Similarity Solutions of the Compressible Flow Equations for a General Equation of State ZACHARY BOYD[1], SCOTT RAMSEY, ROY BATY, Los Alamos National Laboratory — The Euler compressible flow equations admit discontinuous (e.g. shock) solutions regardless of the equation of state (EOS) used to close them. In addition, certain classes of initial conditions and EOS admit special flows known as similarity solutions, including some containing shocks. These are useful (1) as test problems for hydrocodes, (2) as intermediate asymptotic estimates for non-symmetric problems, and (3) in forecasting experimental results. To date, the vast majority of work pertaining to similarity solutions of the Euler equations has been accomplished in the context of the ideal gas EOS; the case where the material is arbitrary is less well-understood. In this work, we classify using Lie-group analysis those materials which admit similarity solutions. We also indicate how such solutions may be found for a variety of materials of interest, including those characterized by particular forms of the Gruneisen EOS.

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