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For a successful space program: Quality and Safety! (1)

Author: Mr. Pranav Balaji
India

Mr. Ansh Jaipuria
SRM Institute of Science and Technology, India
Prof.Dr. Senthilkumar SUNDARARAJ
SRM Institute of Science and Technology, India

DESIGNING A SPACE PIT FOR ROCKET LAUNCHES: A NOVEL APPROACH

Abstract

In recent years, the field of rocket propulsion technology has witnessed remarkable progress driven by innovative systems engineering practices. Nevertheless, a significant gap exists in the domain concerning the development of space pits specifically engineered to mitigate backflow into the rocket nozzle during launch. This research paper endeavors to address this pivotal deficiency.

Traditionally, rockets have relied heavily on the stability and functionality of their launch pads, with inadequate launch pad and space pit design potentially leading to an unstable base for the rocket. Such instability can result in vibrations and backflow, posing the risk of catastrophic consequences, including the rapid consumption of the entire first stage. In light of these challenges, this study is motivated by the urgent need for space pits that can offer superior stability, vibration damping, backflow prevention, and operational feasibility.

Distinguishing itself from previous research, this study adopts a unique approach that prioritizes experimentation and calculations as opposed to simulations. Key controlling parameters such as the location and position of the center and side walls were altered and results were derived from it. Employing a rigorous methodology, the paper investigates three primary aspects:

1) The design and practical implementation of space pits for rocket launches, focusing on their capacity to prevent backflow into the nozzle. 2) The essential performance parameters used to evaluate the effectiveness of these space pits. 3) The feasibility and viability of incorporating space pits into future propulsion systems.

This research relies on real-world scenarios for its experiments and calculations, ensuring tangible, empirically grounded results that can be readily applied to advance rocket propulsion technology. This approach stands in stark contrast to the prevalent reliance on simulations and underscores the practical significance of our findings.

The outcomes of this research yield valuable insights into the development of space pits designed to effectively prevent backflow, thereby enhancing the efficiency and safety of rocket launches. By addressing a design challenge that has, until now, received limited attention, this work contributes to the ongoing advancement of rocket propulsion technology. Our findings offer the promise of innovative solutions that have the potential to revolutionize the industry, leading to improved performance, safety, and operational effectiveness in the field of space exploration.