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Buoyancy Effects on the Instability of Low-Density Gas Jets RAMKUMAR PARTHASARATHY, KASYAP PASUMARTHI, University of Oklahoma — A low-density gas jet injected into a high-density ambient gas is known to exhibit self-excited global oscillations for certain conditions. The primary objective of the proposed research is to study buoyancy effects on the origin and nature of this flow instability. Linear stability analysis was used for this purpose. The flow was assumed to be non-parallel. Viscous and diffusive effects were ignored. The effects of the inhomogeneous shear layer and the Froude number (signifying the effects of gravity) on the temporal and spatio-temporal results were delineated. A decrease in the density ratio (ratio of the density of the jet to the density of the ambient gas) resulted in an increase in the temporal amplification rate of the disturbances. The temporal growth rate of the disturbances increased as the Froude number was reduced. The absolute instability characteristics of the jet indicated positive absolute temporal growth rates at all Froude numbers and different axial locations. As buoyancy was removed, the previously existing absolute instability disappeared at all locations establishing buoyancy as the primary instability mechanism in self-excited low-density jets.

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