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Bell-Plesset effects in Rayleigh-Taylor instability of finite-thickness spherical and cylindrical shells A.L. VELIKOVICH, Plasma Physics Division, NRL, P.F. SCHMIT, Sandia National Laboratories — Bell-Plesset effects accounting for the time dependence of the radius, velocity and acceleration of the Rayleigh-Taylor-unstable surface are ubiquitous in the instability of spherical laser targets and magnetically driven cylindrical liners. We present an analytical model that, for an ideal incompressible fluid and small perturbation amplitudes, exactly accounts for the Bell-Plesset effects in finite-thickness targets and liners through acceleration and deceleration phases. We derive the time-dependent dispersion equations determining the "instantaneous growth rate" and demonstrate that by integrating this growth rate over time (the WKB approximation) we accurately evaluate the number of perturbation e-foldings during the acceleration phase. In the limit of the small target/liner thickness, we obtain the exact thin-shell perturbation equations and approximate thin-shell dispersion relations, generalizing the earlier results of Harris (1962), Ott (1972) and Bud'ko et al. (1989). This research was supported by the US DOE/NNSA (A.L.V.), and in part by appointment to the Sandia National Laboratories Truman Fellowship in National Security Science and Engineering (P.F.S.), which is part of the Laboratory Directed Research and Development (LDRD) Program, Project No. 165746, and sponsored by Sandia Corporation (a wholly owned subsidiary of Lockheed Martin Corporation) as Operator of Sandia National Laboratories under its U.S. Department of Energy Contract No. DE-AC04-94AL85000.

Alexander Velikovich
Plasma Physics Division, Naval Research Laboratory

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