



# A Roadmap Towards Environmentally Sustainable Aviation

September 2022

# The World is Witnessing the Transition to Electric Aviation



**Our Vision**  
A clean electric future



**Our Mission**  
To decarbonize aviation through  
Electrification



Our team is a diverse mix of visionary dreamers, grounded engineers, practical doers and technical experts who come from all walks of life



# magniX

- Headquartered in Everett, WA
- Extensive experience in all aspects of aviation, power electronics, electric motors and applications
- magniX has assembled a strong leadership team comprised of ex Rolls Royce, Pratt & Whitney, Safran, Embraer, Honda Aircraft, Gulfstream, and Viking leaders
- 24 nations represented within our company



Our team arrives at work each morning with passion for what we do and why we do it. We believe that the impossible is possible.



# The magniX vision for the future

## Decarbonization of Aviation

magniX sees a future of where small and medium aircraft become electric and hybrid powered

## Shift in How We Fly

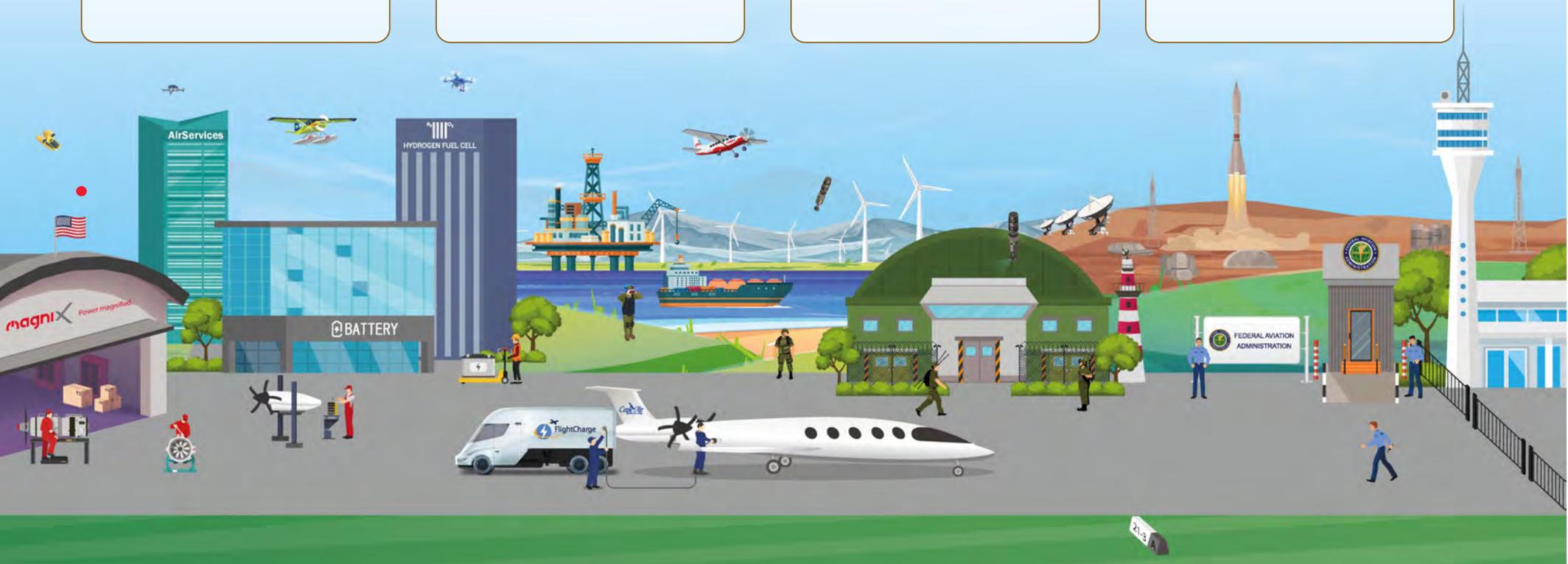
Shift away from large transport hubs to regional based distributed network

## More Affordable Air Travel

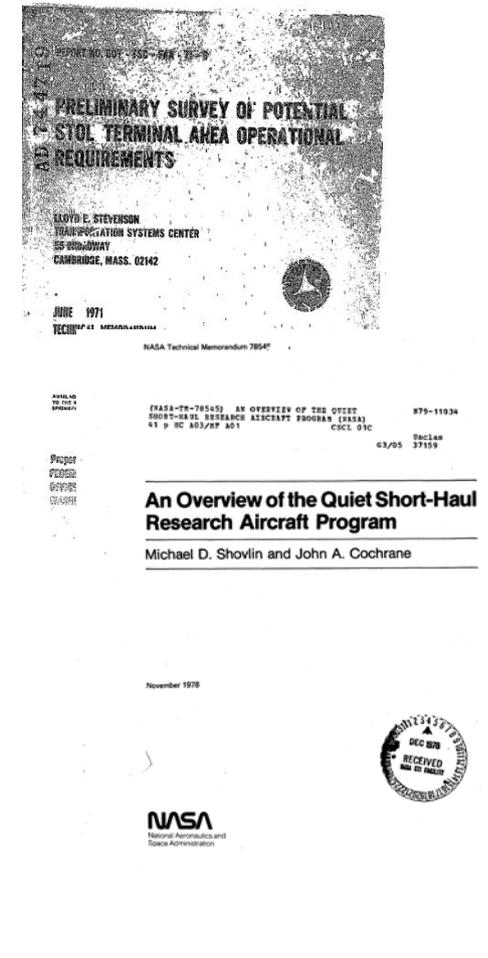
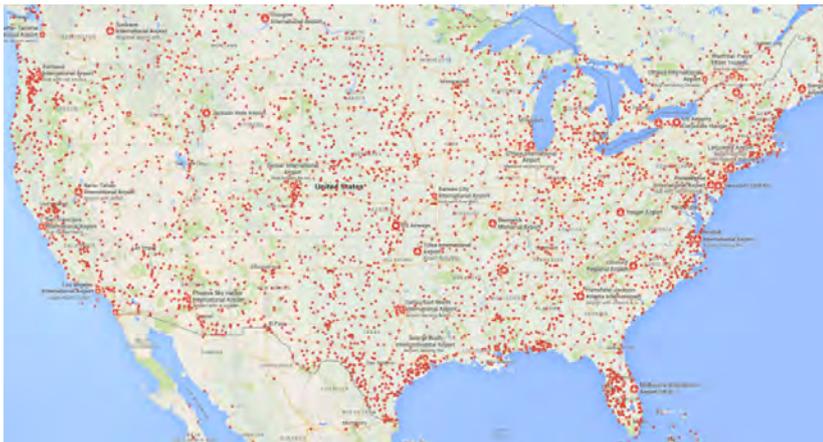
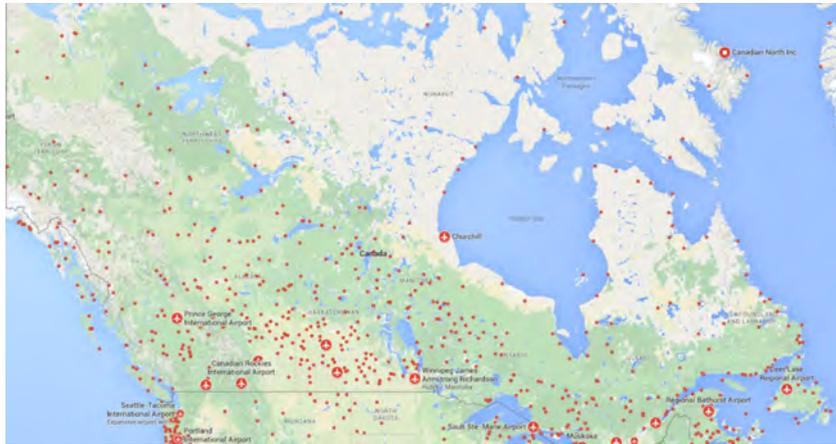
Electric powered aviation can be more sustainable and more affordable

## Propulsion at the core

Development and **certification** of an electric power train is at the core of decarbonizing aviation



# Distributed network – not a new idea



- Utilize the over 19,000 airports, seaplane bases, and other landing facilities across North America
- Provide connectivity to rural and remote populations<sup>1</sup>
- The average North American lives 11 minutes from the closest airport<sup>2</sup>
- 1.6% of trips 50 – 500 miles are by air yet 50% of all flights are less than 500 miles<sup>3</sup>

- 60s' and 70s' vision for air transport of airports around the US enabling the connectivity of communities and feeders to main hubs
- Regional propeller aircraft would connect regions
- STOL capabilities as short as 1500 feet
- Flexible runway surfaces
- Low stall speeds

13 1. NASA Regional Air Mobility White Paper, 2021  
2. "A Study... Future of Regional Transportation" Satadru Roy, Purdue Uni.  
3. Long-Distance Travel, Bureau of Transportation Statistics



# Opportunities

## Opportunities

- >20% of all US departures are regionals <50 seats<sup>1</sup>
- >45% of all US departures are regionals <100 seats<sup>1</sup>
- >3500 Regional Turboprops
- 1.6% of trips 50 – 500 miles are by air, yet 50% of all flights are less than 500 miles<sup>2</sup>
- Lower noise
- Lower emissions
- Lower operating costs

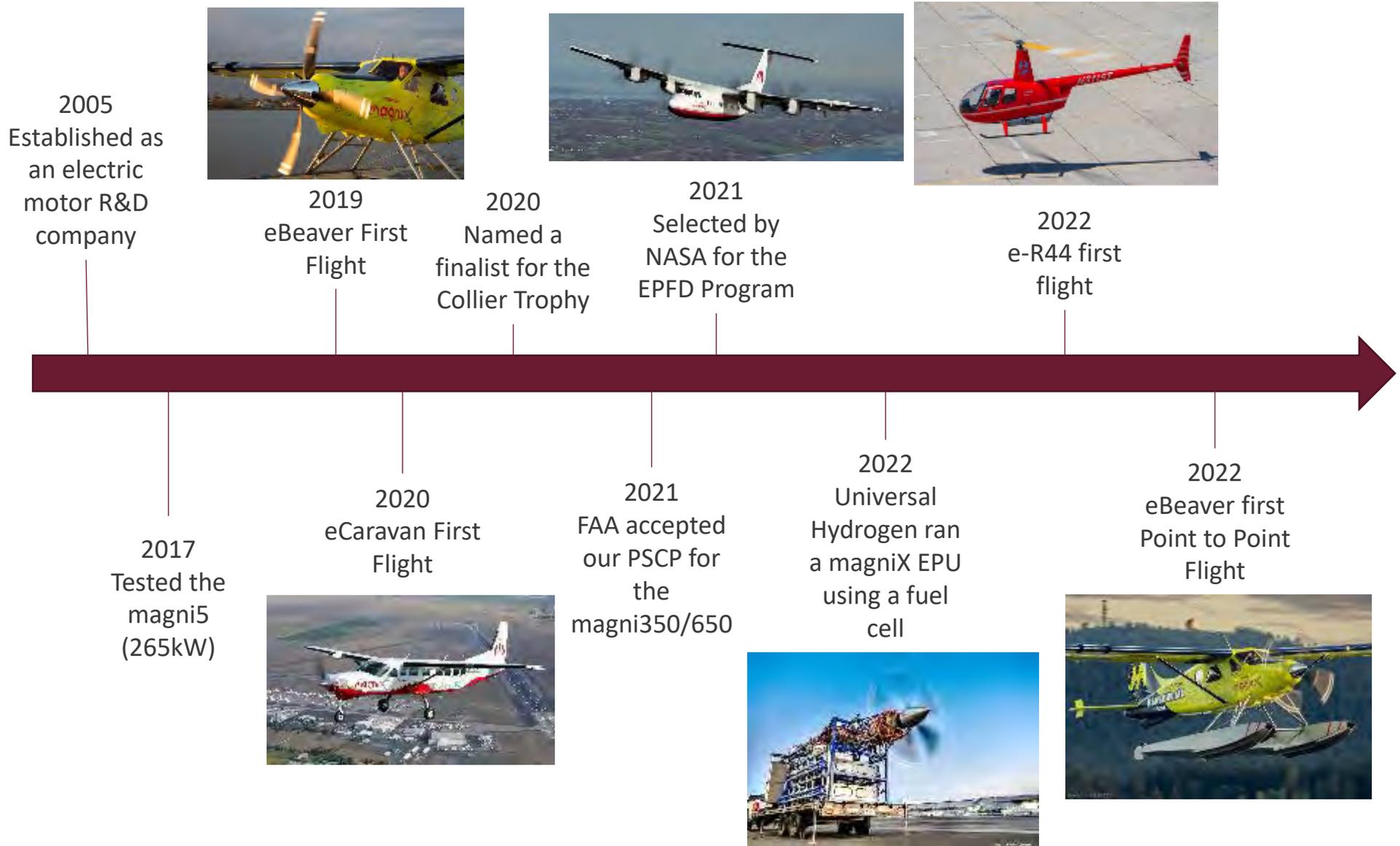


## Risks

- Battery Density at Scale
- Integration
- EMI / Electronics at High Altitude
- >800V System Parts
- Certification



# magniX History

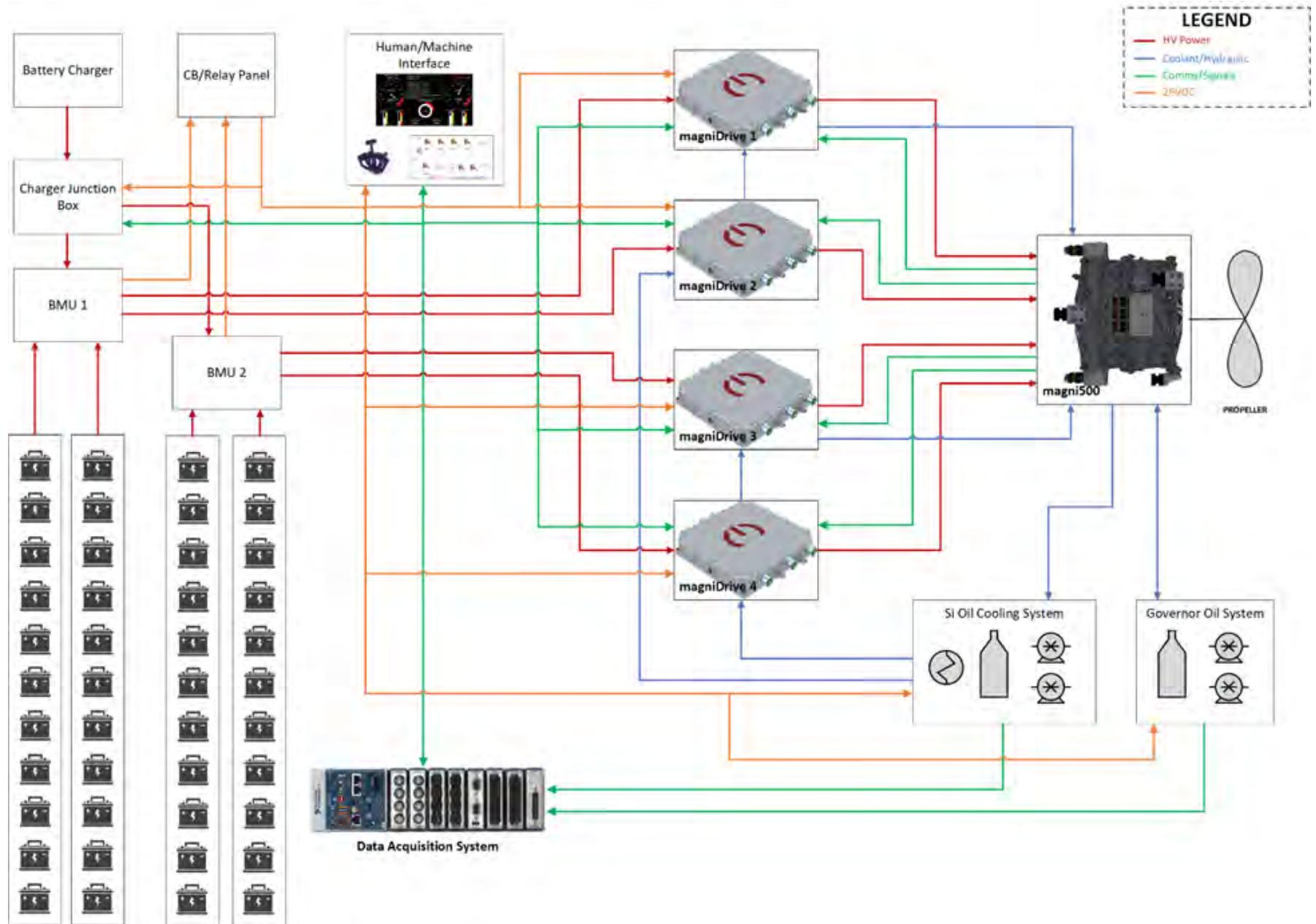


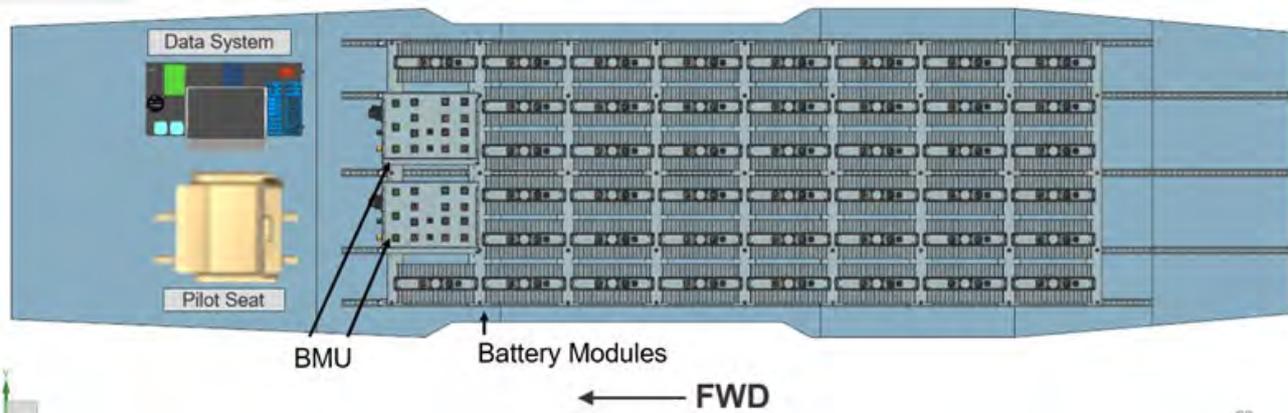
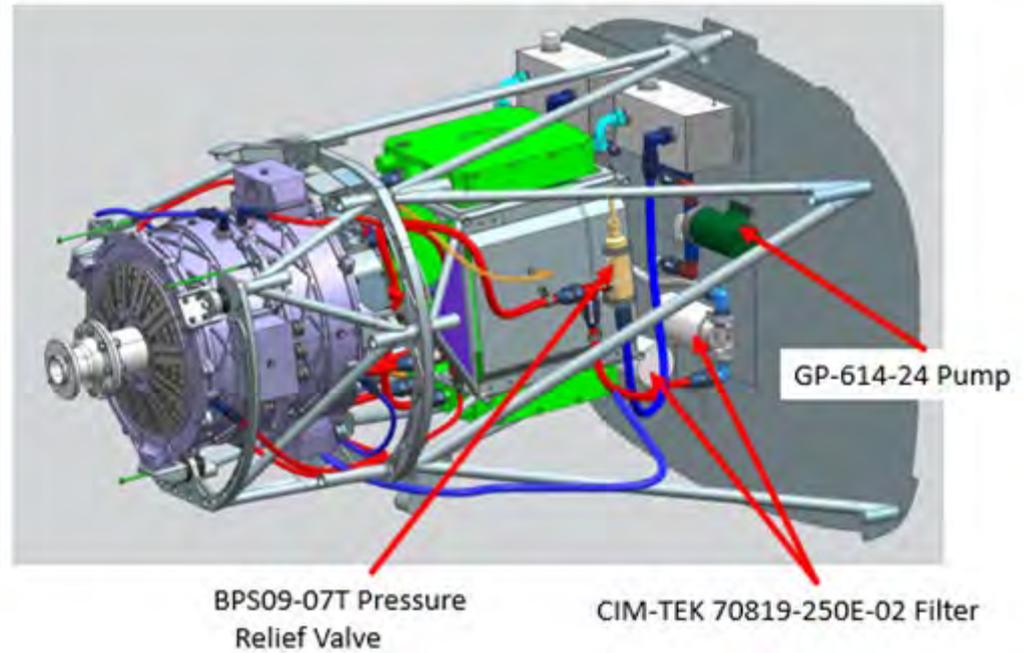
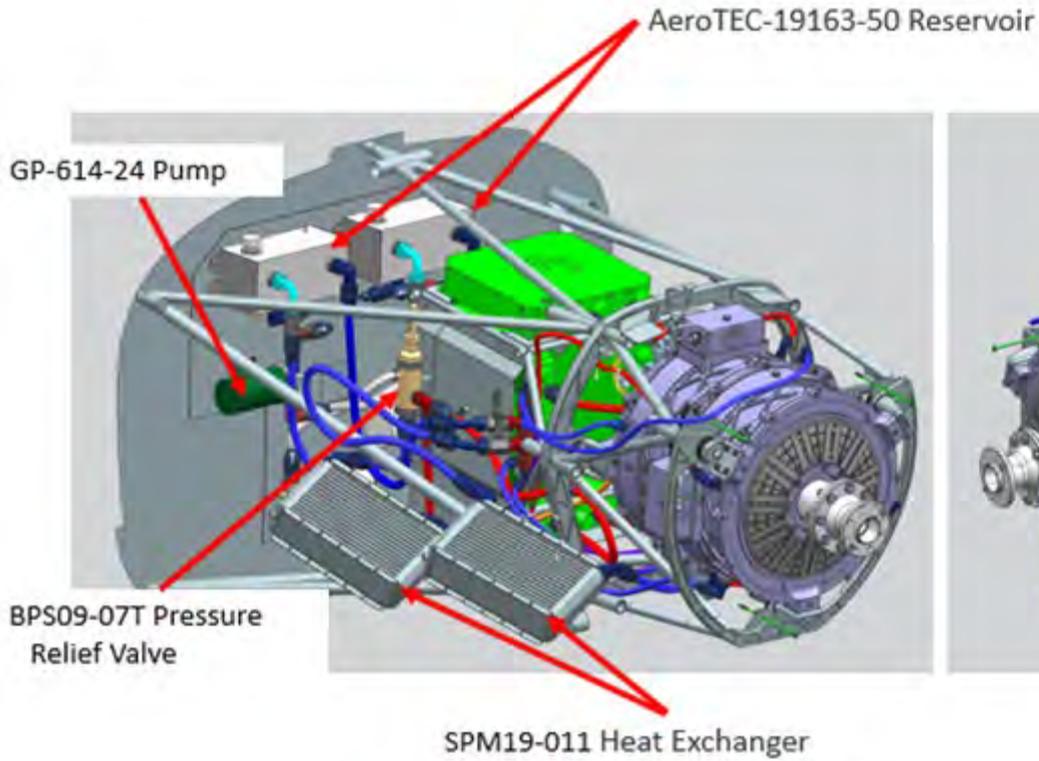
# eCaravan

- Cessna 208B grad Caravan
- Magni500 motor
- 253kw battery
- World's largest electric airplane
- First flight June 4, 2020
- On-going program with Surf Air and AeroTEC



# System Overview





# eBeaver

- First all-electric commercial airplane
- First flight Dec 10, 2019, continues to fly
- Follow-on program in work, STC expected 1Q-24



# Mag650 and 360 Electric Engines

The world's first and only flight-proven all-electric propulsion for commuter/commercial aircraft, enabling low-cost, sustainable air travel

640  
kW Max T/O

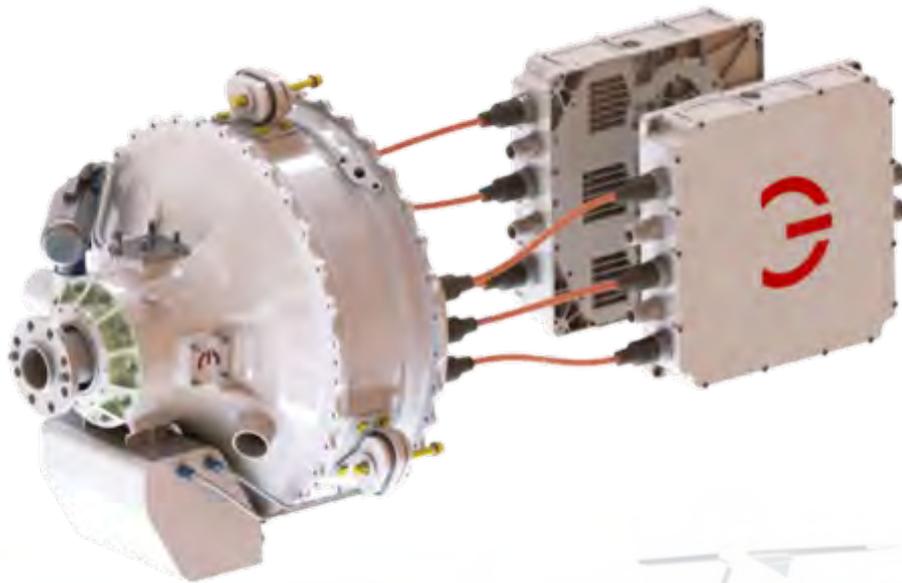
560  
kW Continuous

407  
lbs

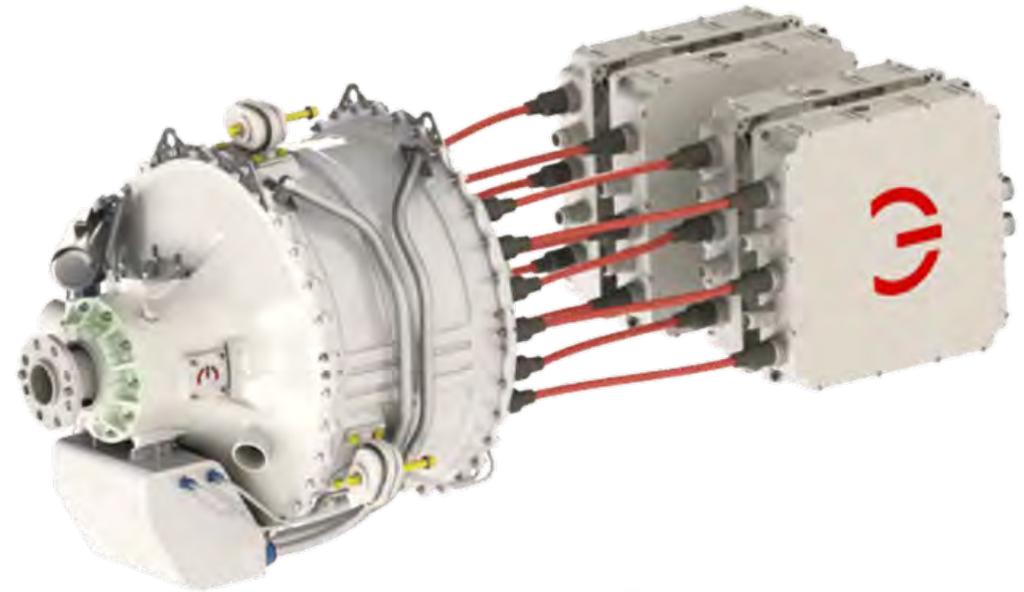
3220  
Nm Max  
T/O

2820  
Nm Continuous

1900 - 2300  
rpm



magni350



magni650



# The magni350/650 EPU

## Accessory Gearbox

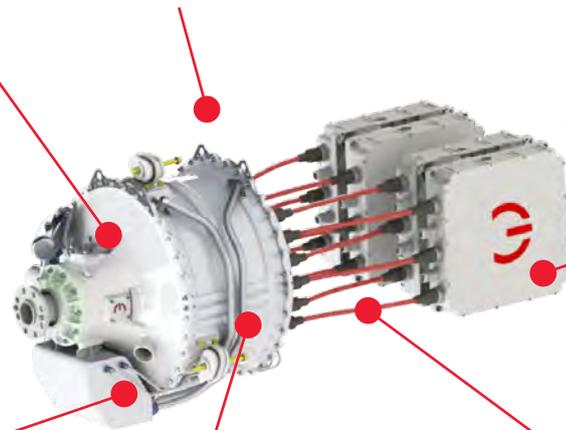
- Direct drive for propulsion, gearbox for accessories
- Supports COTs Props and Governors
- Supports Prop Heat and Beta
- One accessory pad available for customer use

## Few Moving Parts

Supports low maintenance and high reliability

## Power Agnostic

DC Power into the EPU can come from numerous sources including batteries, fuel cell or an APU



## magniDrive

- Power Electronics including both Inverter and Controller functions
- magni650 has 4, magni350 has 2

## Oil System

Provides Cooling, Lubrication and Propeller Control

## Motor

- Efficient AC motor
- Power at Low RPM allows efficient and quiet propellers
- Includes required sensors

## EWIS

Electrical Wire Interconnect System

## Graceful Degradation

The magni650 can be thought of as four motors on a common shaft and the magni350 as two, allowing a single engine airplane to approach multi-engine reliability



# Robinson R44

- Robinson R44 modification
- magni350
- Flew June 4, 2022



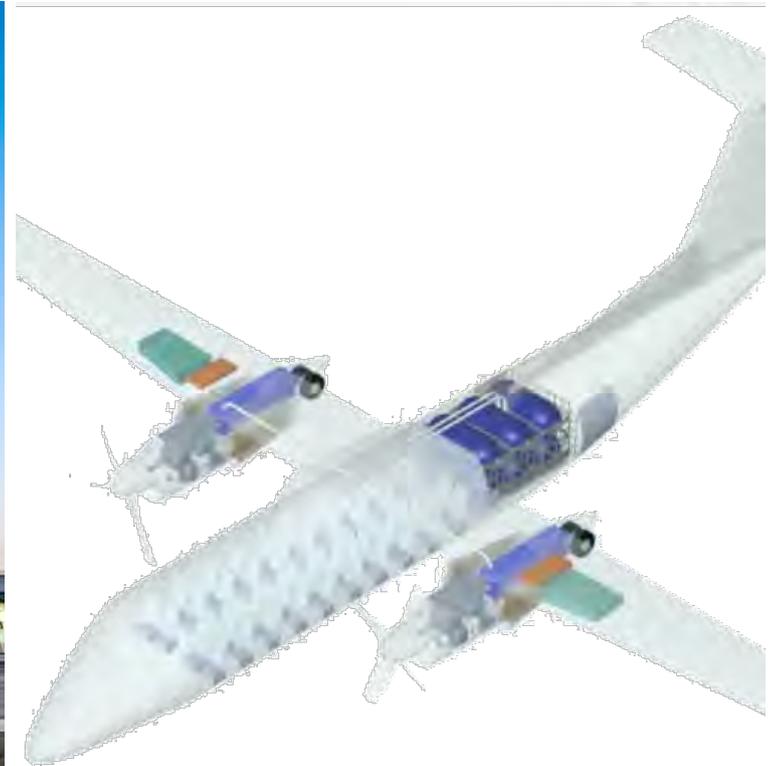
# Eviation Alice

- Battery powered all electric airplane
- 2x magni650 EPU's



# Universal Hydrogen

- Initial ground testing of fuel cell with magni250 followed by a magni500
- One magni650 EPU, one ICE, first flight planned 2022



# Other Programs



Explorer Aircraft

DESAER ATL-100



JetCruzer



Surf Air



Twin Otter



# Many Applications, One Key Enabler

## Battery Electric

Pure electric flight, with Zero emissions from solid state batteries

## Parallel Hybrid

Conventional and electric propulsion on the same wing

## Electric at the Core

## Hydrogen Fuel Cells

Pure electric flight with Zero emissions powered by hydrogen fuel cells

## Serial Hybrid

Electric propulsion with either an on-board generator from conventional fuel, or co-shaft with a conventional engine

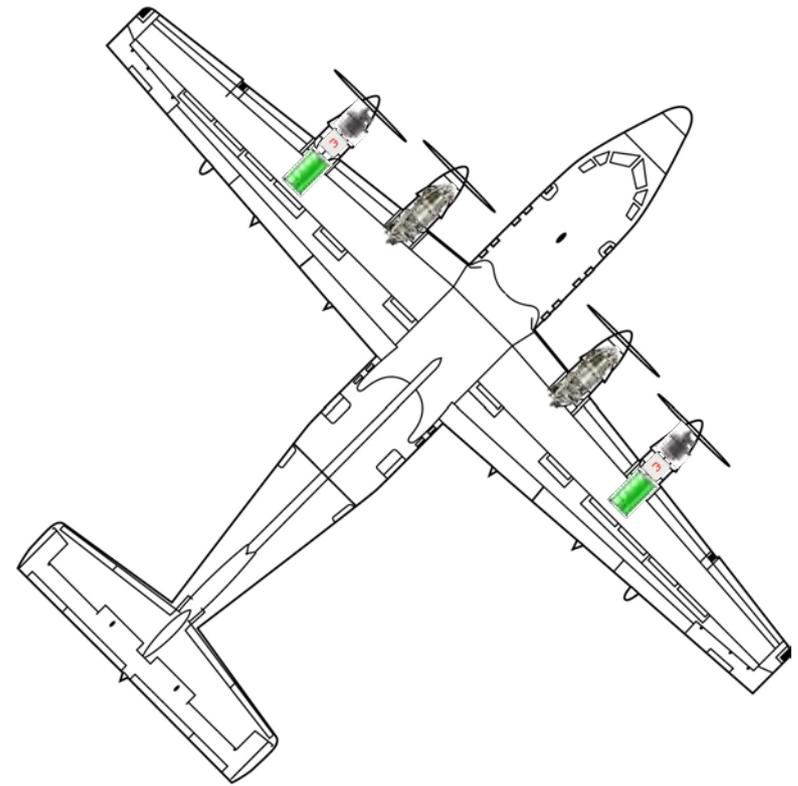




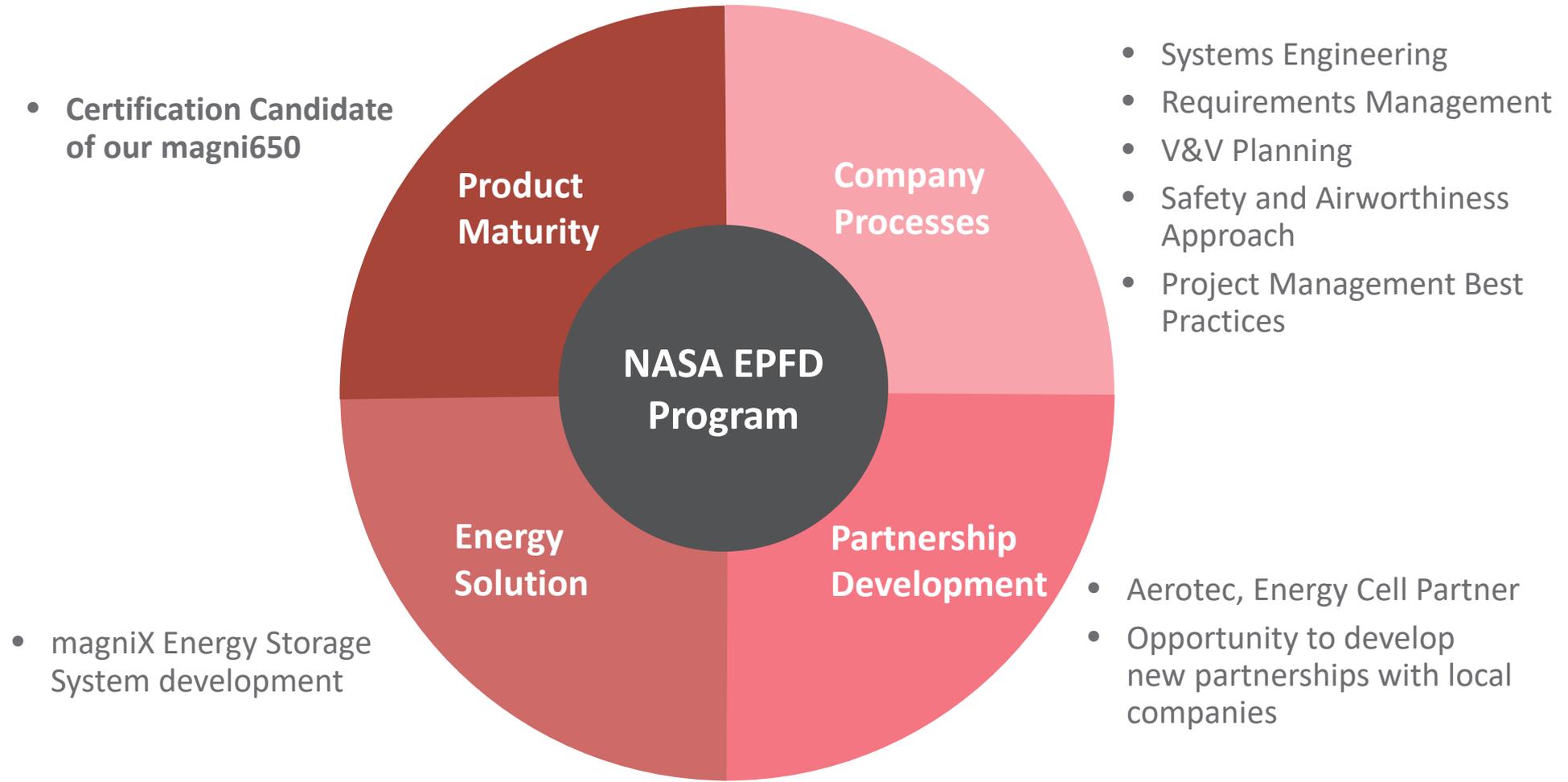
## NASA Electrified Powertrain Flight Demonstration

# DHC-7 Parallel Hybrid Concept

- Replace the two outboard engines with magni650 based electric power train.
- Maintain the inboard engine gas turbine engines and potentially replace with larger ones
- A mixture of gas turbines and magni650's eliminates some common mode failures
  - The gas turbines and e-motors are not connected in any way; failures associated with one device will not affect the other
  - Utilizing the existing engines is both cost savings as well as a safety net which may appeal to regulatory agencies/customers while experience with electric powertrains is accrued
- One concern will be single (turbine) engine performance as maintaining significant battery reserves is problematic
  - Fully utilizing the onboard battery power is desirable for economic and emission reasons
  - Stored energy in batteries is much heavier than in petroleum



# What we are learning from NASA EPFD Program





Magnix

