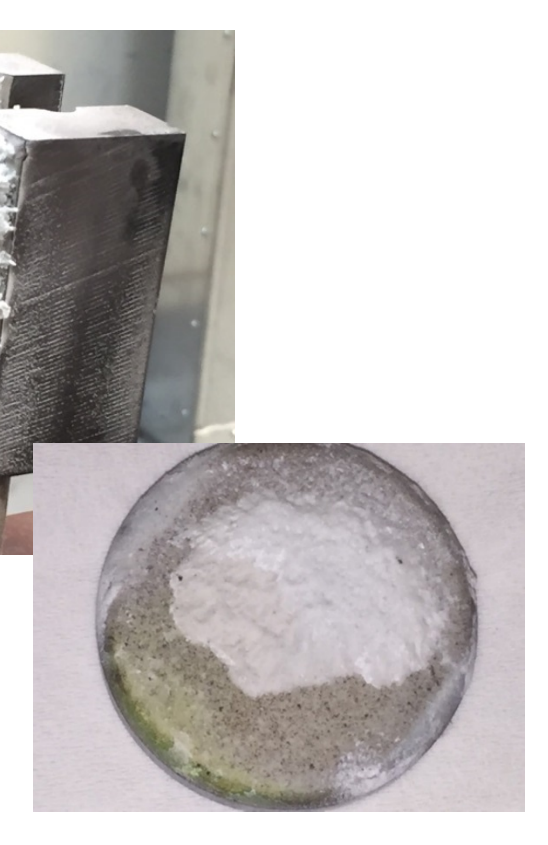
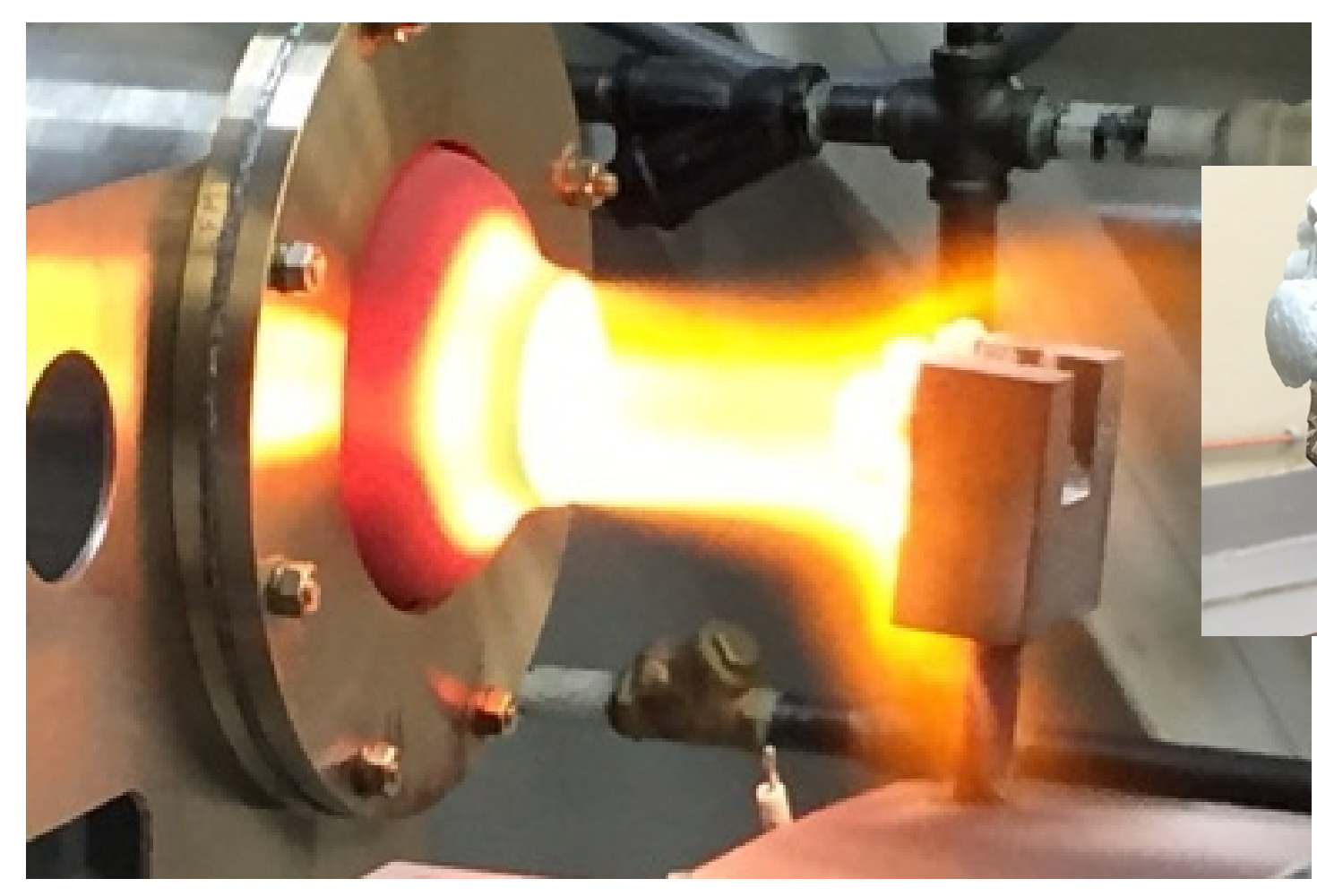
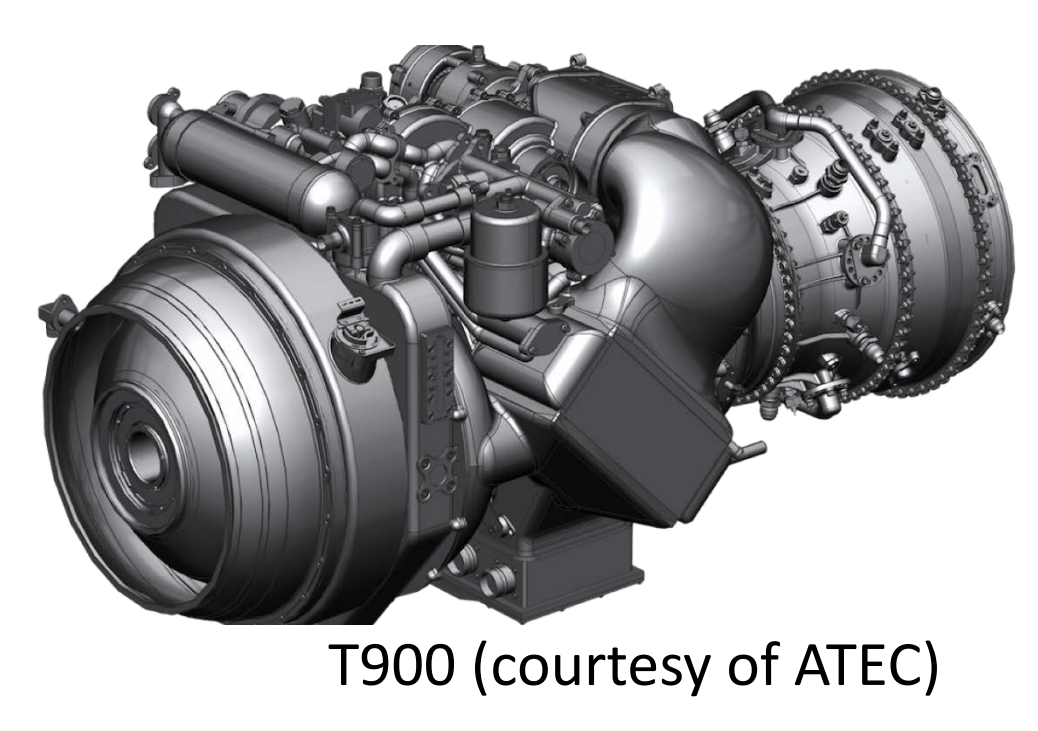
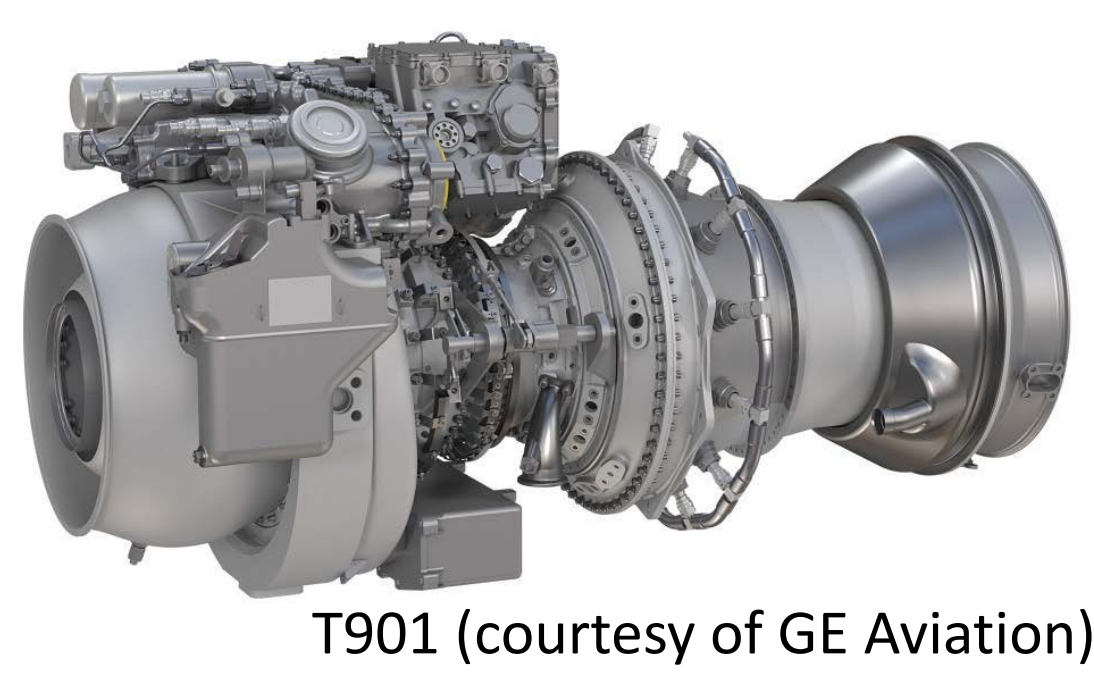


S&T Campaign: Sciences for Maneuver Energy and Propulsion Power/Energy Conversion

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Research Objective

- Conduct propulsion research to discover innovative and mature high-risk novel materials and concepts to enable the next-generation of engines for future manned/unmanned air/ground vehicles

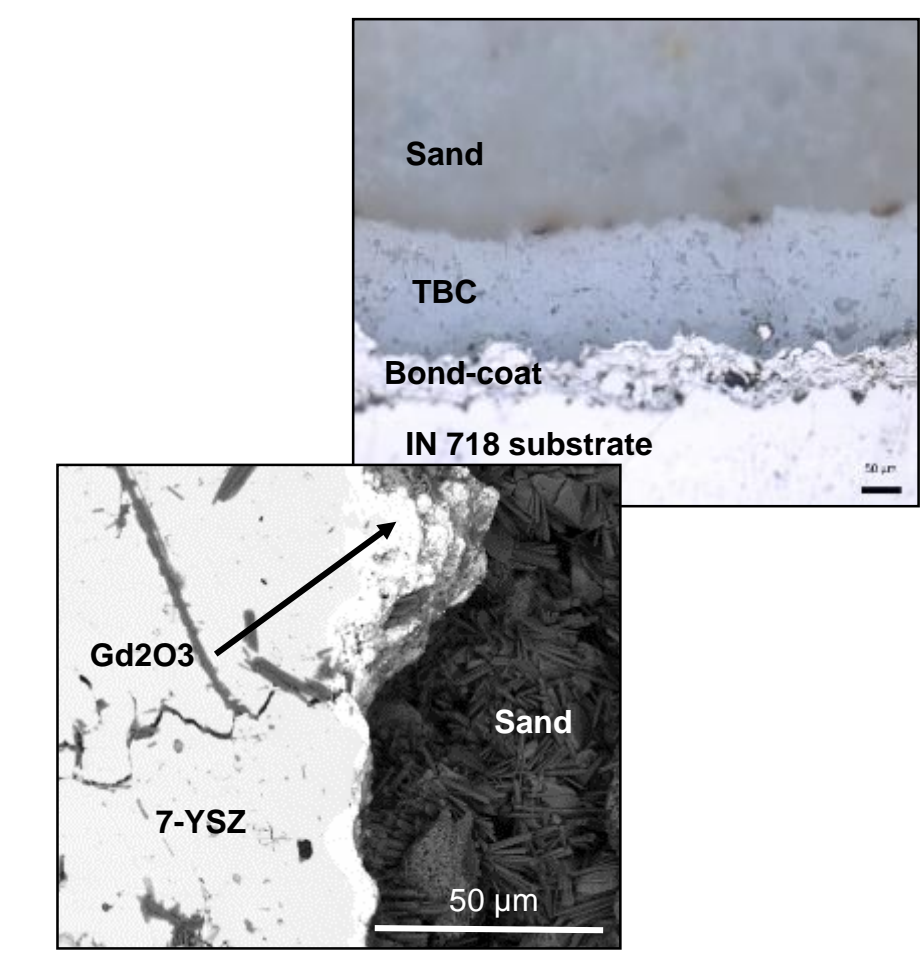
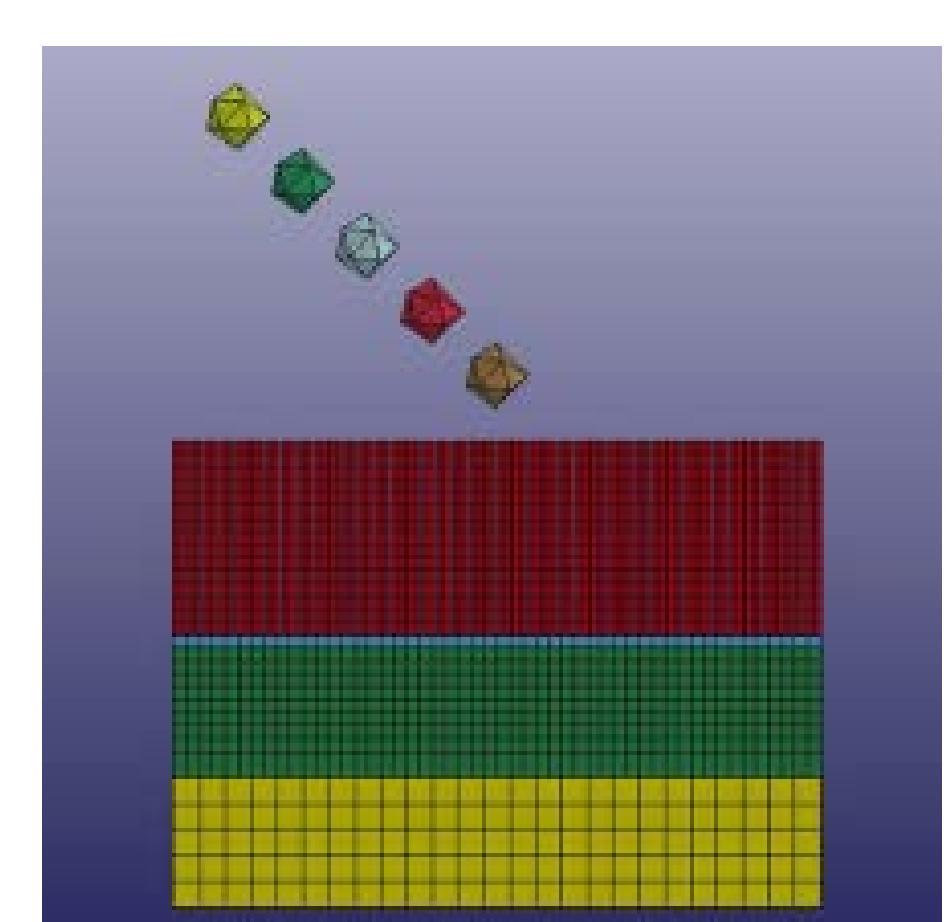
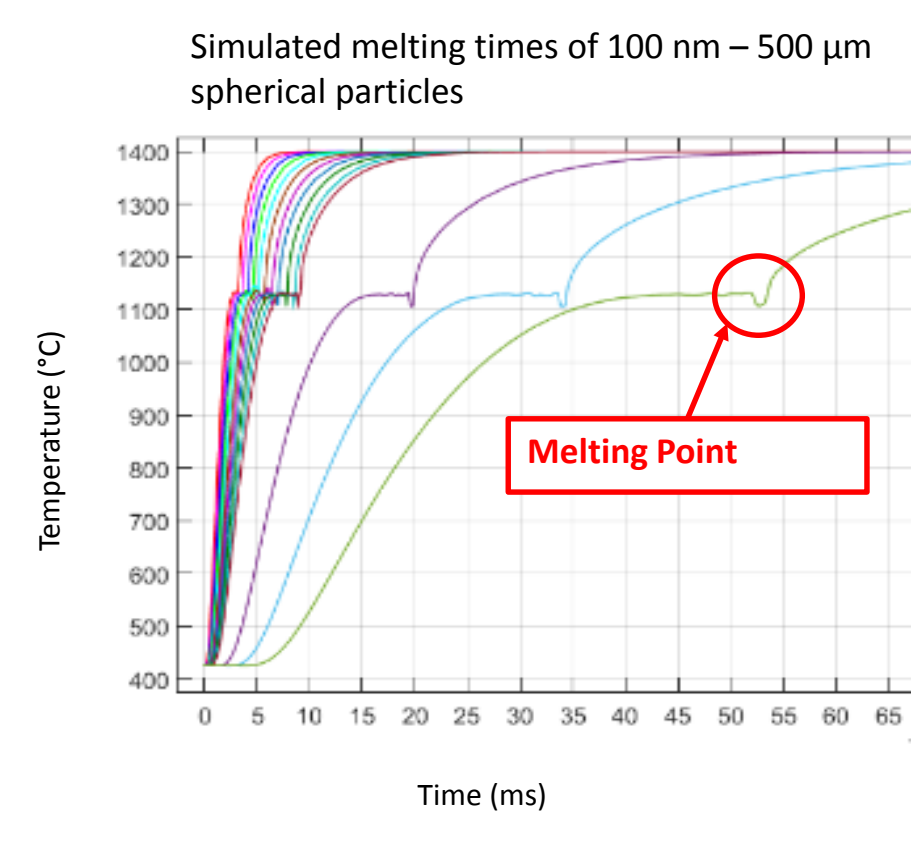


ARL Facilities and Capabilities Available to Support Collaborative Research

- High-Temperature Propulsion Components Laboratory (APG)
- DoD High Performance Computing Center

Challenges

- Efficient, lightweight functional materials for high temperature applications
- Hot corrosion-resistant bulk materials, coatings, and other surface modifications
- Quantitative understanding of hot-corrosion phenomena
- In-situ measurements under engine operating conditions, i.e., high temperature and pressure
- Probabilistic lifing assessments of complex materials



Current Fleet Operates in Harsh Environments



- Sand build up (glazing)
- Plugged cooling holes
- Nozzle oxidation
- CMAS attack
- Blades coated with melted sand
- Blade tip wear
- Plugged cooling holes
- CMAS attack



Complementary Expertise/Facilities/Capabilities Sought in Collaboration

- Expertise in
 - High-temperature smart materials for articulating turbine blade mechanisms
 - Sand, salt, fog and hot-corrosion resistant bulk materials and coatings for gas turbine components
 - Nano-structured materials
 - Ceramic matrix composites
 - Metal matrix composites
 - Functionally-graded materials
- Surface finish and dimensional tolerance potentials of stationary flow-path components for turbine engines fabricated with additive manufacturing
- Additive manufacturing capability for components
- Kinetic and molecular modeling of complex systems, such as ceramic corrosion at high temperatures
- Non-intrusive measurement techniques (e.g., compact laser anemometry, particle image velocimetry, wireless measurement reporting)
- Non-destructive evaluation techniques
- High-temperature in-situ sensing