

SPACE PROPULSION SYMPOSIUM (C4)
Propulsion Technology (1) (3)

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FEASIBILITY ANALYSIS AND TESTING RESULTS OF COLD GAS PROPULSION SYSTEM

Abstract

Till date, no cubesat has successfully flown with a propulsion system onboard. However, incorporating a propulsion system on nanosatellites, for example CubeSats, can help in performing a lot of useful operations like orbit raising , low delta v maneuvers , proximity operations , formation flying , etc. This paper presents the test results of an indigenous designed Cold Gas Propulsion System for the CubeSat platform. The system has been designed keeping in mind the weight constraints of a CubeSat in order to match the Cubesat standards for a 3U model. The ideal design proposes to use a semiconductor laser to decompose the solid nitrogen, which is used as a propellant. Conventional cold gas propulsion systems use a plenum chamber which has been eliminated in this design. Instead, the upper chamber containing the solid nitrogen is connected to a low pressure suction chamber through a hose. The solid nitrogen is wound around a rod and rotated at a low rpm. The suction chamber constitutes of actuated solenoid valves thereby controlling the flow of the cold gas through the nozzle. The design of the nozzle has also been presented with the necessary calculations. The total amount of thrust generated has been found out and the necessary calculations related to the specific impulse and delta v has also been presented. The system would be shielded from solar radiation to maintain the required temperature and pressure. This paper highlights the usefulness of the prototyped cold gas propulsion system in performing the necessary operations by small satellites especially CubeSats, some of which have been mentioned above. The system will help in making the CubeSat platform better equipped and can also provide a helping hand to the space debris management. Moreover, this can make space exploration for industries and university students a lot more economically viable as compared to the conventional systems.