Student Space Activities

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Never Stand Still

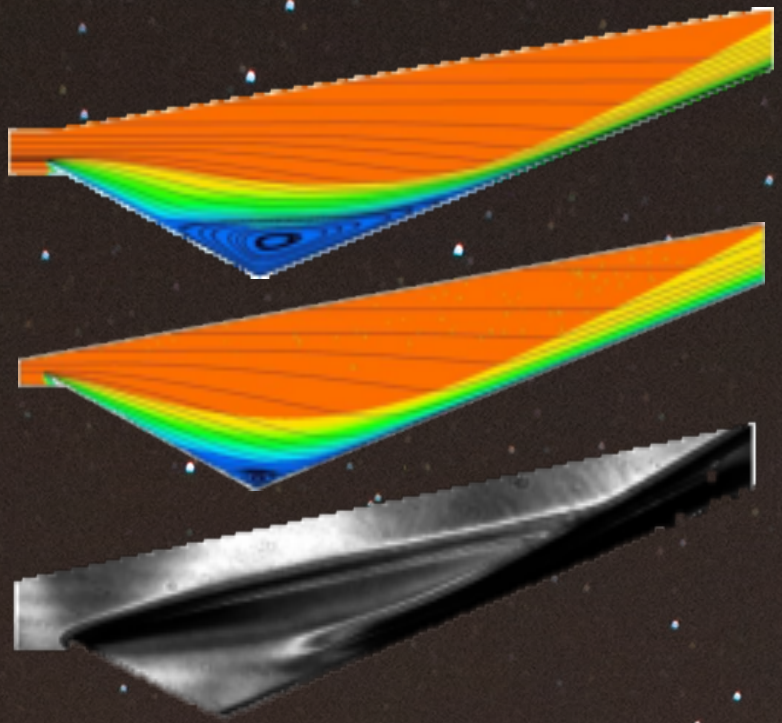
School of Engineering and Information Technology

Aerospace Research

Traditionally:

- High-speed aerodynamics
- Scramjet ignition
- Advanced diagnostics
- Fluidic thrust control

Nanosecond plasma discharges for supersonic ignition.



Hypersonic flow separation in the transitional density regime – Results using Navier-Stokes code (top [1]), DSMC code (middle [1]), and experimental laser diagnostics.

[1] Moss, J. N., O'Byrne, S., Deepak, N. R. & Gai, S. L. Simulations of Hypersonic, High-Enthalpy Separated Flow over a 'Tick' Configuration, AIP Conf. Proc., American Institute of Physics, 2012, 1501, 1453-1460.

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New Space Research & Development Program

Facilities:

- 2 thermal vacuum chambers
- Class 100 clean room
- 6.6 kN shaker table
- Electronics workshop
- Satellite ground station
- Falcon telescope
- 64-core workstation
- T-ADFA free-piston shock tunnel

Key research areas:

- Space situational awareness
- Space technology development
- Satellite formation flying
- Advanced instrumentation

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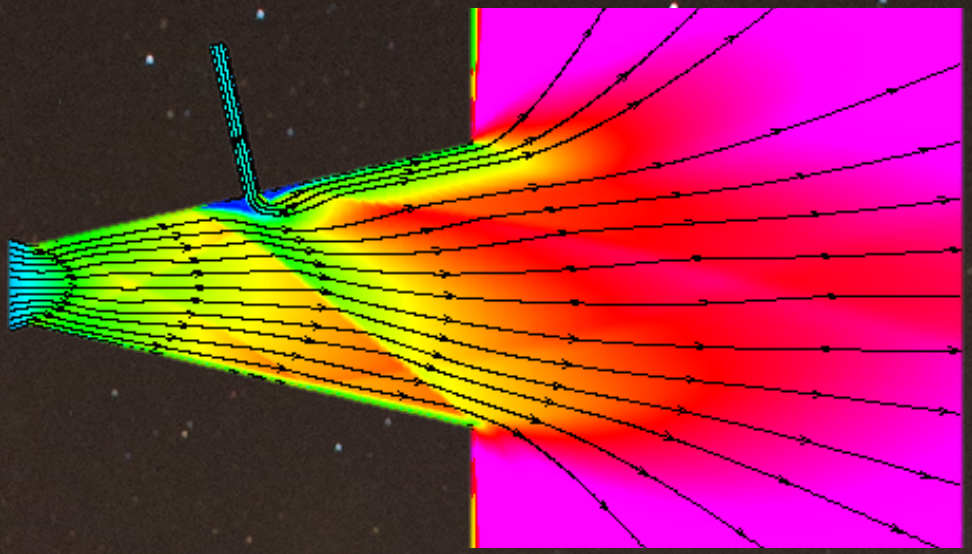
Fluidic Thrust Vectoring for Spacecraft Control

Aim: To improve efficiency/precision of spacecraft manoeuvring by maintaining correct alignment of the thrust vector.

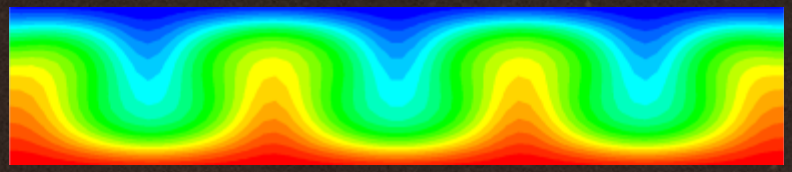
- Parametric study & geometry optimisation using CFD
- Experimental validation with vacuum chamber, biaxial thrust stand, & 3D printed nozzles
- Implementation analysis



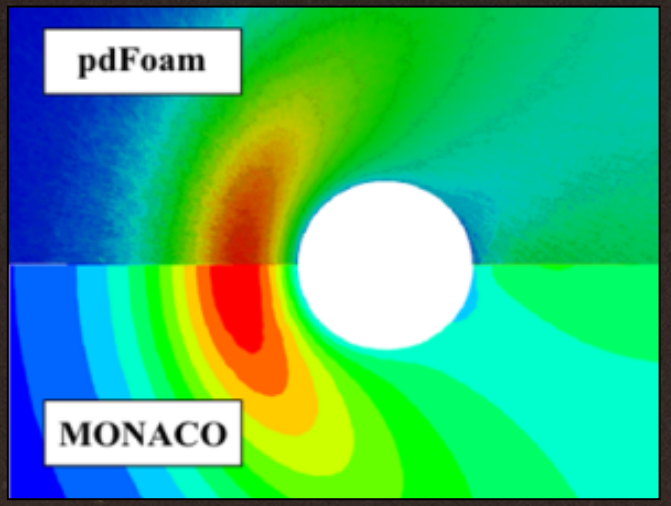
Mach number contours for shock vector control nozzle exhausting into vacuum, 5° vector angle.

Other Research Student Projects

- Aerodynamic simulation of near-earth objects
- Propellantless formation control of Cubesats
- Understanding thermal convection to aid the design of a Mars rover



Simulation of temperature contours between a 243 K plate and a 193 K plate in Martian atmosphere.

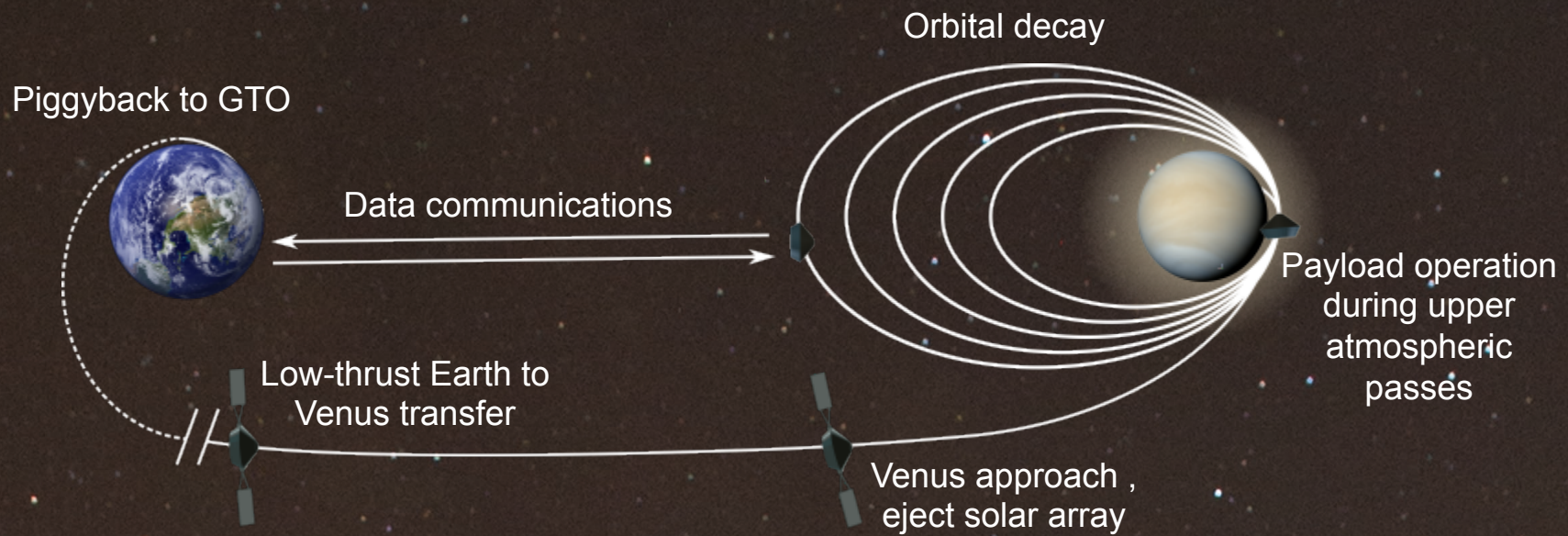


Temperature profile of Mach 10 flow of argon over a cylinder using the evolving in-house code (pdFoam) and a well-established code (MONACO).

Student Team Project: VAPR

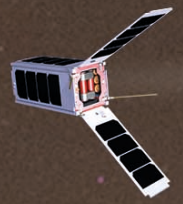
A low cost pathfinder mission to Venus for upper atmospheric wind-speed, density, and species concentration measurements.

- Improved understanding of Venus' atmosphere
- Demonstration of low-cost interplanetary architecture



Science/Engineering Outreach

Thank you!



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