High Efficiency Rocket Nozzles

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The drive for exploration further out into the solar system has led to a search of methods for making rockets more efficient. The application of different geometric shapes could be applied to the throat of modern rocket motors as a way of increasing the specific impulse. Current rocket motors all use a standard circular shape in the throat of the nozzle. The purpose of this experiment was to test the effect two different geometric shapes had on the specific impulse, efficiency, when applied to the throat of a modern rocket motor. The goal was to develop a nozzle capable of lifting the same mass of payload while expending less fuel. The nozzles were fitted to solid rocket motors, similar to those used on the space shuttle, and tested for burn time and thrust. The experimentally determined specific impulse for the circular nozzles was 143 sec which fits with the manufacturer stated specific impulse. When tested, it was determined that the square nozzle had an average efficiency 2.1% greater than the circular nozzle. The triangular nozzle tested 7.7% more efficient than the currently used circular nozzle. According to our data, if the triangular throat shape was implemented on modern rocket nozzles, launch vehicles would be able to lift an average of 7% heavier payload with the same amount of fuel, maximizing profits for launch providers and releasing fewer pollutants into the environment.

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