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Inviscid and viscous aerodynamics of dense gases. (English) Zbl 1113.76046
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Summary: A numerical investigation of transonic and low-supersonic flows of dense gases of Bethe-Zel'dovich-Thompson (BZT) type is presented. BZT gases exhibit, in a range of thermodynamic conditions close to the liquid/vapour coexistence curve, negative values of the fundamental derivative of gasdynamics. This can lead, in the transonic and supersonic regime, to non-classical gasdynamic behaviours, such as rarefaction shock waves, mixed shock/fan waves and shock splitting. In the present work, inviscid and viscous flows of a BZT fluid past an airfoil are investigated using accurate thermo-physical models for gases close to saturation conditions and a third-order centred numerical method. The influence of the upstream kinematic and thermodynamic conditions on flow patterns and the airfoil aerodynamic performance is analysed, and possible advantages derived from the use of a non-conventional working fluid are pointed out.

MSC:

76H05 Transonic flows
76J20 Supersonic flows

Cited in **17** Documents

Keywords:

BZT fluid; airfoil; third-order centred numerical method

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