IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Virtual Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (VP)

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PROPOSAL OF LAUNCHER RECOVERY SYSTEMS FOR SMALL SATELLITE MISSIONS

Abstract

1 Abstract

The space sector has been evolving due to the fast technological advancements generating a reduction of manufacturing, cost and size in space missions, where highly capable performing small satellites are becoming the standard in this industry. Furthermore, the high launching cost limits the trend of cost reduction for the space missions, since the small satellites are sent as a second payload. An alternative to reduce this limitation is using reusable launchers which are key in the future of space industry, once they are optimised in efficiency and reliability. Therefore, an opportunity of design is presented, since the increase of small satellites missions requires a reduction of the cost in launch services a suitable option for the future market are the reusable launchers. The problematic of using recovery systems and reuse parts of the vehicle is the increase of weight due to the added systems that the vehicle needs to be recovered. This paper presents different engines and calculate the performance of each engine based on the needs of missions for small satellites. The starting conditions will be that the payload needs to be launched in low circular or elliptical orbits (altitudes of between 300 and 650 km) and the engine has the ability of vertical take-off, vertical landing. The design will also take into account the possibility of reusing parts of the vehicle and the reentry capability. Different combination of engines and fuels are setup in various configurations. For each case the mass analysis will be developed which will allow to calculate the performance for each engine. The important parameters are the number and type of engines, the ratios of the masses, the thrust-to-weight ratio and specific impulse. Once the mass analysis is obtained the following procedure is the selection of the design considering the empty mass. The best combination of characteristics of the engines will be the suitable candidate. Different assistance systems and techniques for the recovery are assessed to obtain a suitable option to improve the efficiency. The expected results are the calculation of the engine performance and how the selected design can be suitable for the space launcher sector for the small satellites. The expected results are a feasible vehicle for small satellites design based in the calculation of the engine parameters together with an efficient launch recovery system. The conclusion is that the space sector can benefit from the design, demonstrating that a launch vehicle with the reusable characteristics can deliver small satellites as a primary payload in a safe, reliable and relative affordable mission.