Aerospace Propulsion Outreach Program

Air Force Research Laboratory

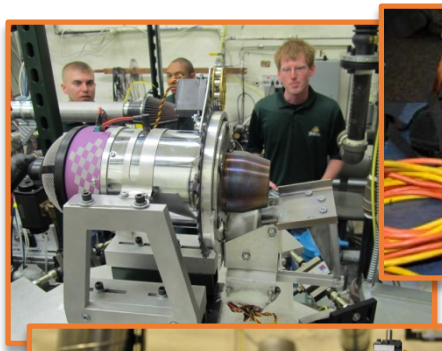
Aerospace Systems Directorate

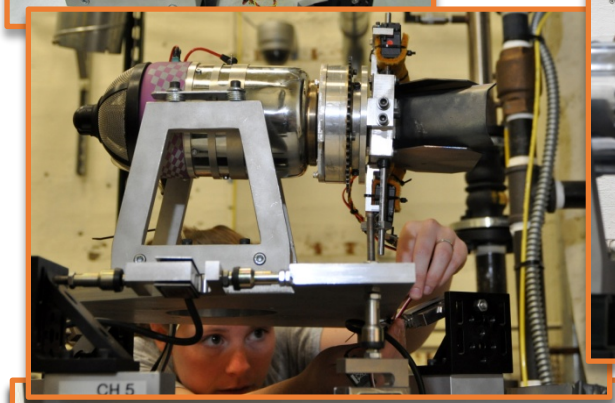
Turbine Engine Division

Quick Summary

- Started in 2009, currently in 8 universities.
- Funded undergraduate capstone experience at universities across the country.
- Students design, build, and test modifications for a small turbine engine.
- Topic historically chosen by participating schools.
- Engines are compared and tested at Wright Patterson Air Force Base at the end of the year.
- Final poster session with AFRL scientists and engineers.

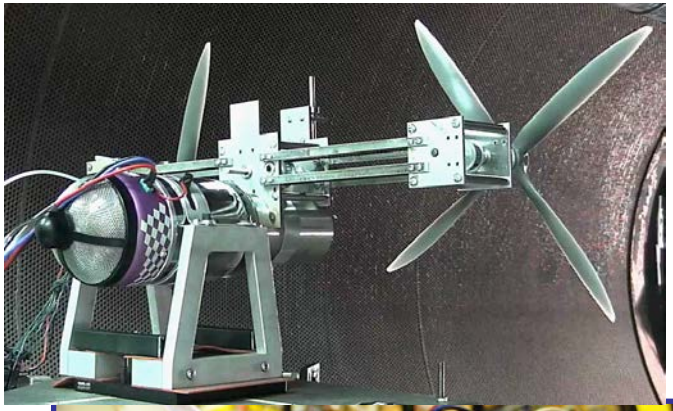
2011-2012 APOP
Small Turbine Thrust Vectoring

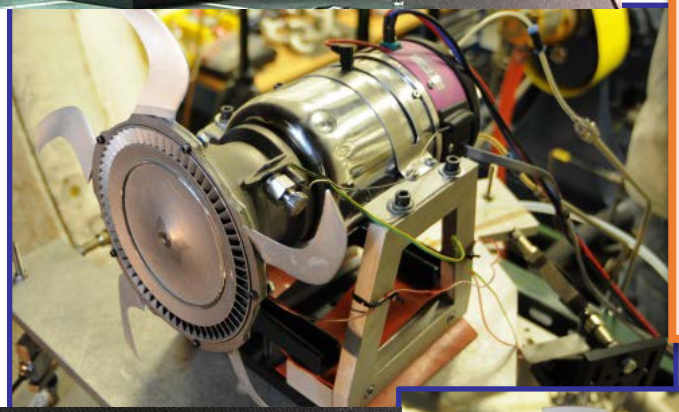


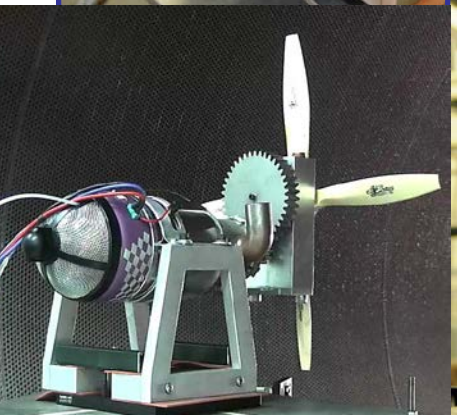


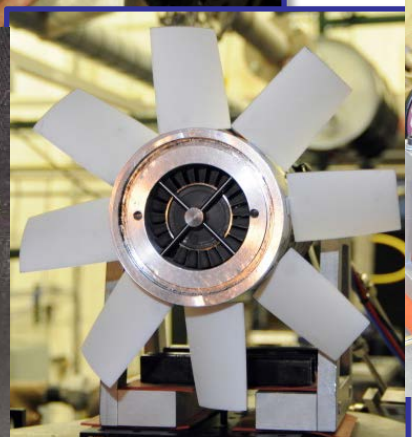
- 2011-2012 Aerospace Propulsion Outreach Program
- AFRL/RZT sponsored
- 6 University Design Competition
  - University of Michigan
  - University of Cincinnati
  - Ohio State University
  - University of Dayton
  - Miami University – Ohio
  - Wright State University
- Design & test a thrust vectoring system
- Device testing event held May 2012 at AFRL/RZT Small Engine Research Lab

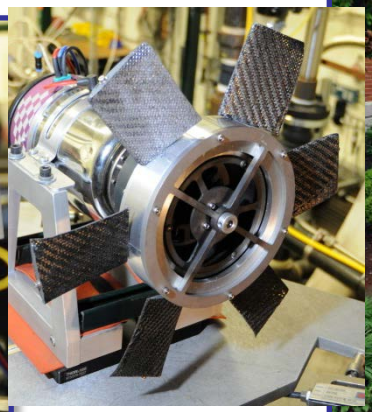
2012-2013 APOP Exhaust Driven Fan



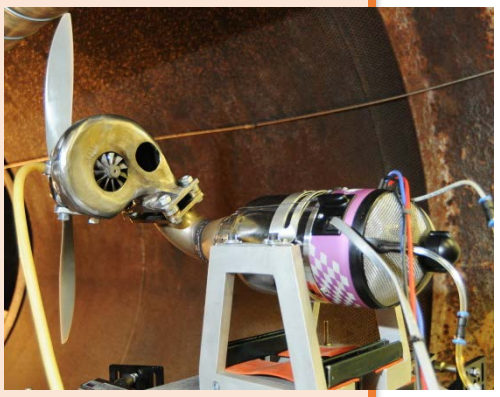




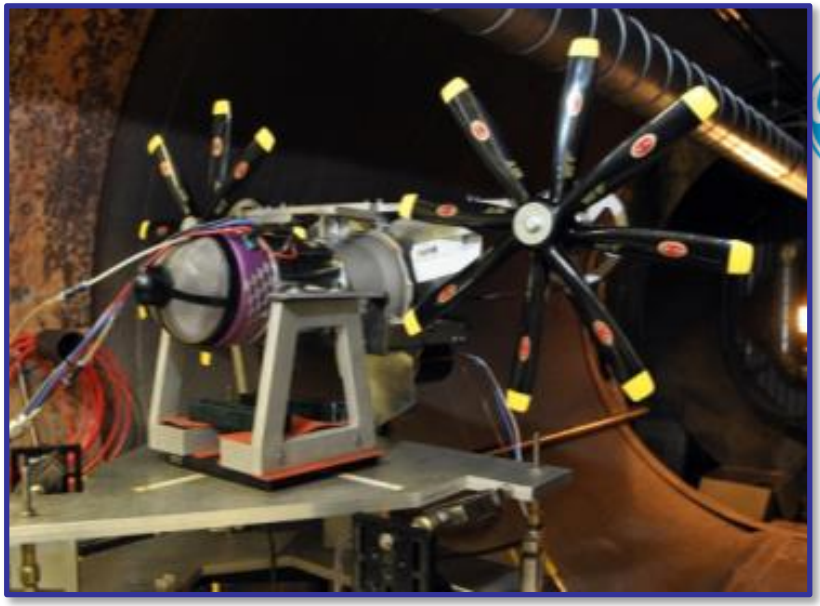




- 2012-2013 Aerospace Propulsion Outreach Program
- AFRL/RQT sponsored
- 6 University Design Competition
  - University of Michigan
  - University of Cincinnati
  - Ohio State University
  - University of Dayton
  - Miami University – Ohio
  - Wright State University
- Design & test an exhaust driven fan for a JetCat P-80
- Device testing event held May 2013 at AFRL/RQT Small Engine Research Lab

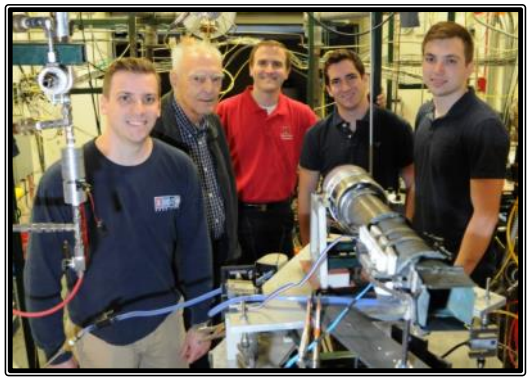


2013-2014 APOP Turbo-Generator

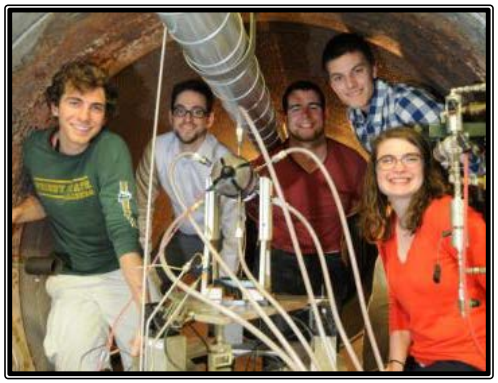


- AFRL/RQT sponsored - $120k
- 7 University Design Competition
  - University of Michigan (4th year)
  - University of Dayton (4th year)
  - Wright State University (3rd year)
  - University of Cincinnati (4th year)
  - Miami University – Ohio (3rd year)
  - The Ohio State University (4th year)
  - **University of Colorado (1st year)**
- Design & test power takeoff turbine to deliver 500W of electrical power + thrust
- Device testing event at AFRL/RQT Small Engine Research Lab
- Actual Requirement from AF-Voldemort

2014-2015 Component Projects



Miami University



Wright State

Afterburner/Nozzle

- Oregon State University (1st Year)
- Miami University (4th Year)

Compressor/Diffuser

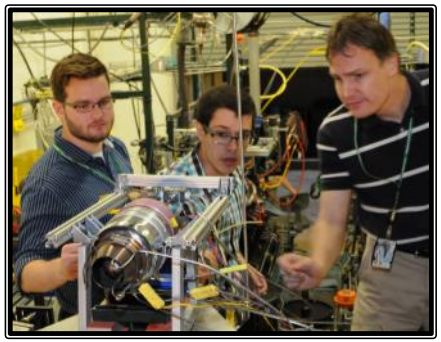
- University of Cincinnati (5th Year)
- University of Dayton (5th Year)

ECU/Conversion to Methane

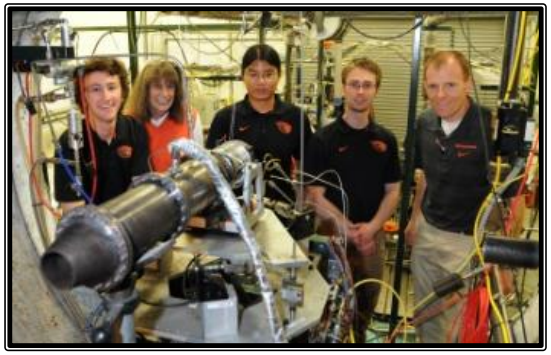
- University of Colorado (2nd Year)
- Wright State University (4th Year)

Turbine/Nozzle

- University of Michigan (5th Year)
- Ohio State University (5th Year)

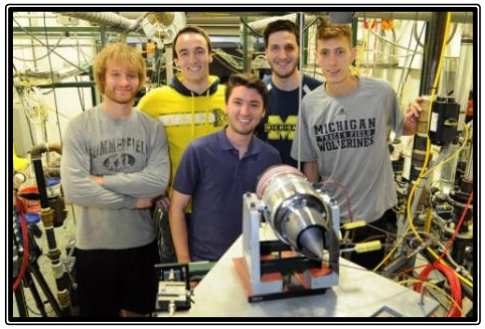


University of Dayton

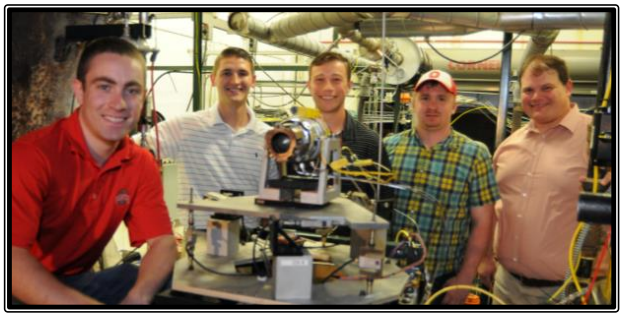


Oregon State

University of Colorado



University of Michigan



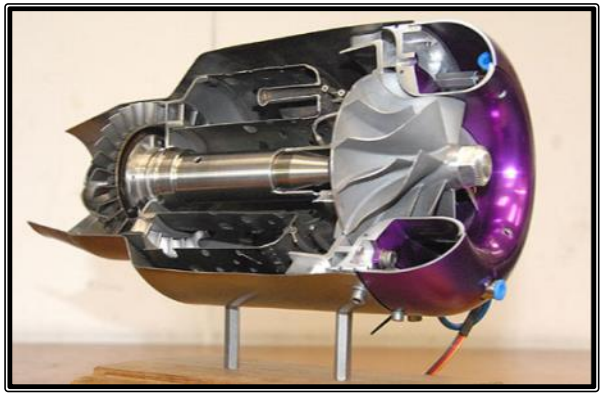
Ohio State

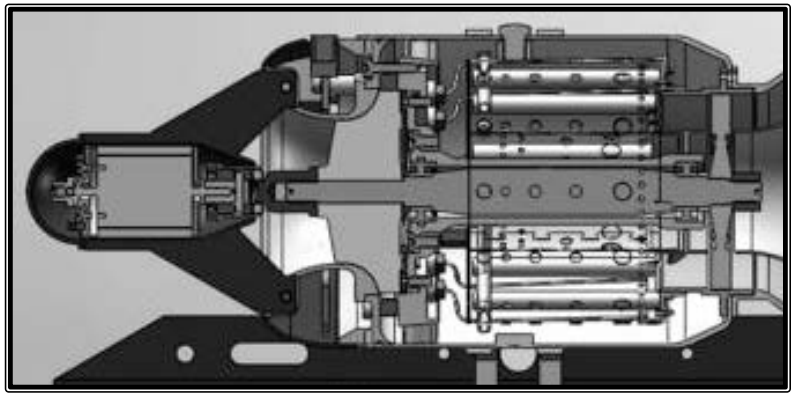
2015-2016 Component Projects

Recuperated Cycle
- University of Dayton
- Miami University
- University of Colorado

Combustor Bypass/External Combustor
- Oregon State University
- Wright State University

Cooled Hi-Temp Turbine
- University of Cincinnati
- Ohio State University
- University of Michigan



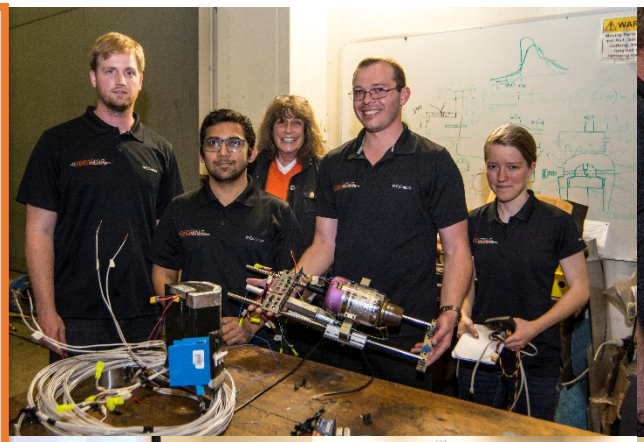


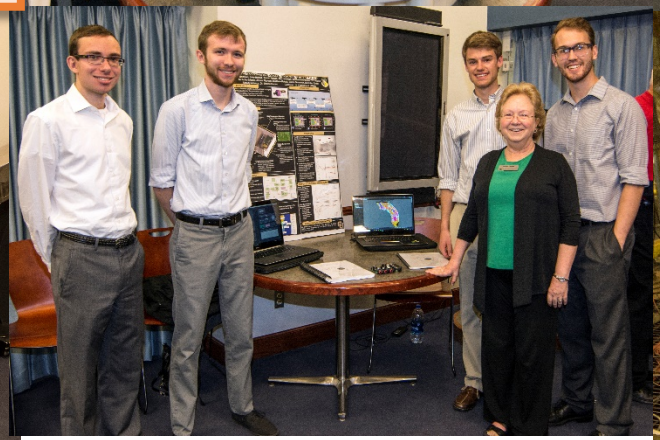
2016-2017 Supersonic Nozzle

- AFRL/RQT sponsored - $120k
- 8 University Design Competition
  - University of Michigan
  - University of Dayton
  - Wright State University
  - University of Cincinnati
  - Miami University
  - The Ohio State University
  - University of Colorado
  - Oregon State University
- Design & test a supersonic nozzle.
- Device testing event at AFRL/RQT Small Engine Research Lab

2017-2018 Cold Start

- AFRL/RQT sponsored - $120k
- 8 University Design Competition
  - University of Michigan
  - University of Dayton
  - Wright State University
  - University of Cincinnati
  - Miami University
  - The Ohio State University
  - University of Colorado
  - Oregon State University
- Design & test solution to start frozen engine and fuel at -50 F.
- Device testing event at AFRL/RQT Small Engine Research Lab




2018-2019 APOP Project

- Increase thrust to weight ratio on a JetCat P100-RXi small turbine engine.
- Engines are provided by AFRL to each school using an Educational Partnering Agreement.
- Budget is $12,000 plus $5,000 to schools that must fly their teams to WPAFB for test week.
- Project manager will visit each school in Nov/Dec to attend design reviews and provide customer input.