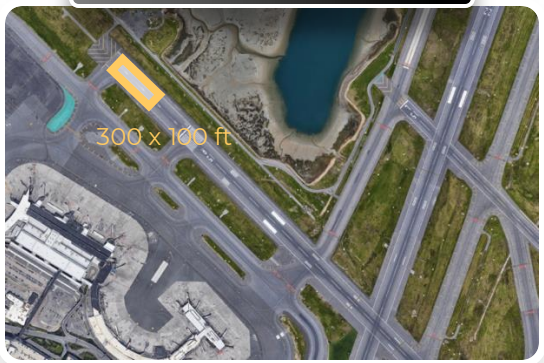
# Blown-lift allows Landing in Space-constrained Areas




Protected surfaces: Can exceed criteria used for design of heliports




Small and large airports




Non-interfering procedures with large aircraft

Existing heliports


Manhattan, NY

New STOLports/Vertiports

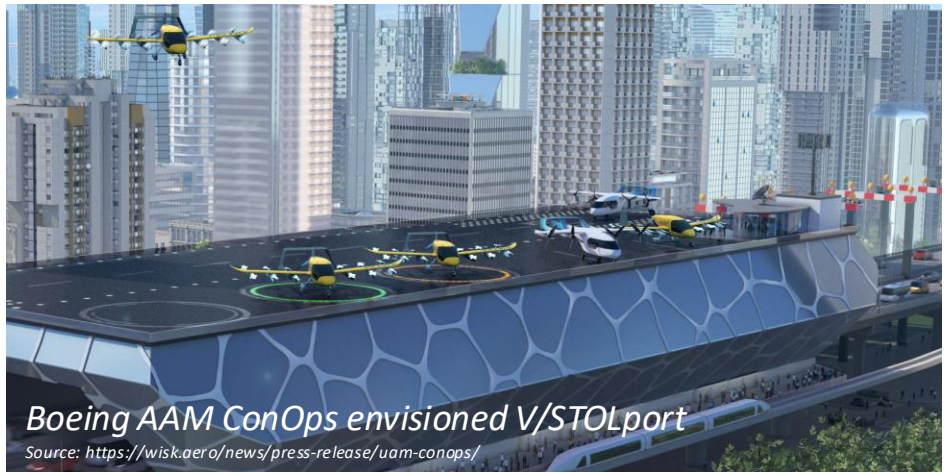

Rooftop parking garage

Unprepared locations


Access roads, soccer fields

No ground infrastructure needed to start – no charging stations, etc.

# Envisioned UAM infrastructure with sufficient space to accommodate eSTOL

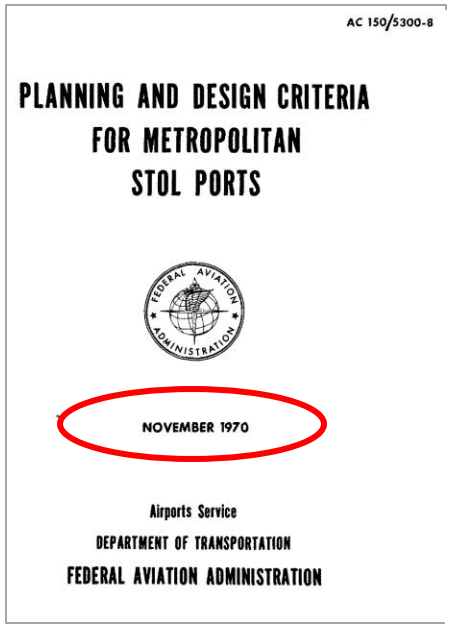


*Boeing AAM ConOps envisioned V/STOLport*

Source: https://wisk.aero/news/press-release/uam-conops/

*Envisioned vertiport for regional air mobility*

Source: https://www.airport-nuernberg.de/de/2022/air-mobility-initiative-schafft-grundlagen-fur-elektrischen-luftverkehr-der-zukunft-05cb92a8ff875d79



AC 150/5300-8

PLANNING AND DESIGN CRITERIA FOR METROPOLITAN STOL PORTS

NOVEMBER 1970

Airports Service

DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

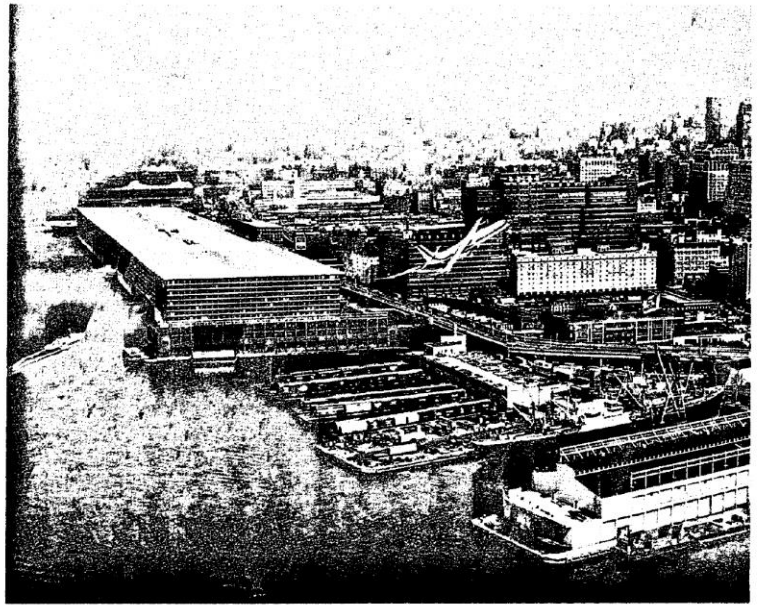


FIGURE 1. Potential New York STOL Port


*Proposed "Skyport" in Brisbane to serve 2032 Olympics*

Source: https://brisbanedevelopment.com/australian-first-electric-air-taxi-hub-planned-in-brisbane-for-2032-olympics/


# ELECTRA BUILDS ELECTRIC AIRPLANES THAT MAKE SENSE