A CONVERGENCE STUDY OF THE HYDRODYNAMIC-PLATE METHOD FOR COUPLED CFD/CSD PROBLEMS

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ABSTRACT

In the MABS 19 Symposium (Calgary, 2006), the author presented a computational method for calculating the explosion of a cased-cylindrical charge [1]. In this method, the case is assumed to be a set of rigid plates, each the size of a cell face and each with a given mass. No solid mechanic model was implemented in the method for the deformation and dynamics of these plates. The motion of these plates is governed only by the hydrodynamics of the explosion, hence the name hydrodynamic-plate method. It is shown in [1] when the method is implemented in the MAZ CFD code, it is capable of giving reasonable results for the case-breakup phenomenon. This method certainly tested all the elements in MAZ essential to the coupling of MAZ to any solid mechanics (CSD) code. However, at the end of [1], the readers were cautioned that the numerical convergence of this method has not been studied and it should be investigated prior to coupling this version of MAZ to another CSD code. This paper presents a numerical convergence study of this method using a simpler geometry, namely, a charge over a flat plate. The convergence calculations include the fragment pattern on a plane 22-ft below the plate. The study shows that the blast solution, the fragment launch velocities and the fragment pattern all converge upon finezoning. This lends confidence in the results from future coupling attempts whether it is MAZ coupled to another CSD code or some CSD subroutines being incorporated into MAZ.

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