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RANS Simulations of Supersonic Combustion using a Flamelet-based Model[1] VINCENT TERRAPON, RENE PECNIK, FRANK HAM, HEINZ PITSCH, Stanford University — A flamelet-based model for supersonic combustion is introduced. Since viscous heating and compressibility effects play an important role in high-speed flows, the flamelet implementation originally based on a low Mach number assumption has been reformulated. In this new implementation temperature is not any longer given by a chemistry table but computed from the total energy and the tabulated species mass fractions. Additionally, the source term in the progress variable transport equation is rescaled by the pressure to better account for compressibility effects. This approach allows the use of complex chemistry with only 2 or 3 additional scalar transport equations. The model is applied to a RANS simulation of a hydrogen jet in a supersonic crossflow and the results are compared with experimental measurements. Finally, the model is also used in the RANS computation of the hydrogen fueled HyShot II scramjet and simulation results are compared with experimental data from a ground experiment.

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