Supersonic flows of a BZT fluid over thin airfoils\textsuperscript{1} FATEMEH BAHMANI, MARK CRAMER, Virginia Tech — We solve a quartic Burgers equation to describe the steady, two-dimensional, inviscid supersonic flow field of a Bethe-Zel’dovich-Thompson (BZT) fluid generated by thin airfoils or turbine blades. A parabolic arc airfoil has been considered. A motivation for this problem is to illustrate the complex flow patterns possible for simple airfoil shapes. The freestream state will be chosen so that the fundamental derivative of gas dynamics is negative for part or even all of the flow. The Burgers equation is solved using the WENO technique. This is the second motivation for this work to demonstrate that the WENO technique is well-suited to the study of BZT fluids. Phenomena of interest include the partial and complete disintegration of compression shocks, the formation of expansion shocks, and the collision of expansion and compression shocks.

\textsuperscript{1}This work received support from National Science Foundation Grant CBET-0625015.

Fatemeh Bahmani
Virginia Tech

Date submitted: 02 Aug 2013

Electronic form version 1.4