Advanced Bipropellant Rocket System Modelling

Overview
The PSU Lunar Lion Team is currently developing and testing a monopropellant rocket landing system. To further expand the number and type of PSU developed landing system, a unique advanced bipropellant rocket system concept was developed. The feasibility and the performance of this bipropellant landing system need to be determined before creating and testing the actual experiment system.

Objectives
Team’s objective was to generate and test a computer model of a unique bipropellant rocket system for planetary landing. This model generation and testing was done to determine the feasibility and the performance of this unique rocket system for practical applications.

Approach
- The concept of bipropellant rocket system was provided by the PSU Lunar Lion Team
- Met with the sponsor team to understand and to discuss the customer needs and requirements
- Based on the system concept and customer needs, relevant patents and existing products were reviewed to determine the uniqueness and practical application of this landing system
- Met with the sponsor biweekly and experimental data for monopropellant system was used for modelling a component of this advanced bipropellant landing system
- Matlab SIMULINK was used for modelling each component of this bipropellant rocket system
- The equations and assumptions used for each component was verified and validated by obtained input from professors and by doing hand calculations
- The final SIMULINK model was improved and developed by iteration to meet the customer needs
- These SIMULINK model produced thrust and specific impulse as the final results

Outcomes
The SIMULINK model generated and tested produced thrust, and specific impulse as final output from the model. A thrust of 4500N and a specific impulse of 315s was given as output. This showed that:
- The bipropellant rocket system is feasible
- It produces high thrust and high efficiency that expected
- These model can be used as a part of obtaining a patent for Lunar Lion Team