Numerical study of two transverse injections into the nozzle for thrust vector control of a rocket engine

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Abstract

This paper presents a numerical study by using fluent software aimed at understanding the impact of the two transverse injections into a divergent section of the nozzle for thrust vector control of a rocket engine. In the situations that aerodynamic forces are negligible (like flight at high altitude), engine thrust vector control is an appropriate method for control and navigation of a rocket. Thrust vector control systems include mechanical and fluidic methods. Fluidic systems don't need mechanical actuators and so they response quickly. In this work, three-dimensional simulations of the Nozzle flow fields are implemented. The Navier-Stokes equations with $k-\omega$ turbulence model were solved. Then, the effects of two injections in the nozzle were evaluated. After that, Injections from two injectors in different axial locations were considered. From results, that is obvious if the locations of injectors are closer to nozzle exit plane so the thrust vector angle will increase.

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