AEROSPACE ENGINEERING
COLLEGE OF ENGINEERING

RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

APPLICATION DEADLINE: February 8, 2026

PROJECT TITLE: Oxygen Measurements in a Fuel Tank Ullage using Tunable Laser Diodes

Physical Requirement :
Must be able to lift 20 lbs and be a US citizen

Project's Technical Skills Requirement :
Work with hand tools and klowledge of pthon coding and data acquisition systems

Project's Available Positions : 1

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Project Description

Aircraft fuel tanks still remain a survivability concern because of the possibility of accidental or intentional ignition. As a result of the TWA 800 incident and in response to potential fuel tank threats, the National Transportation and Safety Board (NTSB) and Federal Aviation Administration (FAA) had issued a safety recommendation , specifically to reduce the risk of ignition of flammable vapors present in aircraft fuel tanks. Currently, the best method for reducing ignition vulnerability in a fuel tank is to displace the oxygen (O2) in the fuel tank ullage with nitrogen-enriched air (NEA) that can be produced by the Onboard Inerting Gas Generation Systems (OBIGGS). However, the cost required to supply the n2 level required for inerting the ullage is expensive and therefore accurate measurements are needed. To this end we are working on modifying and refining an optical based on a laser absorption concept which works on multiple wavelengths and can account for fuel films/wetting of the optic and thereby corrects for the unrelated attenuated signals. Early versions of this system concept were demonstrated in different applications to provide an accuracy of better than 1% of reading and a repeatability (or precision) of better than 0.3% of reading over an O2 range from 0.1% to 21% oxygen concentration by volume. Therefore, our team is currently examining an ullage application of an aircraft fuel tank.
This topic is open to all CEAS students. Although training will be provided, basic skills needed include experience with coding, such as python, LabVIEW, etc. and being a team player is required. Comfortable in a large-scale laboratory environment. In addition, there is a potential for the student to participate in technical publications at local and national levels. Dr. Disimile’s UC-FEST laboratory is located off campus in Fairfield, Oh,

approximately 30 minutes north of UC.