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Numerical Analysis of the Coanda Effect on the Classical Interior Ejectors

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Abstract : The flow mitigation detachment problem near solid surfaces, resulting in improved globally aerodynamic performance by exploiting the Coanda effect on surfaces, has been addressed extensively in the literature, since 1940. The research is carried on and further developed, using modern means of calculation and new experimental methods. In this paper, it is shown interest in the detailed behavior of a classical interior ejector assisted by the Coanda effect, used in propulsion systems. For numerical investigations, an implicit formulation of RANS equations for axisymmetric flow with a shear stress transport k- ω (SST model) turbulence model is used. The obtained numerical results emphasize the efficiency of the ejector, depending on the physical parameters of the flow and the geometric configuration. Furthermore, numerical investigations are carried out regarding the evolution of the Reynolds number when the jet is attached to the wall, considering three geometric configurations: sudden expansion, open cavity and sudden expansion with divergent at the inlet. Therefore, further insight into complexities involving issues such as the variety of flow structure and the related bifurcation and flow instabilities are provided. Thus, the conditions and the limits within which one can benefit from the advantages of Coanda-type flows are determined.

Keywords : Coanda effect, Coanda ejector, CFD, stationary bifurcation, sudden expansion
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