

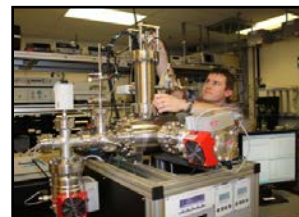


# Facility Factsheet

## National Aerospace Fuels Research Complex (NAFRC)

### Description:

NAFRC serves as the primary source of fuels and novel energy technologies research within the DoD and AF complex. It provides experimental capabilities from basic 6.1, to applied 6.2, and demonstration 6.3 projects to support all in-house research and development projects aligned with the Battlespace Fuels Turbine Engine product. The complex houses research capabilities and tools to study the chemistry and physics of fuels, its application as a thermal management fluid, and its impact on combustor operability and emissions. It also provides access to advanced instrumentation and capabilities supporting energy and energetics development, bio-contamination mitigation and research, and nanofuels research. Primary capabilities or instrumentation for fuel characterization include: gas and liquid chromatography, mass spectrometry, inductively coupled plasma mass spectrometry, differential scanning calorimetry, optical spectroscopy, **and nuclear magnetic resonance spectroscopy**. NAFRC's low temperature fuel and air (-40°C), and sub-atmospheric combustor operating capabilities allow the study of fuel impacts on combustor ignition and flame extinction at high altitude and at the extremes of low temperature. Combustion characteristics and emissions are studied via laser spectroscopy, particle mass, size and counting instruments, and chemical speciation of gaseous and particulate products. Fuel thermal stability is assessed using quartz crystal microbalance, high temperature fuel analyzer, and fuels system simulators. Bio-contamination tools (real time polymerase chain reaction, genomic sequencing, genetic engineering, and bio-incubators), and nanofuels and energy tools (supersonic molecular beam mass spectrometry, helium droplet mass spectrometry, automated nanoenergetic synthesis, atomic force microscopy, x-ray diffraction, Langmuir-Blodgett thin film production, and transmission electron microscopy) allow for studies and mitigation of fuel bio-contamination, and development of nanofuel technologies respectively.



### Purpose:

Provide world class capability to perform research on the chemistry and physics of fuel, its application as a thermal management fluid, and its impact on combustor operability and emissions; explore and develop next generation fuels for high speed flight, high thermal stability, advanced combustion cycles, and expeditionary logistics; explore and develop fuels from alternative sources supporting supply security and reduced environmental impact; and explore and develop alternative energy for its application and impact of future Air Force capabilities.

### Products:

- Fuel characterization: Small scale test protocol, Fuel analysis reports, Thermal stability reports
- Advanced fuel formulations/Endothermic fuels
- Fuel sensors/fuel analyzers
- Nanofuels/nanoenergetics
- Fuel additives/property modifiers
- Modeling and simulation code/data
- Bio-contamination/mitigation strategies/additives/solutions
- Fuel impacts on combustor operability and performance

### Availability:

Primarily in-house and related DoD contractor research. Other U.S. Government agency, DoD contractor and commercial customer programs upon request. Contact: 937-255-4100.