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Numerical simulation of the flow field from a radially lobed nozzle and validation via HWA NOUSHIN AMINI, Texas A&M University, AARTHI SEKARAN, Jawaharlal Nehru Centre for Advanced Scientific Research — With a constant need for higher performance and efficiency in engineering (particularly aerospace) applications, lobed nozzles have experienced a regained interest in the recent past, owing to their superior mixing capabilities. Although previous experimental studies (Hu et al 1999, Hu et al 2008) have analyzed the flow field from lobed nozzles and made conjectures about the physics and flow mechanisms involved, the absence of a "complete" 3D dataset elicits unanswered questions. The present numerical study is intended as a complement to an existing experimental (single component hot wire anemometry) investigation, involving the analysis of the flow field downstream of a six lobed nozzle (N. Amini et al, 2012). A full 3D URANS simulation of the lobed nozzle is carried out, initially validated with experimental data, and then used to examine the stream-wise vortices and obtain a visual corroboration of the structure formation and breakup mechanism as described earlier (Hu et al, 2008). Further, the study takes a close look at the nature of the instabilities which trigger and enhance the mixing process in lobed nozzles in order to determine the precise role of the lobes and eventually obtain more effective mixing in industrial applications.

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