Opportunity Title: Combustion Dynamics for Novel Combustor Systems
Opportunity Reference Code: AFSTFP-AFIT-2018-B7465

Organization U.S. Air Force

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How to Apply A complete application package consists of:

- An application
- A current resume/CV
- Transcript(s) – For this opportunity, an unofficial transcript or copy of academic records printed by the applicant or by academic advisors from internal institution systems may be submitted. **Official Transcripts for Junior applicants must be sent to ORAU directly from the academic institution, including graduation date and degree awarded, and must be provided before the fellowship can begin.** All transcripts must be in English or include an official English translation.
- Three references

Additional documents to be uploaded must be in PDF format in a standard typeface no smaller than 12-point font, 1" margins, and double-spaced.

- Research Proposal (maximum of 10 pages)
- Dissertation Abstract (maximum of 1 page) *not required for Senior applicants*
- Summary of Previous and Current Research (maximum of 4 pages)
- List of Publications (maximum of 2 pages)

If you have questions, send an email to AirForceFellowships@orau.org. Please include the reference code for this opportunity in your email.

Description As future requirements lead toward compact, efficient engine designs, conventional gas turbine component design methodology will become more integrated to provide higher performance systems. Several concepts are being explored to obtain lighter weight, more efficient, lower fuel consumption combustors. One example of this integration of components is the Ultra Compact Combustor (UCC). In this configuration, fuel is deliberately added circumferentially above the vane geometry to accomplish combustion simultaneously while the flow is turned by the vane. Research areas have focused on the combustion mechanisms at high g-loading and radial migration of the hot combustion gases into the integrated vane along with investigations into Rayleigh losses associated with higher Mach number combustion. With optical diagnostics such as PIV, PLIF, TDLAS, and CARS in place in the laboratory, the capability to completely understand these complex burning configurations exist. Future efforts will continue to understand the integration issues with the compressor and turbine. New efforts specifically geared at understanding how to cool the turbine appropriately in this high equivalence ratio environment will also be developed.

Another research area focuses on the combustion process in small engines used in Remotely Piloted Aircraft. These investigations have focused on

attempting to understand the impact of the inlet flow conditions, namely the altitude effects, that can impede the performance of these small IC engines. An altitude chamber has been built that enables control of the pressure and temperature within and around the engine. Investigations into fuel injection, timing, and heavy fuels are possible to understand the performance and the specific fuel consumption of the engine.

Research Advisor

Prospective applicants are encouraged to contact the opportunity's Research Advisor, listed below, to discuss the applicant's approach for responding to this research opportunity and to discuss their potential collaboration on the research opportunity.

Dr. Marc D. Polanka, marc.polanka@afit.edu, (937) 255-3636 Ext.4714

Qualifications

Candidates must have a Ph.D., Sc.D., M.D., D.V.M., or academically equivalent research doctorate before beginning the fellowship.

Candidates must have U.S. citizenship. Research opportunities at AFRL, AFIT, and USAFA are open to U.S. citizens only. Qualified applicants will receive consideration without regard to race, creed, color, age, sex, or national origin.

Stipend rates are determined by Air Force officials, and are based on the applicant's academic and professional background. The fellow must show proof of health and medical insurance. Health insurance can be obtained through ORAU. The fellow will not enter into an employee/employer relationship with ORAU, USAF, or any other facility, office or agency. Instead, the participant will be affiliated with ORAU for the administration of the appointment through the ORAU appointment letter and Terms of Appointment.

For more information, please visit the Air Force STFP website at https://AirForceFellowships.orau.org.

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12)
  - **Computer, Information, and Data Sciences** (16)
  - **Earth and Geosciences** (21)
  - **Engineering** (27)
  - **Environmental and Marine Sciences** (12)
  - **Life Health and Medical Sciences** (45)
  - **Mathematics and Statistics** (10)
  - **Other Non-Science & Engineering** (2)
  - **Physics** (16)
  - **Science & Engineering-related** (1)
  - **Social and Behavioral Sciences** (18)