



ZUNUM Aero



jetBlue

technology
ventures.



SAFRAN
AEROSPACE · DEFENCE · SECURITY



Clean Energy
Fund

Breakthrough ZA10 aircraft for delivery starting 2023



Operating cost

8¢/seat mile



Passengers

6 exec - 12 econ



Max range

700 miles



Max cruise speed

340 mph



Take-off distance

2,200 ft

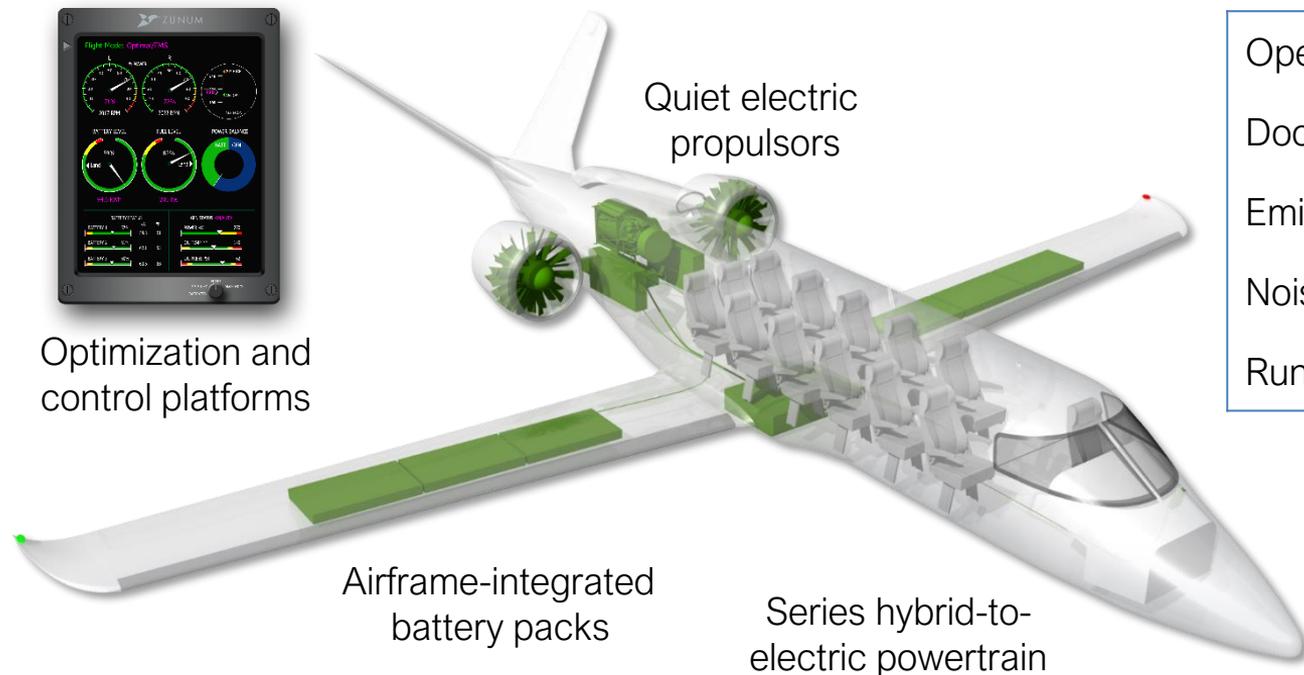
Hybrid to all-electric air for high-speed regional transit

Extending from 700 miles in 2023 to 1,500 miles in 2035



Optimization and control platforms

Quiet electric propulsors



Airframe-integrated battery packs

Series hybrid-to-electric powertrain

Operating costs	⬇️ 60-80%
Door-to-door	⬆️ 2-4x faster
Emissions	⬇️ 80-100%
Noise	⬇️ 80%
Runway	⬇️ 50%

Fast, affordable, and everywhere!

Disruptive
economics

60 to 80%
lower costs

Fly to every
community

40,000
airports

Get there
much faster

2 to 4x
door-to-door

Zero emissions
short-haul*

Quiet and
green

Scaling to 80% of departure and 50% of emissions



2027: ZA50
1,000 miles
50-60 passengers

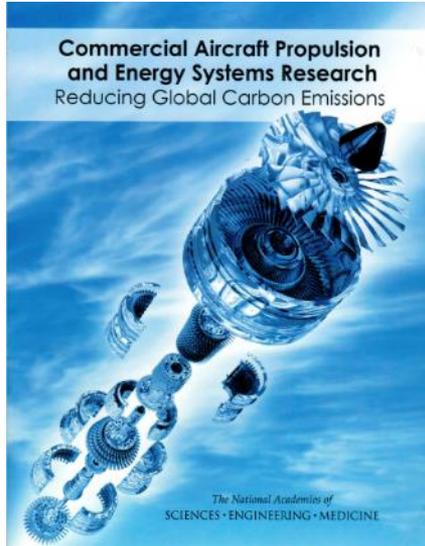
2030+: ZA100
1,500 miles
100 passengers

2023: ZA10
700 miles
6-12 passengers

**Disruptive economics
over short-haul**

2017 was the year that electric aviation ‘tipped’ – and Zunum played a significant role

2016



National research agenda should lower priority assigned to programs that are developing high-power batteries, fuel cells, and superconducting motors

2017



Addressing a vast transport gap over regional ranges

Driven by 70-year shift to large airliners serving fewer hubs



96% of air traffic
in 1% of airports

Air



96% of regional
trips on ground

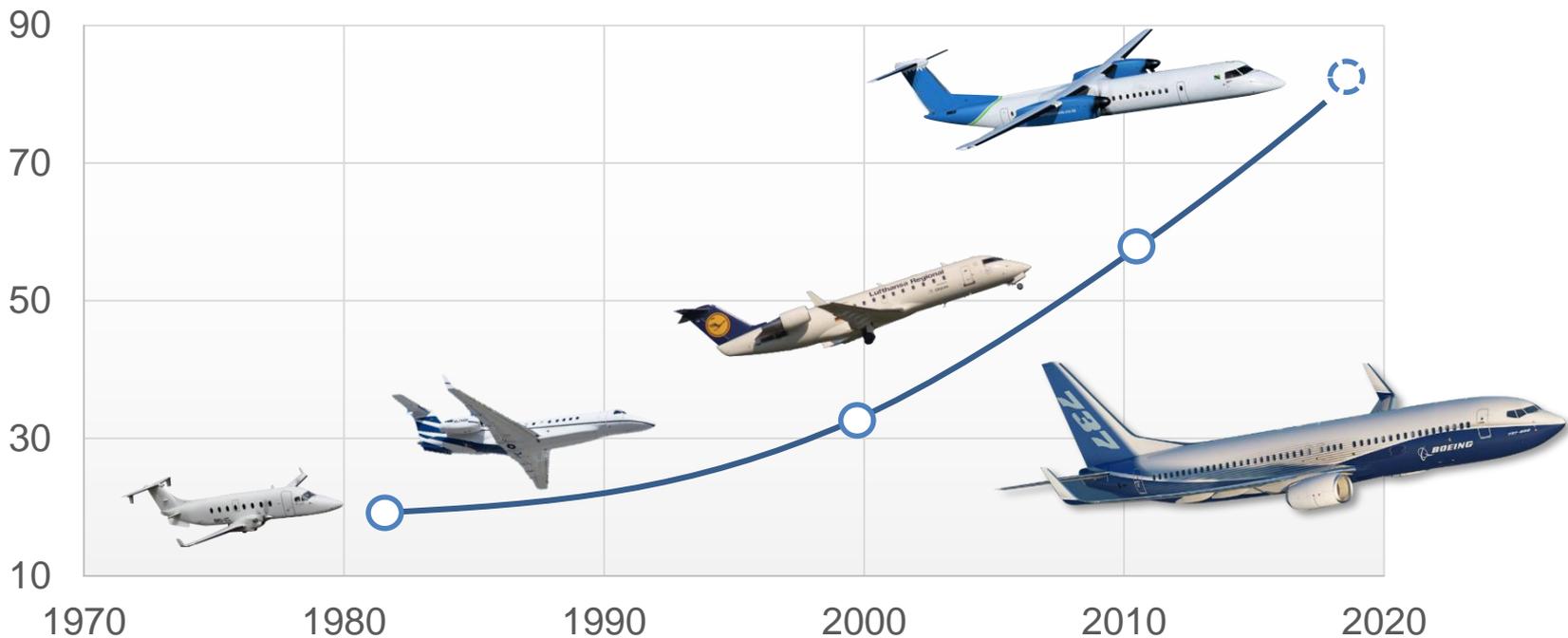
Door-to-door times worse today
than 50 years ago

1,000s of communities without
high-speed links

Inflexible and capital-heavy
alternatives, e.g., HSR

Regional has seen a shift to larger aircraft & longer ranges

Evolution of the U.S. regional fleet (seats)



Building on the 1970s U.S. short-haul air system

“We envision a short-haul system capable of operating from every runway and urban area V/STOL port in the United States and very comfortable in an environmental sense”

John Shaffer, FAA Administrator, 1970

- U.S. DOT 20-year strategy targeted short-haul air
- \$800M investment in an innovative short-haul air system:

US Government

- US DOT
- FAA
- NASA
- US Air Force
- US Army
- Universities

Aerospace OEMs

- Boeing
- McDonnell Douglas
- Lockheed
- DeHavilland
- Grumman
- General Dynamics

Major airlines

- PanAm
- American
- Eastern
- Florida

- Halted due to 1973-74 oil crisis, poor economy

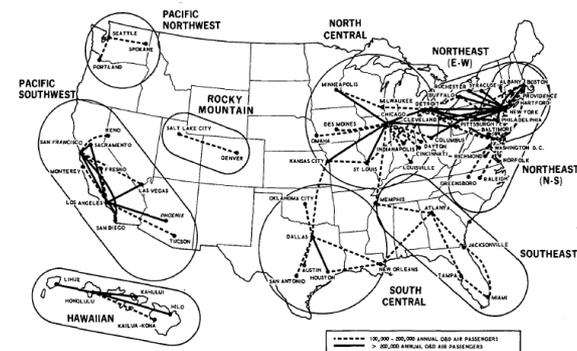


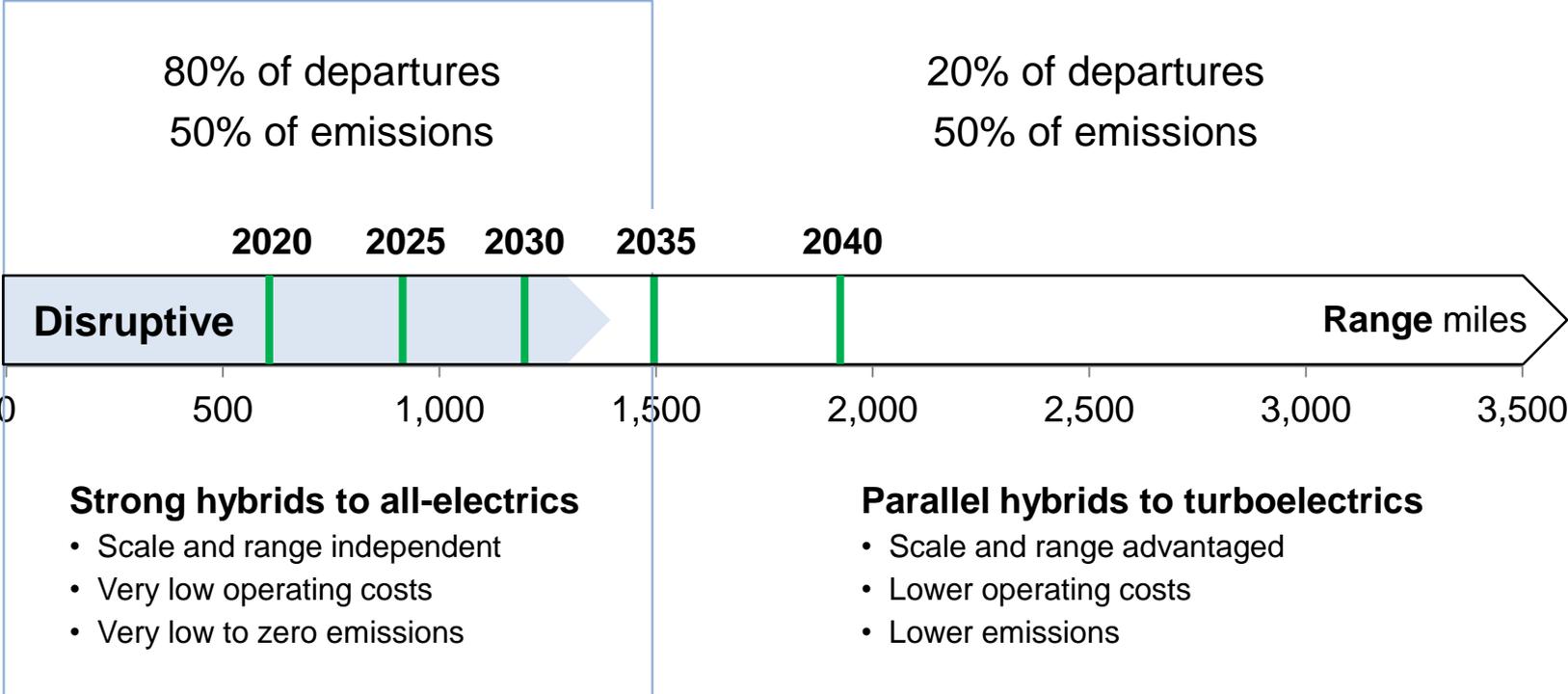
Figure 4. 1970 High Density Short Haul Air Transportation Regions

Reducing door-to-door times by factors of two to four



Extending to address all short-haul air by 2035

Zunum Aero focus



On track for first flight in 2019 and delivery in 2023

2013 ... 2016 2017 2018 2019 2020 2021 2022 2023 ... 2027



Ground testbed



Flying testbed



Conforming prototype



Certified

50-seat regional

FAA/ASTM Electric aircraft group

FAA engagement

Certification basis closed

Type Certificate application

Partners



Rapid prototyping underway, leveraging rich ecosystems



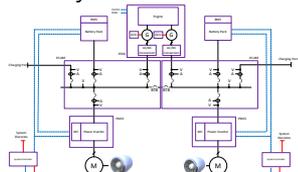
All key technologies in prototype or test for flight in 2019

Hybrid-to-electric controller: In test



Optimization and control platforms

Power system: In simulation and test



Hybrid-to-electric powertrain

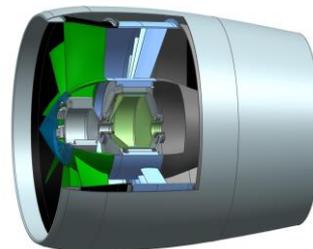
Testbed aircraft: N8445C purchased



Ardiden-3Z Partnership closed

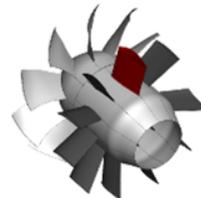


Turbogenerator



Quiet electric propulsors

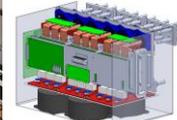
Quiet fan: Fabricated for test



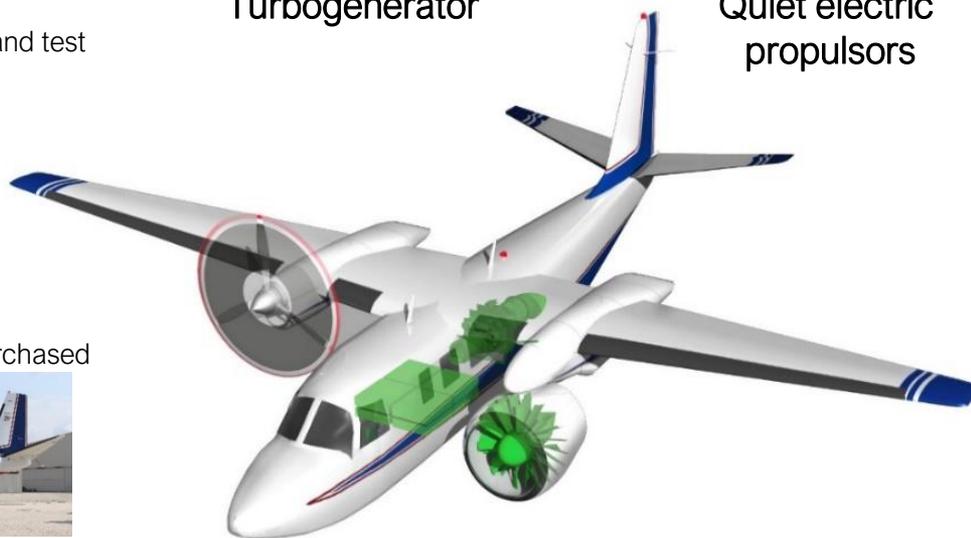
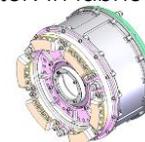
Propulsion thermal system: In test



500kW Power electronics: In test



500kW Electric motor: In fabrication



World-class launch customer and turbogenerator partner

 JET SUITE



- Orders for upto 100 aircraft for charter (JetSuite) and scheduled (JetSuiteX)
- Scaling nationwide with financing from leading global airlines

 **SAFRAN**
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- Ardiden-3Z turboshaft tailored for Zunum 500kW turbogenerator
- Long-term development-sales-service contract, offering disruptive economics

Legislative progress in the US and Europe



- 18-month engagement with Norway led to goal of all-electric short-haul by 2040
- Extending to all Scandinavia/Baltics



- Zunum zero emissions air to 1,000 miles in Senate; new Electrification incentives in draft
- Proposed LINK-Air act of Washington; the WA DOT-led Electric Aircraft Working Group



GA expansion;
Green drive



UDAAN and
make in India
schemes

