**GENERAL INFORMATION**

**Program sponsor:** Princeton Environmental Institute  
**Position number:** E1SMI1  
**Project title:** Aerodynamic Flow Control on Cars to Improve Fuel Efficiency  
**Organization/research group:** Smits Fluid Mechanics Lab  
**Primary location(s) of internship:** Princeton University  
**Additional cities and/or countries to be visited (if applicable):** n/a  

*Note:* If this internship is located in a country with an International SOS risk rating of High or Extreme, final candidates must participate in a travel review process overseen by the Travel Oversight Group (TOG), and obtain safety guidance prior to departure. The University reserves the right to revoke support and funding for travel at any time there has been a significant deterioration in the safety and security conditions surrounding travel arrangements, or in the sector of the country, or countries, where travel is to occur.

**FACULTY SPONSOR(s)/HOST INFORMATION**

**Name(s):** Prof. Alexander Smits, Dr. Tyler Van Buren  
**University Department(s):** MAE  
**E-mail:** asmits@princeton.edu  
**Phone:** (609) 258-5117  
**Website:**

**INTERNERSHIP/RESEARCH PROJECT INFORMATION**

**Internship/project description:**
Aerodynamic drag plays a critical role in the efficiency of an automobile. However, engineers must balance comfort, safety, and aesthetics along with aerodynamics when designing a vehicle. In order to reduce aerodynamic drag without changing the salient features of the vehicle, we propose to use modern flow control techniques that can actively respond to the surrounding flow condition to minimize drag. Using synthetic jets (oscillatory blowing and suction) to reduce the momentum loss in the wake and separations around the sides of the vehicle, we can reduce drag and unwanted side forces in an unsteady flow field. Preliminary tests will be conducted in the EQuad subsonic wind tunnel on model bluff bodies mounted on a force balance. If successful and time permits, we will move to test these models in the high Reynolds number test facility on the Forrestal campus.

**Student's role and responsibilities:**
The students on the project will have the following role/tasks:

1. Design and manufacture a model bluff body that is representative of a typical SUV-type automobile. The bluff body must be outfitted with active flow control devices.

2. Design and build an unsteady mounting apparatus that can be installed in the wind tunnel and can actively change the models position within the tunnel. The mount must also monitor the drag force on the vehicle.

3. With a research engineer, design and conduct experiments that can assess the drag reduction benefits of active flow control.

4. Analyze and interpret the findings.
Internship/project learning objectives:

By the end of the project, the students should have enhanced their abilities in:

(1) Model design and fabrication
(2) Mechanical design, construction, and operation of testing facilities.
(3) Scientific data acquisition and analysis
(4) Interpretation, communication, and dissemination of their scientific findings.

PROGRAM REQUIREMENTS

Academic background and any course pre-requisites:

Preferred: engineering, science

Technical skills:

Preferred: Matlab, CAD

Additional training(s):

Lab safety and laser safety training are required.

Equipment:

n/a

Physical demands:

n/a

Language abilities/competencies (if applicable):

Additional information about the internship/project:

Selected student(s) will need to complete lab safety training prior to the start of the internship.

INTERNATIONAL TRAVEL REQUIREMENTS (if applicable)

Visa(s) required?  Yes  No
Research permit/pass required?  Yes  No
Immunizations required?  Yes  No

INTERNSHIP/PROJECT SUPERVISOR(S)

Name and title of primary supervisor: Alexander Smits
Email: asmits@princeton.edu  Phone: (609) 258-5117

Name and title of additional supervisor, if applicable: Tyler Van Buren
Email: tburen@princeton.edu  Phone: (518) 867-9093

PROGRAM DATES AND FUNDING INFORMATION

Weekly Stipend: $500  Number of Positions Available: 2
Tentative Start Date (mm/dd/yyyy): 6/11/2019  Number of Weeks: 8-10
Tentative End Date (mm/dd/yyyy): 08/31/2019

Note: PEI funding is for full-time work, 35 hours per week minimum, and for a period of at least 8 continuous weeks.

Application Deadline: January 11, 2019