IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Interactive Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (IP)

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DESIGN AND DEVELOPMENT OF A BRAZILIAN LIQUID ENGINE SOUNDING ROCKET TO TRAIN LAUNCH OPERATIONS.

Abstract

The Liquid-Propellant Sounding Rocket (FTB-L) is currently being developed in a technological partnership between the Federal University of ABC (UFABC) and the aerospace company Orbital Engenharia. It is a 300 kg launch vehicle that uses a 15 kN Ethanol/Liquid Oxygen, pressure fed, rocket engine and is designed to carry a 10 kg payload up to 30 km.

Brazil's National Space Activities Plan (PNAE) aims to invest and develop liquid propulsion systems. Given the operational complexity of such system and the current growth of the Brazilian aerospace sector, the FTB-L project has the goal of using national technology to produce a low cost, readily available rocket to train, test and qualify the personnel and operation readiness of Brazil's rocket launching sites.

FTB-L mission will exercise, at the Launch Site, rocket assembling, integration and testing operations, most importantly, the ones involving transportation and loading of the oxidizer at cryogenic temperatures. It will also exercise the Launch Site communication, telemetry and tracking functions.

The partnership between university and private sector targets to stimulate the research of launch systems and to introduce undergraduate students to the aerospace engineering industrial environment. The methodology being used follows the European Cooperation for Space Standardization (ECSS) and the system engineering function coordinates the solutions proposed by the university with the available technologies from previous Orbital's related projects.

The project has a two year schedule, delivering the qualified system (Qualification Review) at the end of 2020. The schedule is divided into five development phases that consists of: mission analysis, feasibility, preliminary definition, detailed definition and qualification. At the end of each development phase a review board, composed of university professors and industry professionals, is assembled to provide technical review and feedback on the engineered solutions.

Trade-off studies were made to compare different system configurations, capable of satisfying the mission, while employing readily available components and equipment. The Liquid Rocket Engine (LRE) and its pressurized feeding system are based on a L15 LRE and on the SAMF (Pressurized LRE Feeding System), respectively, both previously developed by Orbital Engenharia and IAE (Aeronautics and Space Research Institute IAE). Its simple Electrical System is composed of: Service Batteries; On Board Programmable Timed Order Generator; and a Power Distribution Unit. Most of these components and equipment have a single, but successful, flight history.