



# Toward Direct Drive Electrified Propulsion Concepts for Sustainable Aviation

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# FLYING AND THE ENVIRONMENT



The opportunity is equal to the problem

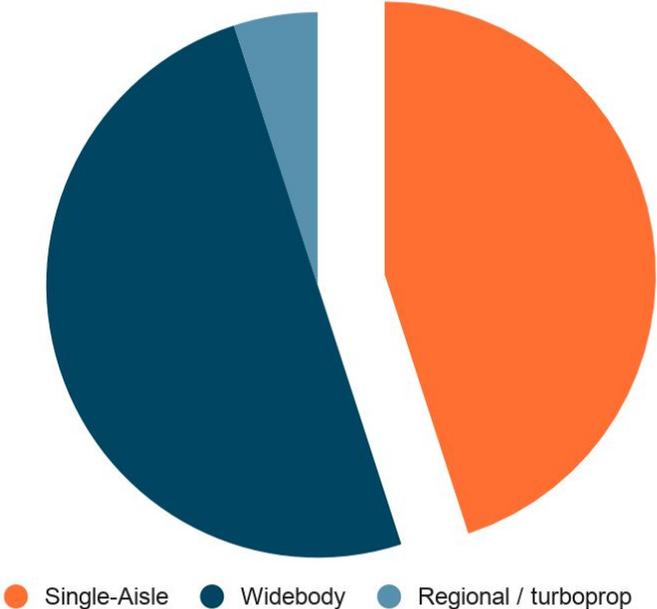
Carbon Footprint

**700** kg CO<sub>2</sub>  
Per Person

A Single Round-Trip  
NY-Chicago Flight

# PROBLEM

Aerospace Emissions Sources



# THE WRIGHT SPIRIT

Coming 2026



- Retrofit of BAe 146
- 100 seats / 1 hr flights
- 90% less expensive GTM

# STEPWISE APPROACH



**Single Propulsor  
Replacement**



**Two Propulsor  
Replacement**



**Fully Electric  
Aircraft**

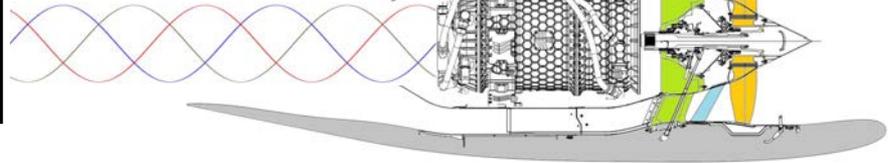
# ELECTRIC POWERTRAIN



Energy  
Storage

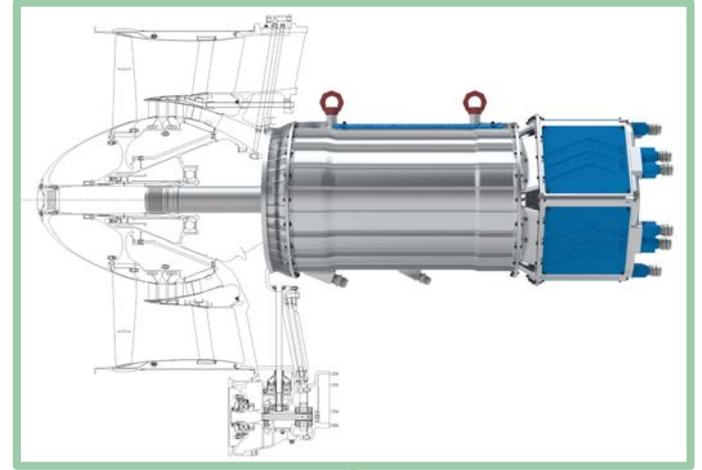
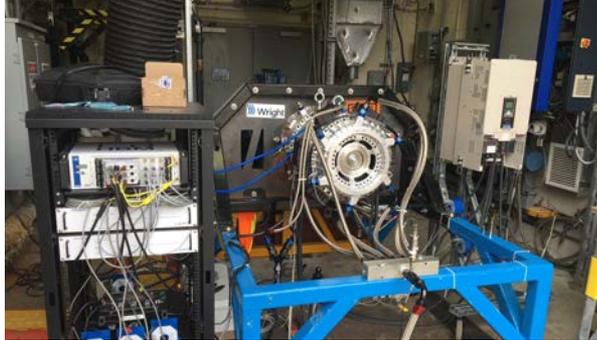
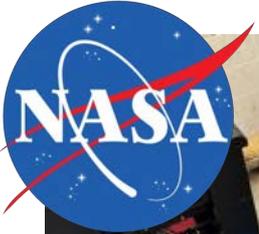


Inverter



Electric Propulsion  
Unit

# EARLY RISK REDUCTION

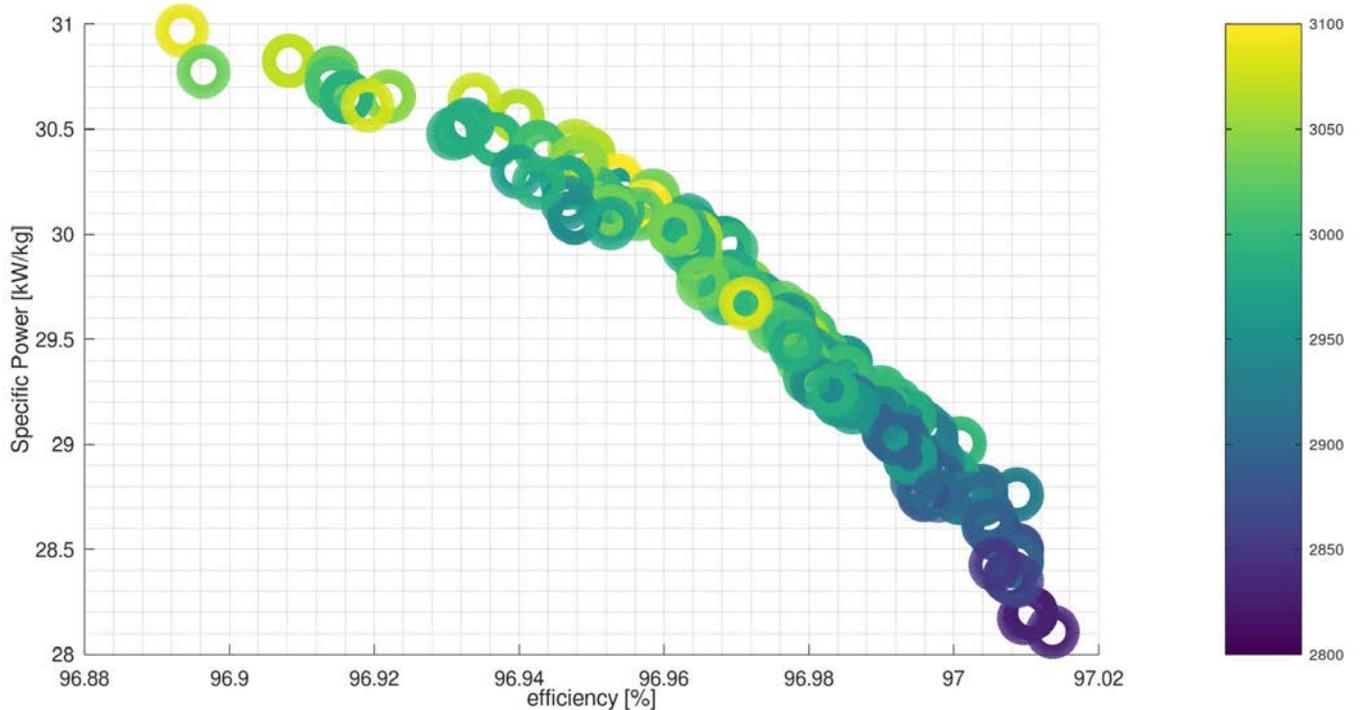


Specs
2 MW
>10 kW/kg



# POWERTRAIN DEVELOPMENT

Continued  
Development



Torque [N\*m]

# NEXT GENERATION

High frequency stator with Halbach rotor

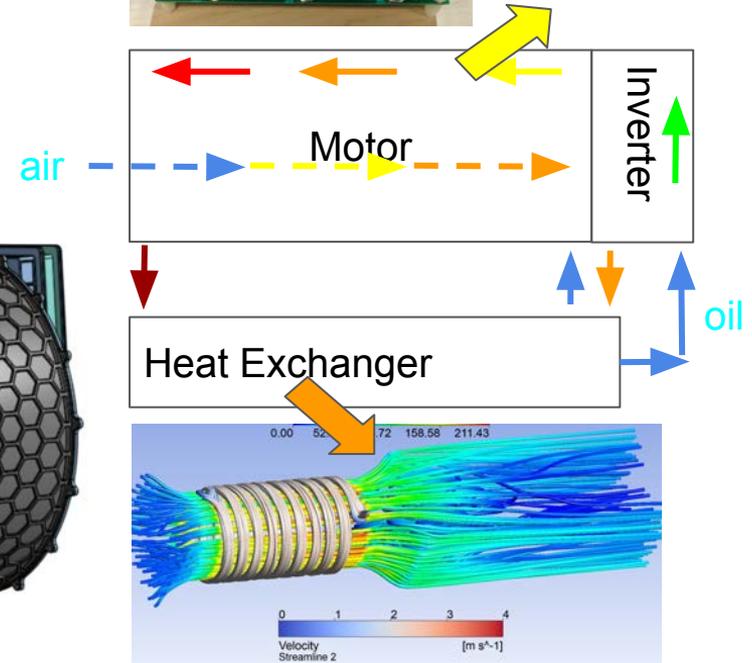
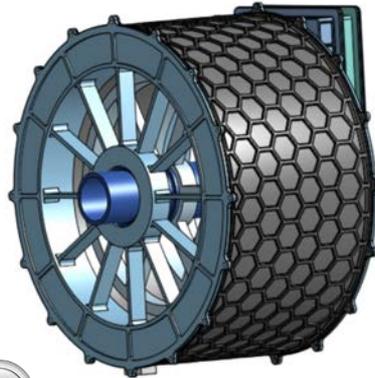
High frequency, soft-switching drive

Shared thermal management

Designed to meet mission requirements

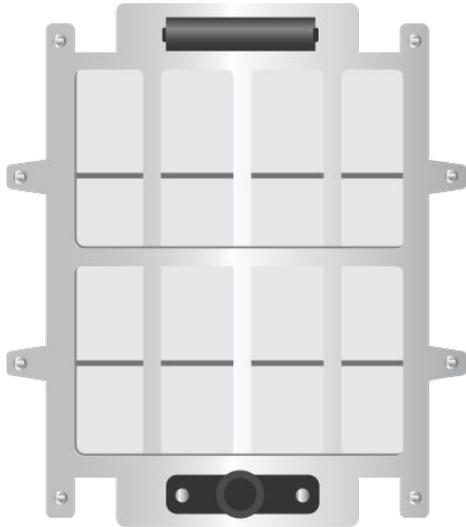
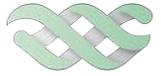
## Technology Development

Power	500 kW
EPU	12.1 kW/kg



# ENERGY STORAGE

We're evaluating prototypes in 2022

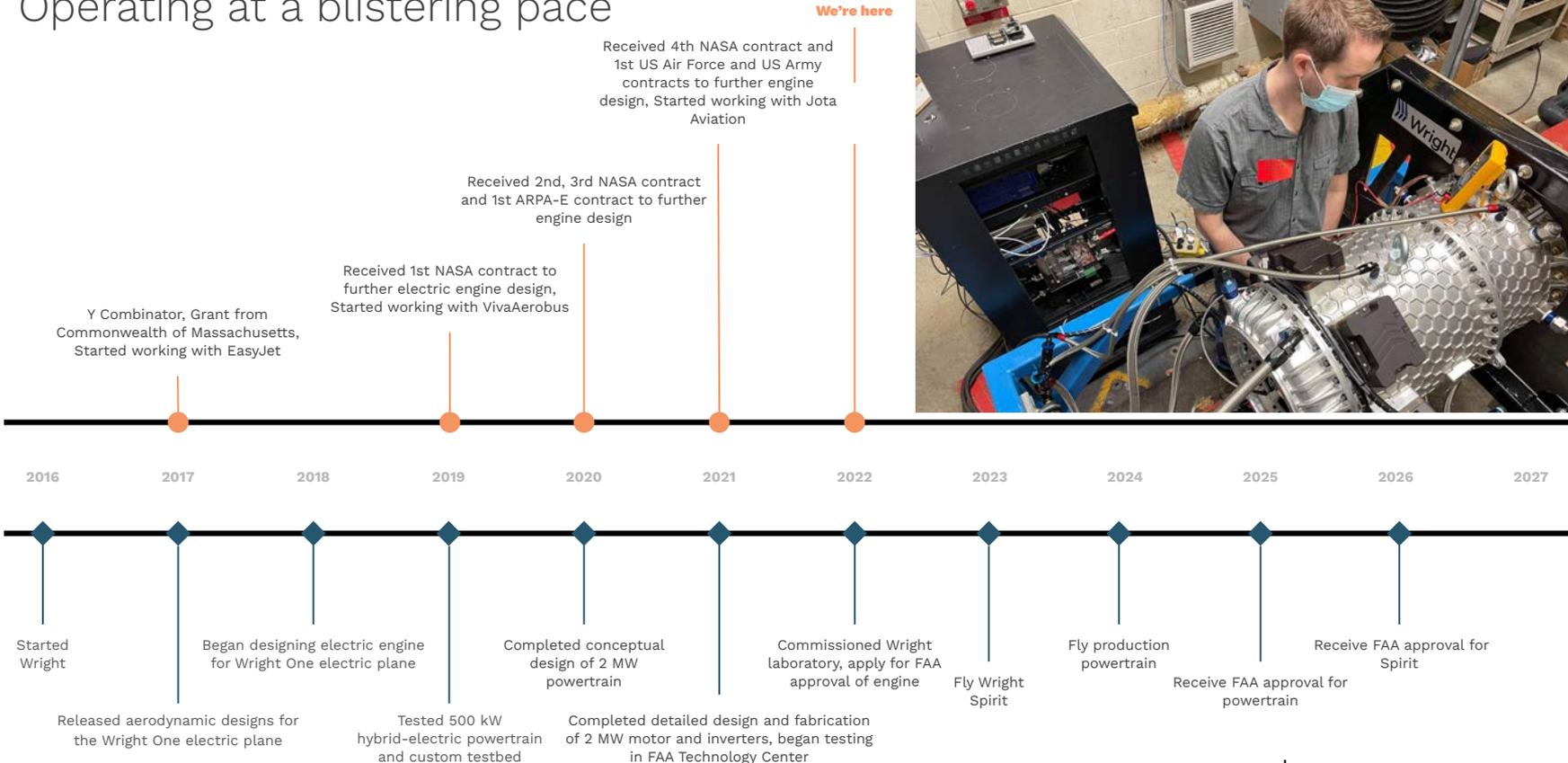


- **Metal-air** chemistries  
Aluminum-oxygen quick-swap design, greater than 1,000 wh/kg, 80% lighter than li-ion.
- Used by the **military** for years  
These chemistries have deep experience in Dept of Defense and also commercial batteries such as hearing aids.

# PROGRESS



## Operating at a blistering pace





33RD CONGRESS  
OF THE INTERNATIONAL COUNCIL  
OF THE AERONAUTICAL SCIENCES  
STOCKHOLM, SWEDEN, 4-9 SEPTEMBER, 2022

**ICAS**  
**2022**  
SWEDEN