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A Numerical Investigation of a Gaseous Jet Interacting with a Supercavity MICHAEL KINZEL, MICHAEL MOENY, MICHAEL KRANE, The Pennsylvania State University - Applied Research Laboratory, IVAN KIRSCHNER, Applied Physical Sciences — In this work, the interaction between a ventilated supercavity and a jet are examined using computational fluid dynamics (CFD). In this context, supercavities are large gaseous cavities that surround a vehicle for drag reduction. Its interaction with a gaseous jet is not well understood, and CFD is used to help understand the physical interactions. A validated CFD model is used, indicating that the CFD qualitatively captures a wide range of interaction regimes. More importantly, for the context of developing physical insight, the CFD seems to capture the correct qualitative trend in the bulk cavity behavior. Using these validated models, a number of novel insights into the physical characteristics of the interaction are developed. These interactions are described by: (1) the jet gas and ventilation gas poorly mix within the cavity, (2) the jet appears to cause additional gas leakage by transitioning the cavity from a recirculating flow to an axial flow, (3) the jet has the ability to lengthen the cavity, and (4) the jet invokes wake instabilities that drive cavity pulsation. These phenomena are to be presented and discussed within the presentation.

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