Opportunity Title: Air Force Research Laboratory (AFRL) Summer Internship: Computational Fluid Dynamics
Opportunity Reference Code: ERDC-ITL-2023-0017

Organization U.S. Department of Defense (DOD)

Reference Code ERDC-ITL-2023-0017

How to Apply Click on *Apply* at the bottom of the opportunity to start your application.

Description The propagation of laser beams through turbulent flows has been an important topic with applications ranging from missile defense to target designation and tracking. The turbulent air disturbances are severe enough to severely distort the light, preventing it from properly focusing. The study of these interactions has been described as "aero-optics". The opportunities for the aero-optic research at AFRL/Directed Energy Directorate include experimental studies of turbulence such as turbulent boundary layers and shear layers as well as the development of appropriate diagnostic instrumentation, and water-table visualization. Computational (CFD) opportunities also exists to design aero-optic experiments and to develop accurate aero-optic CFD solutions.

What will I be doing?

As an ORISE participant, you will join a community of scientists and researchers in an effort to use numerical simulations to predict the flow physics around a hemispherical turret at high-speed flow regimes for laser weapon applications. he effort proposed here serves to increase laser weapon effectiveness at distance on target by improving AF understanding of the flow around laser beam director turrets and the ability to correct for the density/index of refraction gradients in these flows to optimize laser performance.

Why should I apply?

Under the guidance of a mentor, you will engage in various research activities, including:

- The use of a CFD code and utilization of the HPC computer resources for both computations and Pointwise grid generation software
- Familiarize with the supercomputer architecture, e.g., unix command, job script development, file transfer, compiling program, and parallelization scaling studies, etc.
- Numerical simulations of a Mach 2 flow over a 2-in diameter hemispherical turret mounted on a flat plate. You will use post processing / visualization tools to analyze simulation data and to understand the underlying physics
- Investigate the impacts of the simulation inflow boundary conditions, e.g., boundary layer thickness and turbulent intensity, on the flow structures at the vicinity of the laser turret
- Grid resolution studies to understand their effects on the flow features captured in the simulations
- Gain an understanding of the ability of state-of-the-art LES/RANS models to simulate aero-optical effects in supersonic flow, which will provide new insights into the effects of high Reynolds number turbulent separation on aero-optics
- Observe the experimental activities in the supersonic wind tunnel and water-table flow visualization
- Present research results at the end of the internship

Where will I be located? Albuquerque, New Mexico

Exact start dates will be determined at the time of selection and in coordination with the selected candidate. Applications are reviewed on an ongoing basis and internships will be filled as qualified candidates are identified.

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What is the appointment length?

This appointment is a summer research appointment, with the possibility to be renewed for additional research periods. Appointments may be extended depending on funding availability, project assignment, program rules, and availability of the participant.

What are the benefits?

You will receive a stipend to be determined by the sponsor. Stipends are typically based on a participant's academic standing, discipline, experience, and research facility location. Other benefits may include the following:

- Health Insurance Supplement (*Participants are eligible to purchase health insurance through ORISE)*
- Relocation Allowance
- Training and Travel Allowance

About ORISE

This program, administered by Oak Ridge Associated Universities (ORAU) through its contract with the U.S. Department of Energy (DOE) to manage the Oak Ridge Institute for Science and Education (ORISE), was established through an interagency agreement between DOE and DoD. Participants do not enter into an employee/employer relationship with ORISE, ORAU, DoD or any other office or agency. Instead, you will be affiliated with ORISE for the administration of the appointment through the ORISE appointment letter and Terms of Appointment. Proof of health insurance is required for participation in this program. Health insurance can be obtained through ORISE. For more information, visit the ORISE Research Participation Program at the U.S. Department of Defense.

Qualifications

The qualified candidate should have a Mechanical/Aerospace Engineering background, particularly in fluid dynamics related courses.

Highly competitive applicants will have education and/or experience in one or more of the following:

- Computational fluid dynamics
- Matlab
- Linux/Unix

Application Requirements

A complete application consists of:

- Zintellect Profile
- Educational and Employment History
- Essay Questions (goals, experiences, and skills relevant to the opportunity)
- Resume (PDF)
- Transcripts/Academic Records - Please upload a copy of a transcript for your current or most recent degree program that meets the disciplinary qualifications of the opportunity. Click here for detailed information about acceptable transcripts.
- One recommendation. Your application will be considered incomplete and will not be reviewed until one recommendation is submitted. We encourage you to contact your recommender(s) as

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soon as you start your application to ensure they are able to complete the recommendation form and to let them know to expect a message from Zintellect. Recommenders will be asked to rate your scientific capabilities, personal characteristics, and describe how they know you. You can always log back in to your Zintellect account and check the status of your application.

If you have questions, send an email to usace@orise.orau.gov. Please list the reference code of this opportunity ERDC-ITL-2023-0017 in the subject line of the email. Please understand that ORISE does not review applications or select applicants; selections are made by the sponsoring agency identified on this opportunity. All application materials should be submitted via the "Apply" button at the bottom of this opportunity listing. Please do not send application materials to the email address above.

Connect with ORISE...on the GO! Download the new ORISE GO mobile app in the Apple App Store or Google Play Store to help you stay engaged, connected, and informed during your ORISE experience and beyond!

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Bachelor's Degree, Master's Degree, or Doctoral Degree received within the last 60 months or currently pursuing.
- **Discipline(s):**
  - **Computer, Information, and Data Sciences** (17 👁)
  - **Engineering** (27 👁)
  - **Mathematics and Statistics** (11 👁)
  - **Physics** (16 👁)
- **Age:** Must be 18 years of age
- **Veteran Status:** Veterans Preference, degree received within the last 120 month(s).