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Effect of background turbulence on an axisymmetric turbulent jet LAURENT MYDLARSKI, Department of Mechanical Engineering, McGill University, BABAK KHORSANDI, SUSAN GASKIN, Department of Civil Engineering and Applied Mechanics, McGill University — An experimental investigation into the effect of different levels of background turbulence on the dynamics of a momentum-driven, axisymmetric, turbulent jet was conducted. An approximately homogenous isotropic turbulent background with zero mean flow was generated using a random jet array. The velocities were measured by acoustic Doppler velocimetry and flying hot-film anemometry. The results show that the mean axial velocities decay faster in the presence of background turbulence, while the mean radial velocities increase, especially close to the edges of the jet. The RMS velocity of the jet issuing into the turbulent background also increased compared to that of a jet emitted into a quiescent background. In addition, the width of the jet increased in the presence of the background turbulence. The mass flow rate of the jet decreased in the presence of the background turbulence, from which it can be inferred that the entrainment into the jet is reduced. It is hypothesized that, in the presence of background turbulence, large-scale engulfment (and not small-scale nibbling) is expected to be the main entrainment mechanism.

Laurent Mydlarski
McGill University

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