**PhD Opportunity: A Novel Fuel Transfer System for Sustainable Space Missions**

**Department:** Mechanical and Mechatronics Engineering

**Supervisor:** Dr Priyanka Dhopade
**Location:** University of Auckland, New Zealand
**Start Date:** Applications accepted all year round
**Funding:** Competition Funded PhD Project (Students Worldwide)

**Project Overview**

There are currently more than 10,000 operational satellites orbiting Earth, and this number is expected to triple over the next decade. As the global in-space servicing and refuelling market accelerates, projected to be worth USD $1.1 billion by 2032. The space industry is moving toward a future where in-orbit fuel stations will become essential infrastructure for sustainable satellite operations.

Today, spacecraft must launch with all the propellant they will ever use. This limits mission lifetimes, leads to premature decommissioning, and contributes significantly to the growing challenge of space debris.

This PhD project forms part of an ambitious research programme as part of the Sustainable Space Initiative (SSI) (ssi.org.nz) on developing a novel in-space refuelling system that will revolutionise spacecraft maintenance, extend satellite lifetimes, and reduce environmental impacts. The SSI is a research initiative dedicated to ensuring the long-term environmental, social, cultural, and economic sustainability of space activities.

Your research will focus on understanding and controlling liquid behaviour in zero gravity, one of the most complex challenges in enabling safe and efficient fuel transfer in orbit. Since in-space refuelling has never been performed, this project will generate new fundamental knowledge for future satellite servicing missions, deep-space exploration, and sustainable space operations.

**Research Objectives**

**1. Experimental Investigation of Zero-Gravity Flow Patterns**

You will design, build, and operate an experimental facility that recreates key aspects of zero-gravity fluid behaviour by constraining flow between two closely spaced horizontal plates. Surface tension dominates in this configuration, allowing realistic simulation of propellant behaviour.

**2. Computational Fluid Dynamics (CFD) Modelling**

The CFD component will provide detailed insight into the physics of mixing jets and gas–liquid interactions in microgravity.

You will perform a hierarchical simulation campaign using tools such as ANSYS CFX or Fluent, incorporating models capable of capturing capillary forces, such as the Continuum Surface Force (CSF) model.

**Candidate Requirements**

We welcome applications from candidates with a background in:

- Mechanical, aerospace, or chemical engineering
- Physics or applied mathematics
- Fluid mechanics, CFD, or related fields

Experience with laboratory experimentation, CAD, or numerical simulation is advantageous but not required.

**How to Apply**

Email your CV and academic record (including grades and subjects) to Dr Priyanka Dhopade: priyanka.dhopade@auckland.ac.nz. Also include the GPE estimation calculated used the online calculator linked to in the "Funding Notes" section. **Requests for further information or correspondence without all of this information will be treated with low priority and are unlikely to receive a response.**

**Funding Notes**

Excellent candidates for PhD research at The University of Auckland can compete for a University of Auckland Doctoral Scholarship. These are competitive scholarships and are not restricted against nationality. As a general rule, only GPEs in excess of 7.0 are considered competitive. You can get an informal estimate of your GPE here: View Website

This is the only source of funding available for this project.