

It's not Rocket Science:

Improving the Efficiency of Rocket Engines

Nicholas J Gallek and Edward C Hurley

Practical Applications of Advanced Mathematics

Amy Goodrum and Anna Hunt

Summer Ventures in Science and Mathematics

The University of North Carolina at Charlotte

Abstract

This paper explores the effects of throat diameter on peak thrust, impulse, and specific impulse of a rocket engine. The data was found empirically with a small-scale simulation of a liquid propelled rocket. The simulation was a variation on the classic Diet Coke and Mentos bottle rocket. The main difference was that the researchers used the screw-on caps as throats for the engine by drilling various sized holes in the caps. It was hypothesized that the larger throat diameter would provide less resistance to the foam produced in the engine and so the peak thrust, impulse, and specific impulse would be higher for these engines. However, it was found that the smallest throat size actually had the highest impulse and specific impulse and that the medium sized throat created the highest peak thrust. The proposed explanation for these results was that the higher pressure created by the restricted flow prevented the foam from collapsing and losing energy before reaching the throat.