MONASH
ENGINEERING

MONASH University

Faculty of Engineering
Summer Research Program 2024-2025

Project Title: Impact of Surface Roughness on Liquid Film Cooling of Rocket Engines

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Objective

Modify a laboratory scale hybrid rocket engine to allow for the surface injection of coolant over surface of various roughness, and use changes in refractive index to quantify coolant film thickness and entrainment.

Project Details

The rate at which a liquid film can absorb and transport heat away from the walls of a rocket motor, depends on radiative and convection heat transfer from the hot gases to the liquid and the vaporisation and entrainment of the liquid into the gas flow. This heat transfer to the liquid-gas interface from the flame depends on the local vapor concentration between the flame and the interface. In this project, principle of schlieren imaging will be used to estimate the local thickness of the liquid film by capturing the refraction of light that occurs as it moves through regions of differing refractive index. This will allow quantification of the impact of surface roughness on film entrainment and allow for enhanced modelling of the effective cooling.

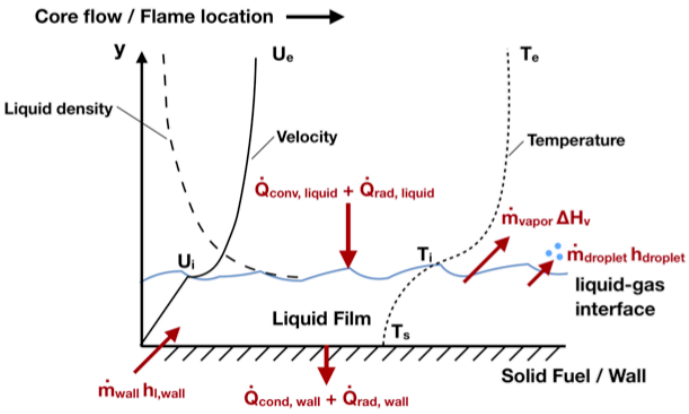

Figure 1: A boundary layer model for hot gaseous flow over a wall-bounded liquid film.

Prerequisites

Applicants should have a background in fluid dynamics and an interest in experimental mental methods and optical diagnostic.