Demonstrations: A Path to the Future of Aviation

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Old NEAT

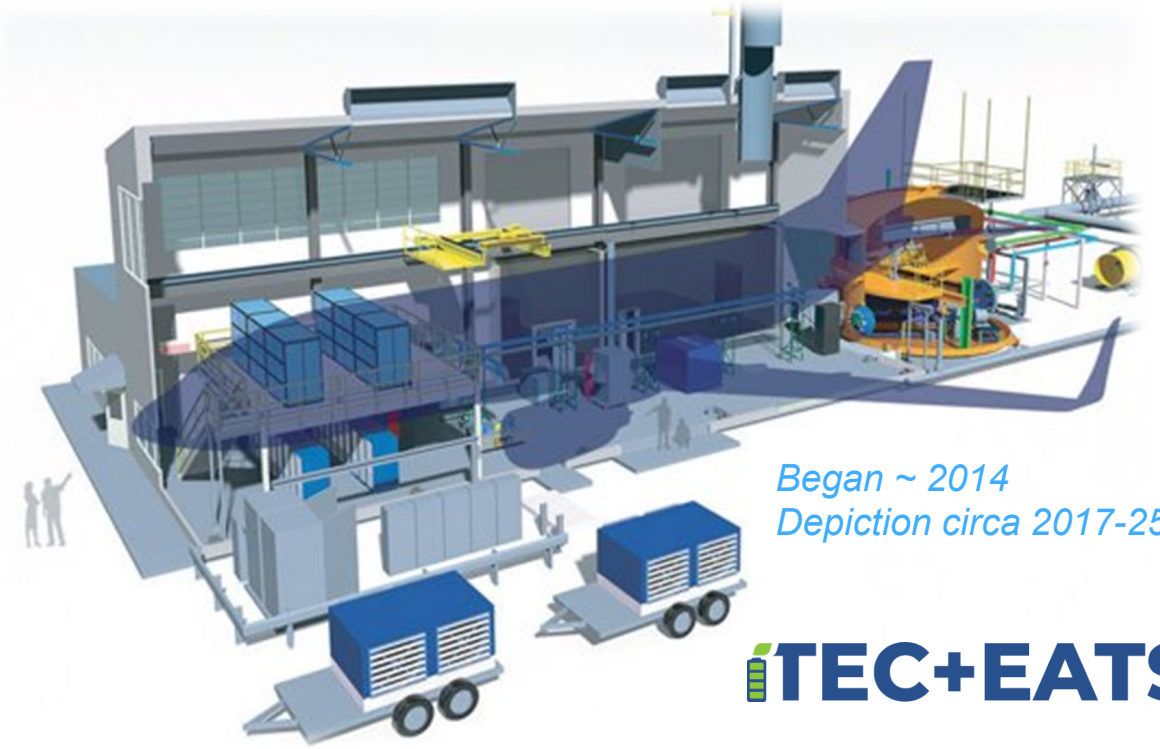
NASA Electric Aircraft Test Bed

- Created to perform R&D on MW-class powertrains
- Propulsion controls, power quality and stability, system-level effects, characterization/evaluation of technologies
- Altitude chamber brought online to enable component and systems tests
- Have tested with industrial, university and government partners as well as performed in-house research

Lessons from past test programs

- Critical to consider affects of low-pressure conditions on thermal management and electrical performance
- Interconnected powertrain system testing is critical
  - Connections and full-size subcomponents, cable lengths, proximities
  - Interaction among eclectically active components
  - Electrical insulation complex in altitude conditions
  - System response differs from individual components

https://ntrs.nasa.gov/citations/20250001338

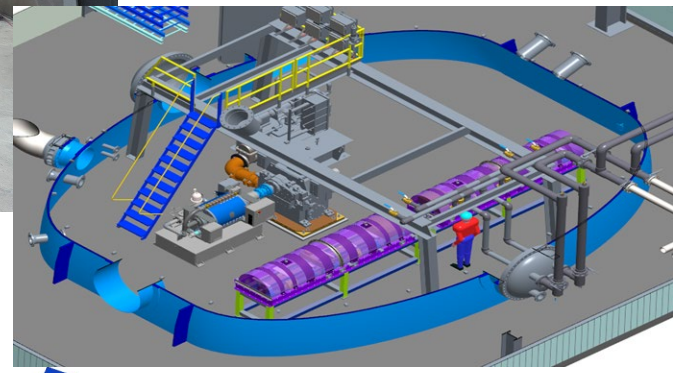


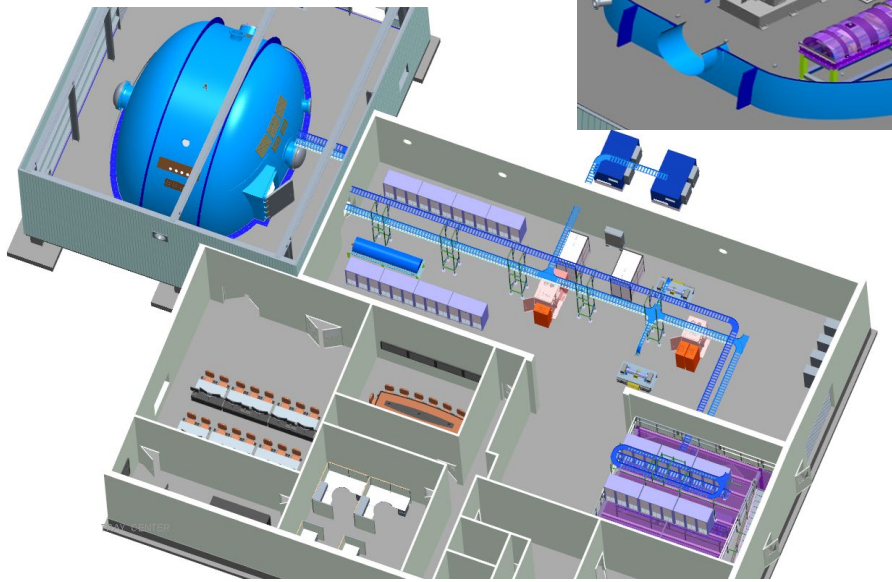
Began ~ 2014
Depiction circa 2017-25

New NEAT

- Test area sized for 737-class electric powertrain (sea level)
- 6MW of DC power available
- Steel chamber w/ elliptical base (37ft & 30ft axes)
- Maximum 17ft 9 in height
- Reinforced concrete floor
- Access:
  - Access door (8 ft tall x 5 ft wide)
  - Two bulkheads open to main test area and outside
  - Other plates and flanges
- Operated at 60,000 ft (15-minute pump down)
- Two 1 MW active dynameters available (7000 RPM Max)
- One water break dynameter (3.5 MW)
- 3-1 gear boxes for faster machines

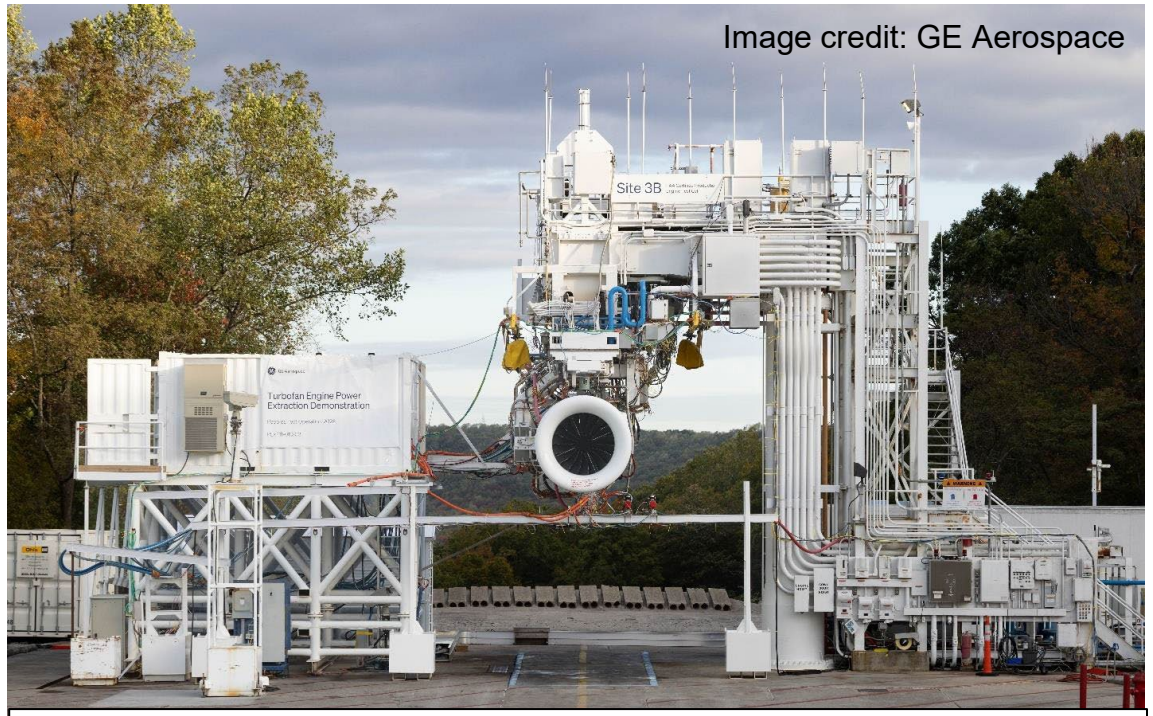
Future work and partnership opportunities
- Schedule open after RTX test
- NASA happily considers:
  - Reimbursed tests
  - Co-proposing
  - Cooperative R&D
  - Ideas for in-house R&D for public good/dissemination

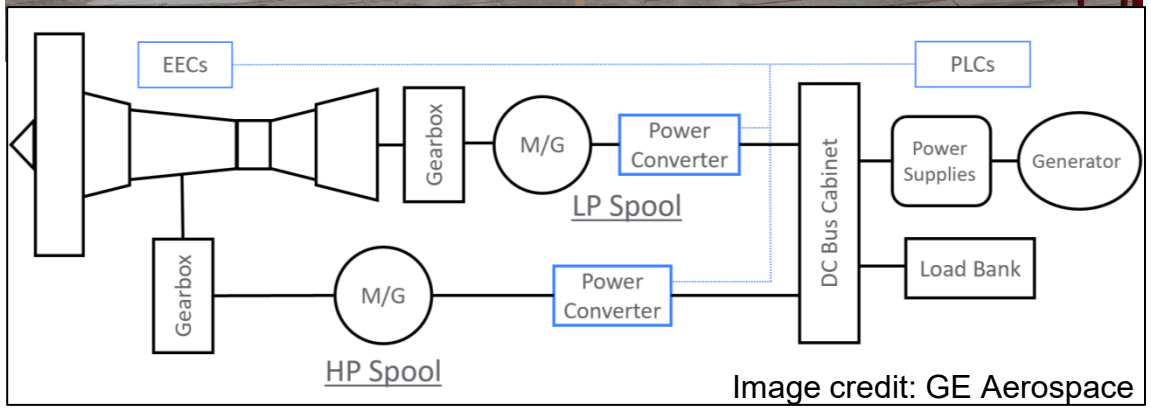




GE Aerospace NASA Turbofan Power Extraction Demonstration

- GE Aerospace and NASA demonstrated a high bypass commercial turbofan with megawatt scale motor-generators (M/Gs) integrated with both the low- and high-pressure spools
  - Completed testing at GE Aerospace's Peebles Test Operation (OH) in December 2025
- Exceeded goal of demonstrating feasibility of 20% power extraction from low pressure spool
- Successfully demonstrated physical integration and integrated control of a hybrid commercial turbofan
  - Technology maturation accelerated to TRL 4 for dual-spool power extraction and integrated control





EPFD

Electrified Powertrain Flight Demonstration

For megawatt scale powertrains:

- Addressed many airframe integration issues
- Identified barrier risks
  - High voltage at altitude
  - Battery performance shortfall
  - Thermal management
- Raised technology readiness of critical technologies
  - Components
  - Subsystems
  - Systems
- Identified & prioritized certification gaps
  - Electric Engines
  - Energy storage systems
  - Wires and connectors
  - Aircraft integration

CHILL Motor Development

Cryogenic **H**igh-power **I**ntegrated **L**ow **L**oss

- Enable Propulsion beyond 10 MWs of Electrification
- Requires machines and drives that operate beyond 2MW
- Goal:
  - Design highly efficient 5MW electric motor
  - Design a motor drive to support that motor design
  - De-risk key tall poles of 5MW design with a subscale demonstration motor and drive
- Will be testing drive and demonstration motor at NEAT