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Entitled

INVESTIGATION OF SMALL-SCALE AEROSPIKE NOZZLES FOR COLD THRUST APPLICATIONS

by

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Abstract

The aerospike engine appears to be a vision for engineers who are constantly seeking to better rockets in a world where one percent improvement is considered a massive growth. Aerospike nozzles are a very promising option and a near-term alternative of the conventional de Laval nozzles in the world of propulsion systems. Up to date there have been a few aerospikes that have advanced to this point at time. However, none have been used or utilized on a rocket nor any application to date.

The aerospike nozzle capabilities are relatively more advanced than the conventional de Laval nozzle due to its ability to adapt to different surrounding environments by changing the outer jet boundary. They are highly encouraging for space launch vehicles given their notable features, altitude compensating qualities and the ability to adjust their aerodynamics without the requirement for moving parts. Conventional nozzles must compromise performance as they ascend through the atmosphere from the surface to their highest point.

Given that a question should be asked, why isn't anyone using them, given how effective they are? An engine that operates in vacuum just as well as a huge vacuum bell while operating just as well at sea level. In this study CFD analysis was done for both the traditional bell nozzle and the aerospike nozzle using cold thrust. In the simulation, several changes were made to the input temperature, intake pressure, throat area, and exit area plug under the same operating conditions. The results of a CFD analysis demonstrate which nozzle performs at its best and how does the different parameters affect this kind of propulsion system.