Advanced Materials Development under NASA's Hybrid Thermally Efficient Core (HyTEC) Project

National Aeronautics and Space Administration

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Project Overview

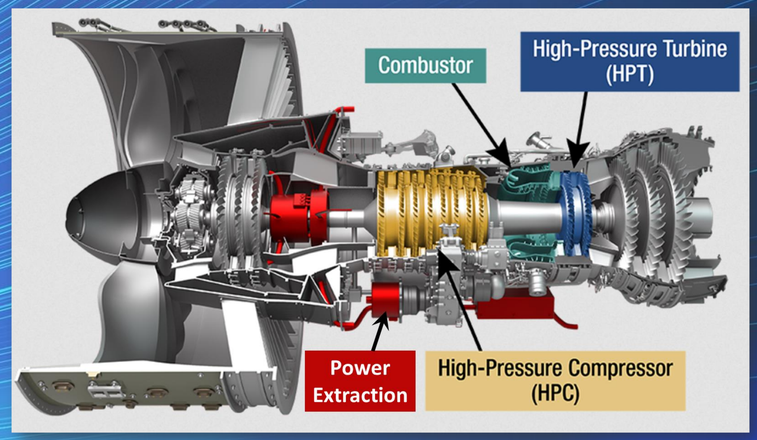
The Hybrid Thermally Efficient Core (HyTEC) project aims to develop small core turbofan engine technologies that will enable fuel burn reductions, additional use of electric airplane systems through power extraction, and to advance engine operability and compatibility with sustainable aviation fuels.

The HyTEC Project aims to achieve:

- ❑ Fuel burn reduction of 5 to 10% compared to 2020 best-in-class turbofan engines.
- ❑ Up to 20% power extraction at altitude (2 – 4 times the current state of the art).
- ❑ Advanced design capabilities for small core combustors to operate effectively and efficiently on high blend (80 – 100%) sustainable aviation fuels.

HyTEC Hybrid Thermally Efficient Core

Technology Portfolio



- ❑ **High Pressure Compressor**
  Casing treatments and advanced designs for optimized performance
- ❑ **Enhanced Combustor Materials**
  Ceramic matrix composite (CMC) liners to increase performance and durability – reduce cooling and emissions
- ❑ **High-Temperature Turbine Materials**
  CMCs and environmental barrier coatings (EBCs) for turbine blades and vanes
- ❑ **Advanced HPT Aerodynamics**
  Advanced blade and cooling designs and aerodynamic features
- ❑ **Turbofan Power Extraction**
  Power extraction to enable more electric airplane systems

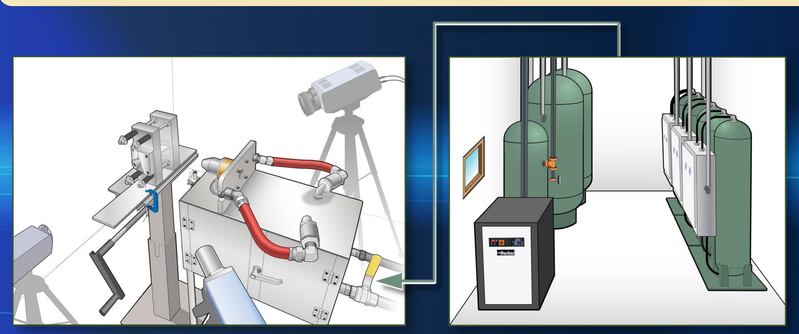
Technology advancement under NASA's HyTEC project will provide environmental and cost benefits for the next generation of single-aisle class aircraft.

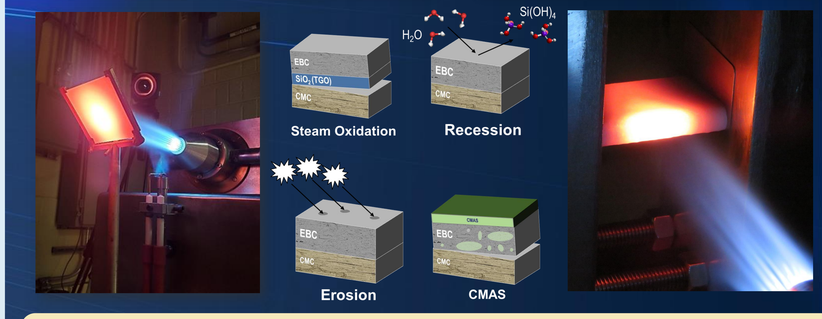
Materials Development

Phase I: CMC and EBC technology will be tested in laboratory-relevant environments, and advanced to a technology readiness level (TRL) of 4 – 5.

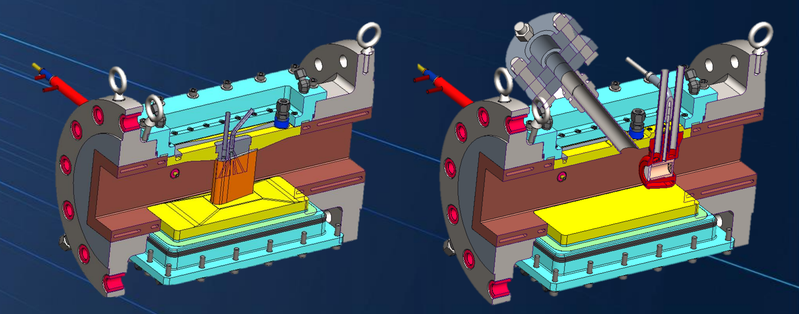
Phase 2: Technologies integrated into an engine core demonstrator to achieve TRL 6.

Natural Gas – Oxygen Burner Rig





Combustion Rig – CE-5 Stand 2



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