

IAF SPACE PROPULSION SYMPOSIUM (C4)
Joint Session between IAA and IAF for Small Satellite Propulsion Systems (8-B4.5A)

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LEAK TESTING PROCEDURE FOR STUDENT-DESIGNED NANOSATELLITE
PROPULSION/FEED SYSTEMS

Abstract

In recent years, the number of nanosatellites being developed by student-led research teams at universities has increased dramatically. However, due to challenges with range safety constraints, only a limited number of propulsion systems have been developed indigenously and flown on-orbit. A key element that can allow student teams to successfully fly innovatively designed thrusters is the need for repeatable, affordable, and accurate leak testing of associated propellant feed systems that addresses range safety concerns. In universities developing small satellites, students typically lack resources and available guidance to conduct component testing on campus grounds. Using the propulsion system designed by a team of students in the Missouri ST Satellite Research Team at the Missouri University of Science and Technology as part of the NASA-funded Undergraduate Student Instrument Project (USIP) for the Multi-Mode Mission (MMM or M-cubed) CubeSat, a meticulous testing procedure is currently in development for leak testing of the student-designed propulsion/feed system. This research paper summarizes an approach to qualify a university-developed satellite for flight in space by meeting industry-recognized leak testing standards that ensure flight-readiness, along with a detailed discussion on the leak testing procedures used by space companies before integrating a nanosatellite to their launch vehicle. The novelty of this research lies in mapping the development of an accurate yet affordable leak testing procedure for student-designed nanosatellites that can be conducted on campus whilst being at par with industry accepted standards and within general tolerance levels.