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The effect of the Darrieus-Landau instability on statistically planar turbulent flames NAVIN FOGLA, MOSHE MATALON, University of Illinois at Urbana Champaign, FRANCESCO CRETA, University of Rome "La Sapienza" — In a recent work, the propagation of premixed flames in weak two dimensional homogeneous turbulent flows was studied by Creta & Matalon using a hybrid Navier-Stokes/interface capturing technique within the context of a hydrodynamic model, which treats the flame as a surface of density discontinuity. Particular attention was devoted to the Darrieus-Landau (DL) instability, whose effect on turbulent flames has recently been recognized both via experiments and numerical studies. This instability can be triggered in a laboratory setting via changes in pressure and/or fuel type and composition. In the current study, we focus on the effects of the DL instability on turbulent, statistically planar flames. Results are therefore limited to positive Markstein length corresponding to lean hydrocarbon-air or rich hydrogen-air mixtures. We show that conditions under which a laminar flame remains unaffected by the instability, a turbulent flame on the other hand is affected by it. The turbulent flame is observed to exhibit, in addition to the effect of thermal expansion, a nontrivial dependence on the instability, and on the turbulent integral scale both effects modulating, the well established quadratic dependence of turbulent flame speed on turbulence intensity.

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