Launch Vehicle Propulsion
An Introduction to Liquid Propellant System Design and Analysis
Oct 19, 2020 to Oct 22, 2020

This introductory short course covers liquid propellant system design and analysis for launch vehicles. Intended for those with an engineering background, the participant is exposed to a fully-developed understanding of the propellant system that they can directly apply for the design, test, and operation of launch vehicles. Attendees will gain an in-depth understanding of liquid propellant dynamic considerations for launch vehicle design.

Course Description
This course is focused on the feed systems of liquid propellant space propulsion systems. Subjects of interest are the propellant tanks, propellant feedlines, pressurization systems, and the interaction of these components with overall vehicle performance. Starting with a basic foundation in liquid propulsion systems, in-depth topics are addressed and reinforced with classroom exercises. The concept of liquid sloshing in propellant tanks is covered along with the analytical, computational, and experimental methods to characterize sloshing parameters for guidance, navigation, and control (GNC) simulations.

Common and advanced concepts of slosh baffling and other mitigation strategies with analysis techniques are discussed. The concept of unusable propellant is introduced along with methods for estimating the maximum fraction of propellant than can be drained from a tank. An introduction is given to propellant feedline dynamics, including start slump, water hammer, and pogo stability. Class exercises for identifying the pogo modal interactions between the vehicle structure and propellant system will include both strategies of avoidance as well as mitigation.

The importance of maintaining adequate pressures in propellant tanks and the analysis techniques to design and model these pressurization systems will be introduced. Cryogenic propellants require a firm understanding of phase change and thermodynamics to minimize propellant boil-off while maintaining tank pressurization and temperature requirements. This complex, multiphase, thermodynamic system is covered in detail with class examples.

Pre-registration
Please contact Grant Musgrove or call +1-210-522-6517 to pre-register, reserve your spot, and receive course updates.