



Hybrid Electric Propulsion: Powering The Next Era of eVTOL

A sustainable future for all air travel, with energy-optimized aircraft that make flying clean, quiet, and affordable
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Re-powering Aviation

Energy-optimized airplanes by using electric propulsion where most impactful



UNLOCKING POTENTIAL

Pragmatic building blocks approach

Advanced Technology Applications:

- Advanced Air Mobility (AAM & RAM)
- Distribution of Electric Propulsion (DEP)
- Boundary Layer Ingestion (BLI)
- Rotor-Wing aero-propulsion integration
- Propulsion-based Flight Controls
- Low noise propeller and jet design
- Light weight energy storage

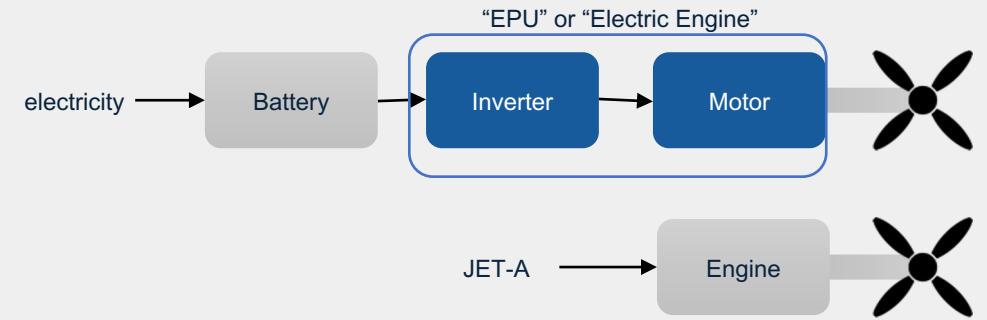
Ampaire: Vision Turns to Reality



Hybrid Architectures to Energy-Optimised Aircraft

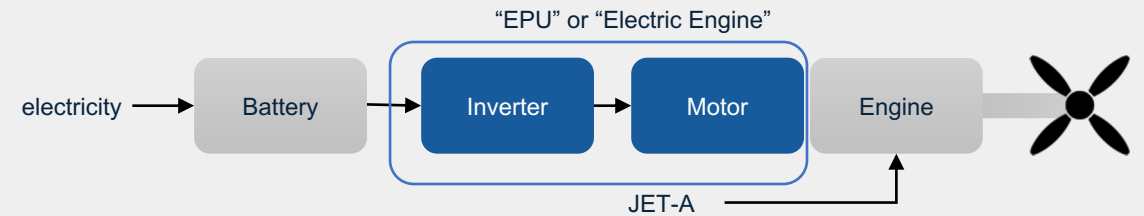
INDEPENDENT PARALLEL HYBRID

- More efficient JET-A path
- Potential JET-A engine certification advantages
- Charging infrastructure necessary
- May need re-winging
- More challenging to scale into a product family



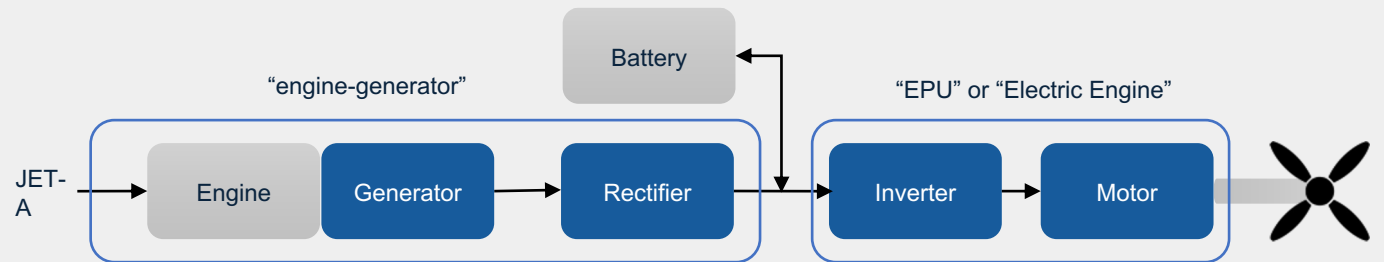
INTEGRATED PARALLEL HYBRID

- More efficient JET-A path
- Lowest weight
- Mechanically more challenging to implement



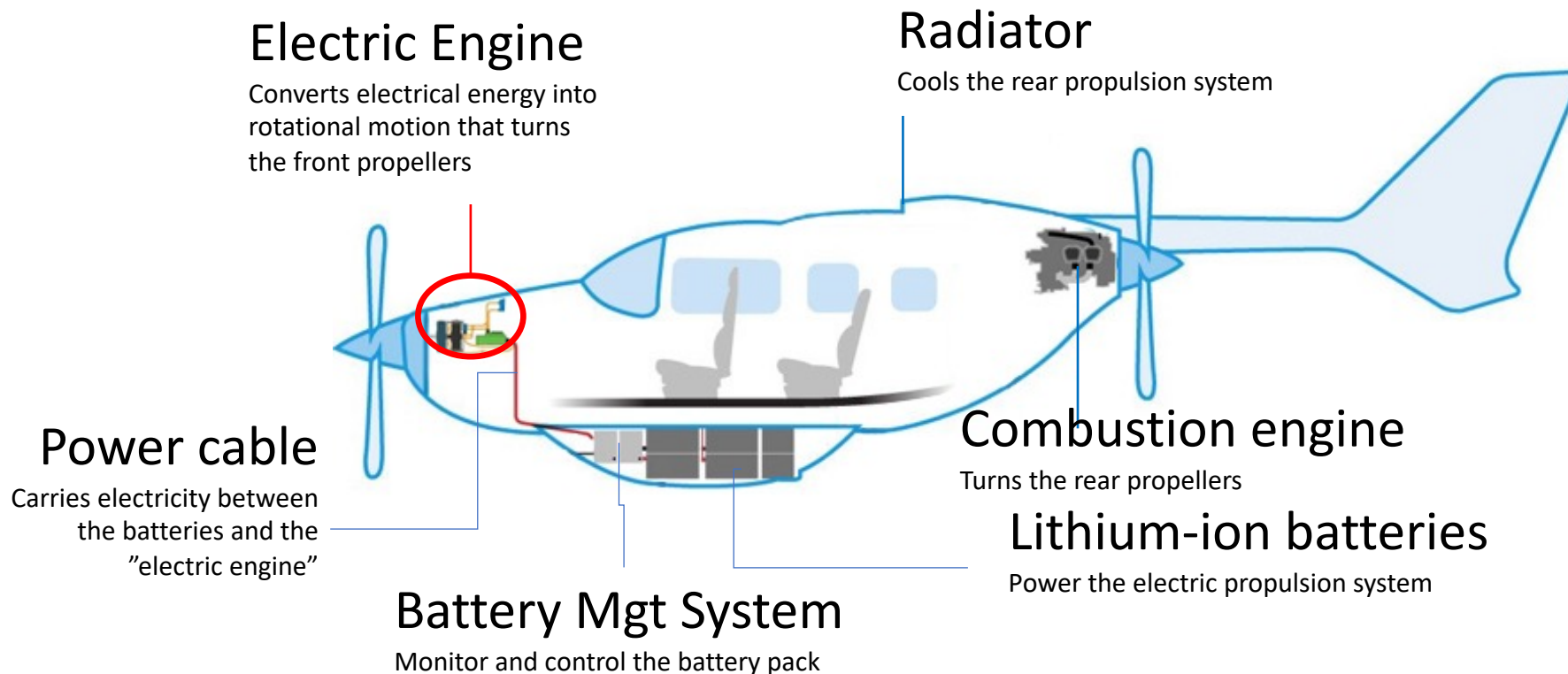
SERIES HYBRID

- More flexible / scalable
- Better for distributed propulsion
- Less efficient Jet-A path



Hybrid architectures enable battery power to be used for the entirety of a mission, with unused fuel retained for emergency reserves

Ampaire's Prototype Hybrid Flying Testbed 337EE



<u>Flight</u>	<u>Fuel savings</u>	<u>Average trip range</u>
Scotland Flights	38%	61 nm / 113 km RT
SW England Flights	37%	126 nm / 233 km RT
Ferry Flight	33%	418 nm / 774 km

- 100% Dispatch Reliability
- 20,000+ miles flown to date (three hybrid airplanes)
- 1,135 nm single charge / refuel flight demonstrated



Ampaire's Eco Caravan

First flight Nov 18th, 2022



*50-70% fuel savings / emission reduction
unlocks Dramatic expansion of capabilities*

Enter in service 2025

Fuel Economics

Aircraft	ATR72 - 500	Q-400 / Dash 8	Dornier 328	Beechcraft 1900D	Caravan /Cessna 208	Eco Caravan (Ampaire's Hybrid)	PC-12 /Pilatus	Quest Kodiak	Pipistrel Taurus G4
1 st Flight	1997	1998	1991	1982	1982	2022	1991	2004	2011
PAX	70	78	32	19	9	9	9	9	4
pMPG (L / 100 km)	93 (2.53)	68 (3.46)	49.4 (4.76)	35.8 (6.57)	32 (7.35)	107 (2.20)	41.6 (5.66)	37.5 (6.28)	403.5 (0.58)

For reference:

- Toyota Prius: 53 ~ 58 MPG
- Chevy Bolt EV: 120 MPGe
- Tesla Model 3: 132 MPGe, Model Y: 129 MPGe

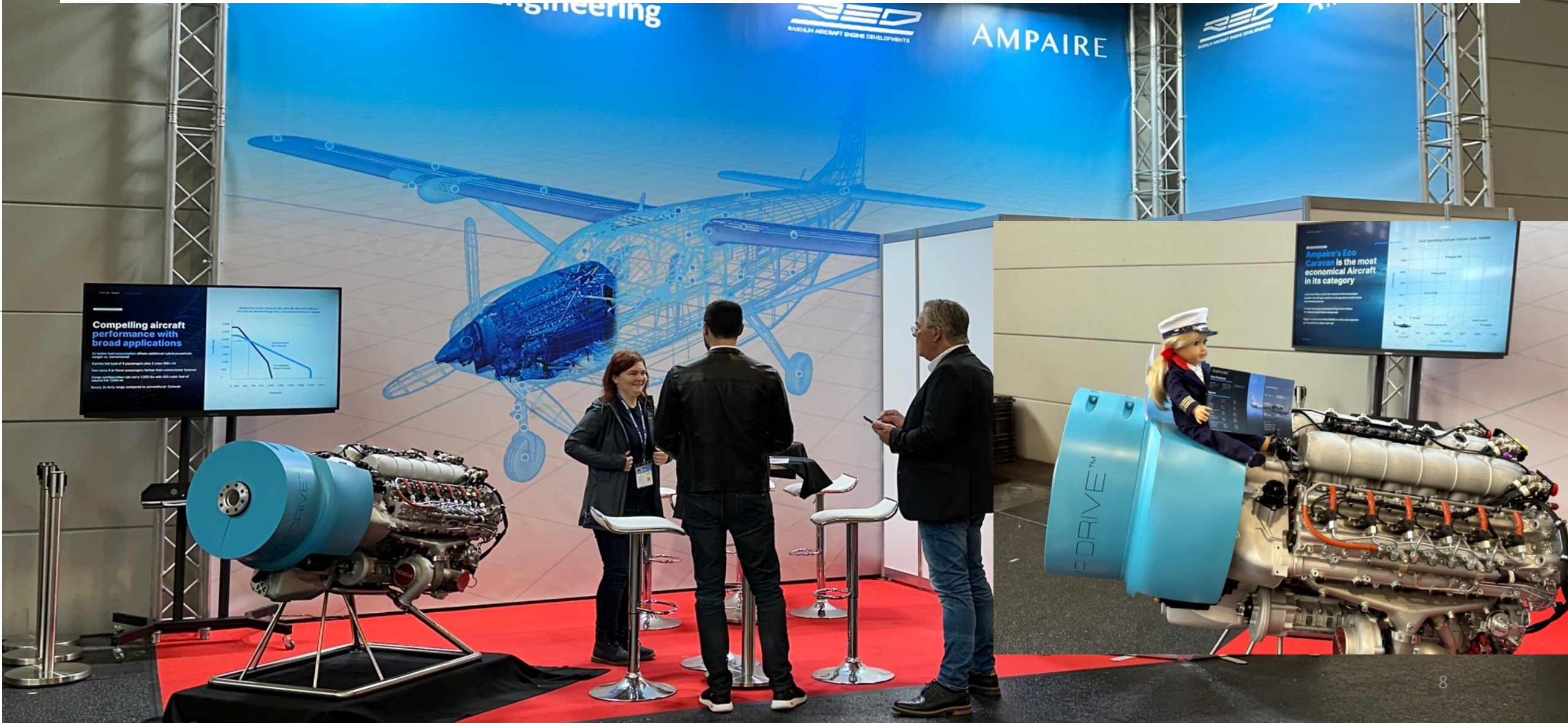
pMPG = passenger MPG
(load factor assumed 100%)
MPGe = equivalent MPG

Source: https://en.wikipedia.org/wiki/Fuel_economy_in_aircraft

MPGe: calculated using EPA's 2000's def, 33.7 kwh of electricity equivalent to 1 gal of fuel in energy

Working with Global Partners

AMP Drive™ (AMP-H570) Collaboration with RED



Aircraft Scaling Roadmap

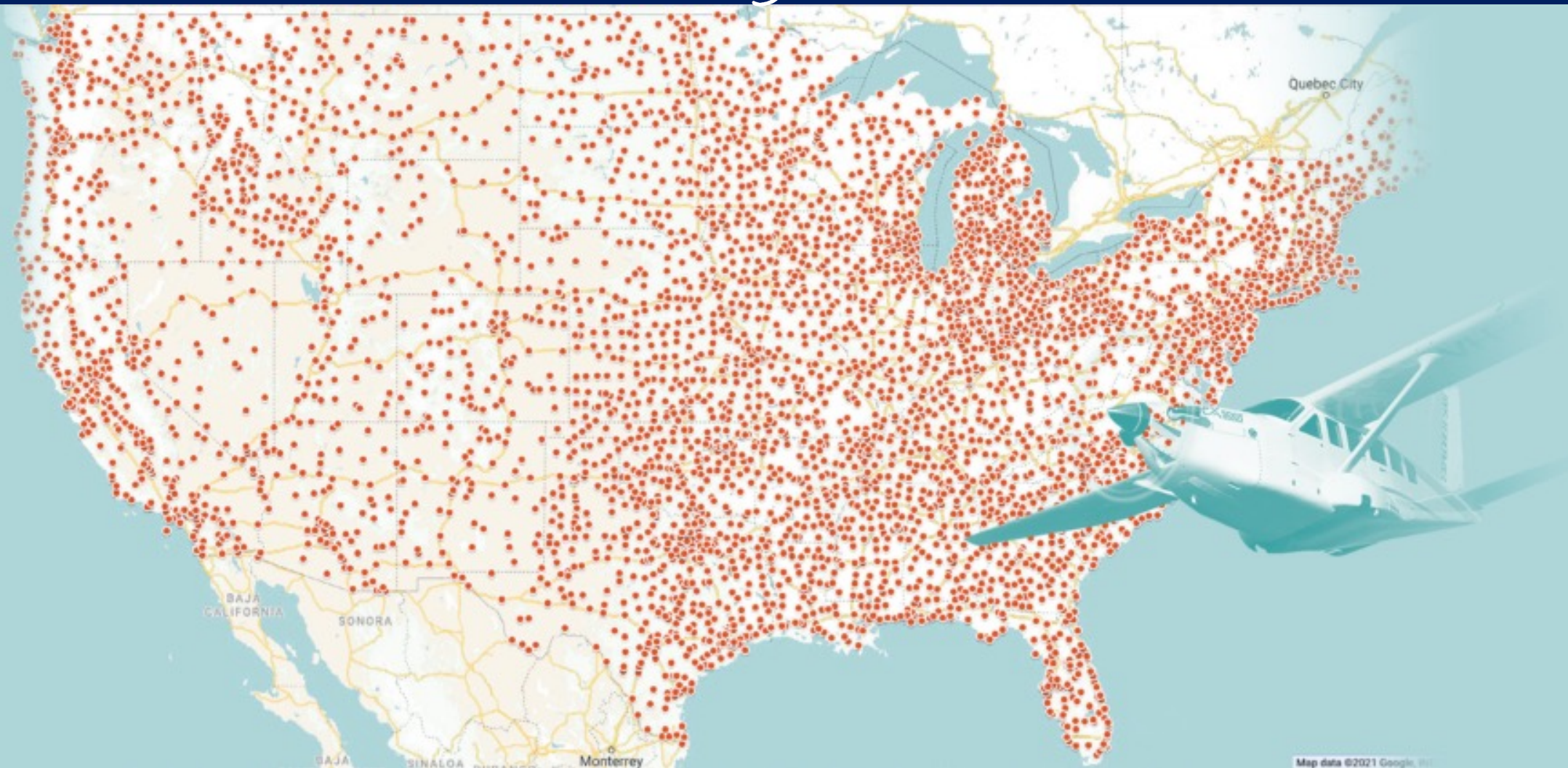
AMP Drive™

					
2025	2026	2027	2028	2030+	2035+
9 seats	10 to 19 seats	2 to 5 seats	30 to 76 seats	150 to 200 seats	9-19 seats
Hybrid	Hybrid	Hybrid	Hybrid	Hybrid / Electro-Jet	All-Electric
AMP-H5XX	2 X AMP-H5XX	AMP-H2XX	4 X AMP-H5XX	1 x AMP-H 20M 14 X AMP-E14XX	AMP-E14XX
300+ NM	300+ NM	300+ NM	500 ~ 1,000 NM	1000 ~ 2,500 NM	200+ NM
Caravan, Kodiak	Twin Otter, King Air	UAS, SR22, Stationair, Skylane	Do328, ATR42/72		

Dual vehicle eVTOL - Mid-Air docking of two aircraft: Lift vs. Cruise



Airports of the U.S: National Plan of Integrated Airport Systems (NPIAS) 1946



Goal: all of the United States' population would live within 20 miles of one.
5,000+ airports in US

Take Aways

- **Hybrid unlocks a dramatic expansion of eVTOL capabilities**, including meeting the performance needs and infrastructure constraints for key early markets such as government operators and customers in remote areas
- **Hybrid electric propulsion systems are proven** in flight and iron bird tests with applications to eVTOL
- **Hybrid propulsion systems have much lower fuel burn** and operating cost and even higher payload on most missions than competing turboelectric systems, as well as being far more suited to the high cycle and short distance operations required by eVTOL platforms
- Hybrid does not necessarily mean burning fuel and is **not a stopgap**
- Hybrid architectures enable **battery power to be used for the entirety of a mission**, with unburned fuel retained for emergency reserves

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