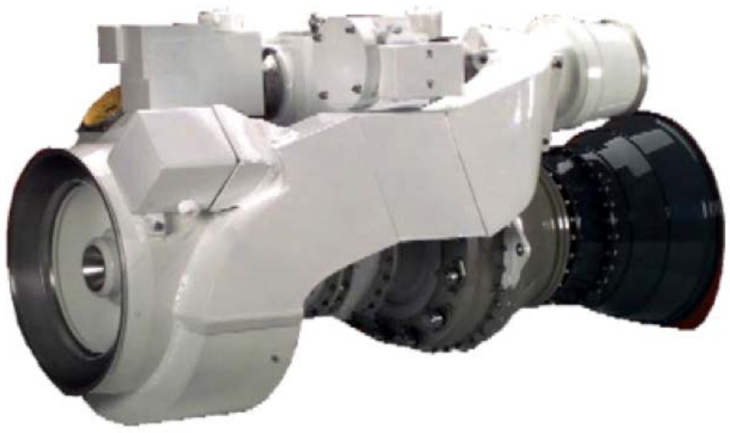
High-Efficiency Gas Turbine Engine Components

S&T Campaign: Sciences for Maneuver
Energy and Propulsion

Anindya Ghoshal, Ph.D., (410) 278-7358, anindya.ghoshal.civ@mail.mil
Muthuvel Murugan, Ph.D., (410) 278-7903, muthuvel.murugan.civ@mail.mil
Waldo Acosta, (216) 433-3393, waldo.a.acosta.civ@mail.mil

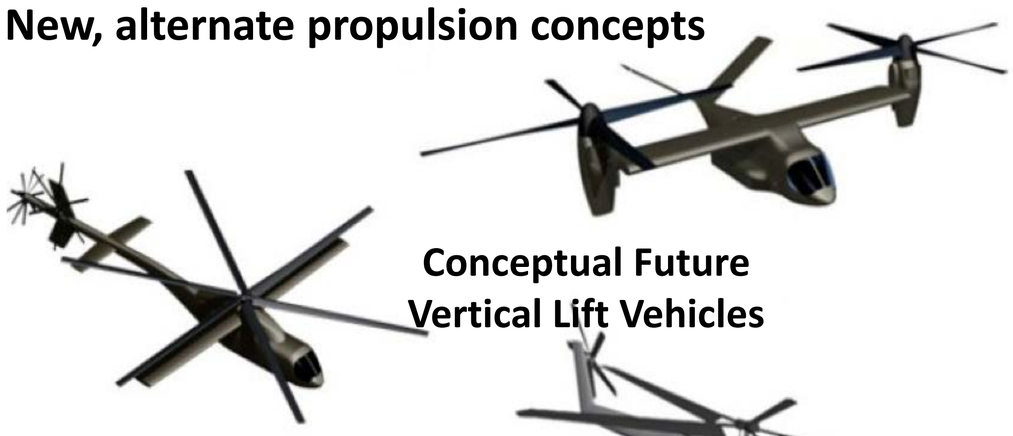
Research Objective

- Conduct rotorcraft-unique propulsion research to discover innovative and maturate high-risk novel concept technology beneficial to enable hover efficient and faster forward flight engines
- Reduce specific fuel consumption and increase engine power density



Challenges

- High-heat release, compact combustors
- New, alternate propulsion concepts
- Efficient, compact, durable, lightweight turbomachinery
- High-temperature turbomachinery components, functionally graded materials and sensing, and associated probabilistic lifing assessments
- Engine-On-Demand (EOD) concepts, sequential combustion
- Mix-mode engine concepts (turbofan/turboshaft/ turbojet)
- Conformable adaptive engines
- High-heat release, compact combustors
- New, alternate propulsion concepts

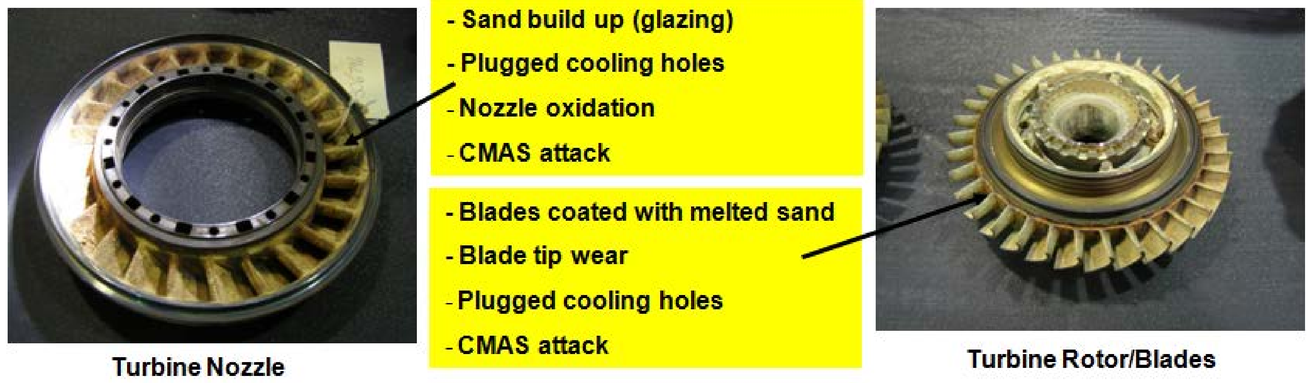


Conceptual Future Vertical Lift Vehicles

Current Fleet Operates in Harsh Environments

ARL Facilities and Capabilities Available to Support Collaborative Research

- High-Temperature Propulsion Components Laboratory (APG)
- Transonic Turbine Blade Research Facility (NASA Glenn)
- Small Engine Compressor Research Facility (NASA Glenn)
- Combustion Research Facility (NASA Glenn)
- Turbomachinery Heat Transfer Tunnel (NASA Glenn)



Turbine Nozzle

Turbine Rotor/Blades

Complementary Expertise/Facilities/ Capabilities Sought in Collaboration

- Expertise in
  - Advanced propulsion concepts/cycles, advanced hybrid electric technologies
  - High-temperature smart materials for articulating turbine blade mechanisms, biomimicry
  - Sand-phobic, high-temperature coatings/components
  - Salt, fog, and hot corrosion resistant coatings for gas turbine components
  - Surface finish and dimensional tolerance potentials of stationary flow-path components for turbine engines fabricated with additive manufacturing
  - Additive manufacturing capability for components
  - Non-intrusive measurement techniques (e.g., compact laser anemometry, particle image velocimetry, wireless measurement reporting)
  - Flow physics modeling, high coupled fluid structure interaction physics under extreme temperature and pressure and high-speed rotation
  - High-temperature turbomachinery components
  - Functionally graded materials and sensing