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Fluidic Thrust Vectoring Modelling of a two-dimensional convergent-divergent nozzle BRUNO MANGIN, LAURENT JACQUIN, AMER CHPOUN — Injecting air into the divergent of the nozzle causes a shock in the primary flow, and turns the flow supersonically. The angle between thrust and nozzle axis is due to asymmetric wall pressure and secondary flow thrust. The main component of the normal force is due to the overpressure in the separated area upstream the injector. A theoretical modelling has been implemented to evaluate the flow structure and forces resulting from the injection in the divergent. Different penetration theories including Zukoski's blunt body theory and a new method based on characteristics method are coupled to separation and reattachment criteria to qualitatively evaluate the different parameters influences (total pressures and Mach numbers in the nozzle and in the injector). Applying this model on a NASA experiment (AIAA 2003-3802) enabled to evaluate the model accuracy. Thrust vector components are estimated within 20%. RANS calculations have been realized thanks to the CFD code elsA.

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