Research Facilities

Provides capabilities to research high-temperature materials and components for propulsion systems (such as gas turbine engines, rocket engines, and next generation unmanned aerial system engines) to improve power density, efficiency, and durability.

Supporting Equipment

- **Hot particulate ingestion rig (HPIR), with maximum sustaining temperature of 1650 °C (3000 °F)**
  - Hot gas mass flows 0.14 – 0.34 kg/s (0.3–0.75 lbs/s)
  - Impinging velocities of 150 – 1050 m/s (0.3 – 0.8 M; 490 – 3445 ft/s)
  - Sand/salt ingestion rates of 1 – 200 g/min (0.13 – 26.5 lbs/hr) via dual feeder system; water-based dust collection system
  - Laser Doppler velocimeter (LDV) and particle imaging velocimeter (PIV) for measurements of particulate velocities and distributions within hot gas flows
  - IR camera for thermal imaging up to 2000°C
  - Single and dual wavelength pyrometers for temperature measurements from 260° – 3000 °C (500° – 5400 °F)
- **Button cell flame testing rig (BCFTR)**
  - Maximum sustained temperatures up to 2820 °C (5110 °F) and 3160 °C (5720 °F) with oxy-propane and oxy-acetylene, respectively
  - Motorized sample carousel holds up to eight samples
- **Thermomechanical fatigue rig**
  - Capable of 100 kN (22-kip) loads
  - 1500°C (2732°F) max sustaining temperature
  - In- and out-of-phase thermomechanical cycling and creep testing capability
- **High-temperature air-jet erosion rig (HAJET)**
  - Maximum sustained temperature of 1000°C (1830°F)
  - Erodent flow rates from 1 – 5 g/min (0.13 – 0.65 lbs/hr), at velocities from 30 – 150 m/s (98 – 492 ft/s)
  - Varying angle of attack: 15° – 90°
- **Digital C-mode scanning acoustic microscope (C-SAM)**
- **Confocal laser scanning microscope (C-LSM)**
- **Scanning electron microscope (SEM), with energy dispersive x-ray spectrometer (EDS)**
- **Digital Image Correlation (DIC) System**

Capabilities

- Particulate accumulation (adherence), erosion, sand-glazing, and CMAS-formation testing of advanced high-temperature bulk materials and coatings under near-operational conditions
- Rapid prototyping of advanced high-temperature materials with high thermal gradients
- Thermomechanical peak sustained load fatigue, survivability, and durability testing of high-temperature ceramics, polymer-woven composites, metal alloys, and advanced thermal/environmental barrier coatings (T/EBCs)
- Surface, near-surface, and subsurface nondestructive materials characterization and evaluation of new and advanced propulsion materials
- Non-intrusive laser-based 1-D, 2-D and 3-D point and planar/volumetric measurements of velocity and turbulence distribution in hot flows