Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

An efficient and accurate coupling between Lagrangian front-tracking and unstructured Eulerian grids XIAOYI LI, MARIOS SOTERIOU, MARCO ARIENTI, United Technologies Research Center — Evolution of flow of immiscible fluids under high-shear poses severe challenges to the development of accurate and robust numerical techniques that can maintain a sharp separating interface. The implicit volume of fluid (VOF) advection using High Resolution Interface Capturing (HRIC) scheme offers the advantage of numerical stability at large time steps, but has been observed to cause interface diffusion at high shear. Advection using the standard Piecewise Linear Interface Calculation (PLIC), on the other hand, requires much smaller time steps. We have developed an efficient, accurate coupling approach between a sharp-interface front-tracking library and an *unstructured-grid* implicit flow solver. The high efficiency results from a localized searching algorithm for grid cells close to the interface. The accuracy is obtained from a conservative interfacial force transfer between front and grid that preserves momentum balance and from a novel approach for constructing the density profile across the interface. Validation of the method with tests of drop deformation in high shear will be presented, with attention to efficiency and accuracy. The performance of this stand-alone front-tracking capability on unstructured grids suggests that the coupled approach may be well suited for simulations in complex domains.

Marios Soteriou
United Technologies Research Center

Date submitted: 07 Aug 2009 Electronic form version 1.4