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**Transonic Flows of Bethe-Zel'dovich-Thompson Fluids** MARK CRAMER, ALEKSANDR ANDREYEV, Virginia Tech — We examine steady transonic flows of Bethe-Zel'dovich-Thompson (BZT) fluids over thin turbine blades or airfoils. BZT fluids are ordinary fluids having a region of negative fundamental derivative over a finite range of pressures and temperatures in the single phase regime. We present the transonic small disturbance equation, shock jump conditions, and shock existence conditions capable of capturing the qualitative behavior of BZT fluids. The flux function is seen to be quartic in the pressure or density perturbation rather than the quadratic (convex) flux function of the perfect gas theory. We show how this nonconvex flux function can be used to predict and explain the complex flows possible. Numerical solutions using a successive line relaxation (SLR) scheme are presented. New results of interest include shock-splitting, collisions between expansion and compression shocks, two compressive bow shocks in supersonic flows, and the observation of as many as three normal stern shocks following an oblique trailing edge shock.

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