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Lie Symmetries of a Potential Flow Equation Modeling Compressibility Effects of Spherical Bubble Collapse in Water SCOTT RAMSEY, ROY BATY, ERIC ALBRIGHT, CORY AHRENS, Los Alamos National Laboratory — This work applies analytical methods for differential equations to derive Lie symmetries associated with a potential flow equation used to model the effect of compressibility on bubble collapse in water. The compressible potential equation describes the unsteady radial motion of a one-dimensional, inviscid, spherical bubble. The potential equation is obtained by linearizing a perturbation term about an incompressible flow field modeling the collapse of a spherical cavity in water. The symmetry analysis is performed for an arbitrary isentropic equation of state for water over the pressure and density range observed for cavitation. The resulting symmetry groups obtained from the Lie analysis are then related to a general form of the method of characteristics developed to integrate second order hyperbolic equations.

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