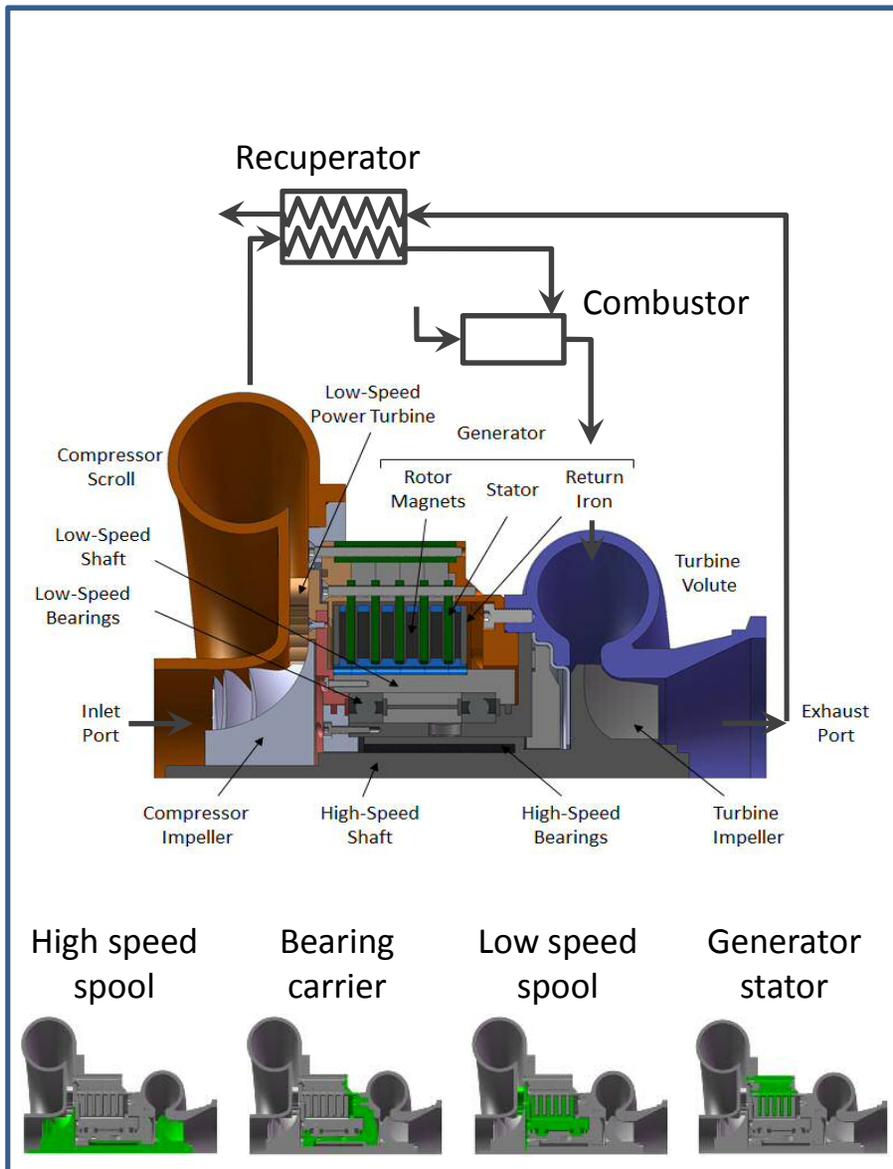


# Metis Design Corp

## Company Info

- Offer novel multi-disciplinary defense & aerospace solutions
  - Structural Health Monitoring
  - Multi-functional Materials
  - Lean enterprise training
- Diverse engineering staff
  - Solid fundamental principles (10/14 staff hold Ph.D.'s)
  - Hands-on experience from 42 SBIR/BAA contracts over 12 years
  - Boston MA headquarters & satellite offices in CA & NM
- MDC has invented multiple disruptive technologies
  - Distributed structural monitoring and sonar PZT array for active/passive detection of impacts/damage
  - Multi-functional CNT assemblies for ice protection & damage detection
  - Innovative lightweight microturbine system

# Metis Design Corp Microturbine



- Unique two-spool gas turbine with pre-combustion power turbine
- Compact low-cost integration of turbomachinery and generator
- State-of-the-art recuperator and low NOx combustor

## Technical Details

- Scalability: 1 kW to 500kW
- Weight: 0.85 kW/kg
- Size: 1.2 kW/L
- Efficiency: 32%
- Emission: < 0.06 g/kW.hr NOx
- Exhaust temperature: 350°C
- Turbine inlet temp: 975°C
- Durability: 40,000 hours
- Cost: < \$100/kW (at 40kW)
- Noise: <60dB

# Metis Design Corp Microturbine

## Development Needs

- 40kW prototype under development for NASA Armstrong
- **Higher efficiency** by increased:
  - turbine inlet temperature (900°C → 1150°C)
  - overall pressure ratio (3.0 → 5.0)
  - recuperator inlet temperature (700°C → 800°C) and effectiveness (85% → 90%)
  - Improved compressor performance at small scale
- **Durability** is tied to turbine hot section and recuperator designs
- A 1kW system will require extensive redesign and use of additive manufacturing to reduce **cost**.
- 5 kW is **feasibility** today, but a cost effective 1 kW is challenging
- **Trade-off** of between efficiency vs. durability and cost
- A low noise generator is a key **features** needed for **residential** use
- Current **manufacturing** capability: 3 recuperator units shipped