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Compressible Dynamics of Fast Turbulent Flames[1] RACHEL HYTOVICK, JONATHAN SOSA, JESSICA CHAMBERS, KAREEM AHMED, ALEXEI POLUDNENKO, VADIM GAMEZO, None — h $-abstract-$\f1The research characterizes the dynamics of compressible flame-turbulence interactions for propagating fast flames. A Turbulent Shock Tube with a series of turbulence inducing plates has a large viewing area to capture the flame dynamics with various optical diagnostics, including high-speed PIV and schlieren. The experimental results show that the turbulent Mach number, M_T, within the flame increases non-linearly relative to the flame propagation Mach number, M_f, and grows quickly for flames propagating faster than Chapman-Jouguet deflagrations (M_f>1). This relationship shows that turbulence is self-generated by fast turbulent flames. Furthermore, the flames with M_f>1 are intrinsically unsteady. They tend to accelerate and generate shocks. This acceleration is accompanied by the fast increase of M_T and continues until shocks become strong enough to ignite a detonation. Slower flames with M_f <1 show, little or no self-generated turbulence, and do not produce shocks. The results are highly relevant for hypersonic scramjet propulsion engines and compressible shock-laden turbulent reacting flows in rotating detonation engines.\f2-/abstract-\

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