



## Umbrella Nozzle Tractor Motors

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### **Umbrella Nozzle Tractor Motors**

Looking at the development of rocket nozzles over time, the next step is intuitively obvious. Obvious to me, anyways. But that's why I am called "Doc", and you are just "regular."

Early workers Tsiolkovskii, Goddard, and Von Braun, all understood the De Laval convergent-divergent compound nozzle (invented in 1890) we are all familiar with:

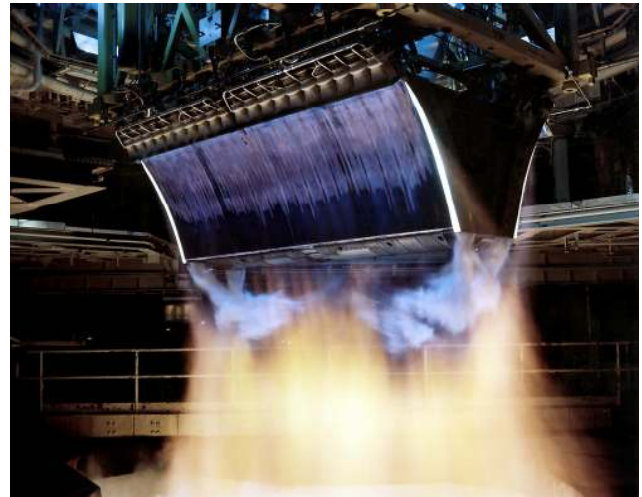


*De Laval convergent-divergent nozzle from a V2 rocket motor*

In recent years, the aerospace community has experimented with "aerospike" nozzles. Aerospikes attempt to compensate for ambient atmospheric pressure, at the cost of weight at the wrong end of the rocket. Aerospike nozzles have a divergent section on the inside, which supports complete expansion of the exhaust and therefore efficient thrust generation.



NASA Dryden Flight Research Center Photo Collection  
<http://www.dfrc.nasa.gov/Gallery/Photo/index.html>  
NASA Photo: EC04-0113-146 Date: March 30, 2004 Photo By: Carla Thomas  
A closeup of one of the Cesaroni Technology, Inc. - constructed aerospike nozzles used in the Dryden Aerospike Rocket Test.



*Aerospike nozzles, photos by NASA Dryden.*

By imagining the aerospike inside out, I have invented the umbrella nozzle. A rocket motor exhausting out the umbrella nozzle will pull like a tractor, not push. The motor can be deployed on the top of a saucer-like vehicle.

