SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Small Launchers: Concepts and Operations (7)

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DEVELOPMENT OF A LOW-COST LIQUID-FUEL SOUNDING ROCKET.

Abstract

Mexico is a country with an aerospace industry that is in current development with many companies opening new sites in the national territory. However, the exponential growth that this industry has seen since ten years is focused on the manufacturing of aircrafts and parts for exportation and not on spatial activities. One of the challenges that has yet to be overcome is access to space where there are few companies that are doing big efforts to achieve this goal. For a country with a limited budget dedicated to the development of space technology, it is mandatory to find a way to build suborbital and orbital launch vehicles using significantly lower resources in comparison to other countries.

In this work, through four sections, we present the progress made in the development of a small liquid-fuel sounding rocket that would serve as the base platform in the design and manufacturing of more complex rockets in the future. The document's scope is the first phase of the rocket's development although the final section presents an introduction to the further development phases to achieve the objective of putting in orbit small payloads.

In the first section, we will describe the general architecture of the JFCR-2000A, the main characteristics as well as a brief explanation of the main design choices. The JFCR-2000A is a 6.22 meters long rocket with a capacity to transport payloads up to 3 kg in a sub-orbital flight reaching 90 km of altitude. The rocket uses a pressure-fed engine based on re-engineering process applied to the design of the Rocketdyne's LR-101. The propellants selected for this rocket are Liquid Oxygen and Jet fuel.

In the second section, we will present some of the results of the simulations performed before starting the manufacturing process. Also in this section, we present how these results helped in the definition of the requirements and dimensions of the rocket.

The process and results of the different tests performed to the rocket systems will be presented in the third section. These tests include hydrostatic tests, flow tests and static tests. An important discussion is focused on the results of thrust, vibrations and deformation to validate the rocket's design

In the final section we will present the conclusions of the work that has been completed so far and the perspectives for the future.