Abstract Submitted for the DFD10 Meeting of The American Physical Society

Improved-Efficiency DSMC Collision-Partner Selection Schemes MICHAEL A. GALLIS, JOHN R. TORCZYNSKI, Sandia National Laboratories -The effect of the collision-partner selection scheme on the accuracy and efficiency of the Direct Simulation Monte Carlo (DSMC) method of Bird is investigated. Three schemes to improve the efficiency of the method are proposed in which the standard random collision-partner selection scheme is replaced with a near-neighbor one. These near-neighbor schemes limit the number of selections used to determine the nearest-neighbor by a fixed number, a fixed prescribed discretization error, or the distance traveled by the colliding molecule. These three schemes are evaluated for one-dimensional Fourier flow and two-dimensional hypersonic flow over a biconic. Their convergence characteristics as functions of spatial and temporal discretization and the number of simulators per cell are compared to the convergence characteristics of the sophisticated and standard DSMC algorithms. Improved performance is obtained if the population from which possible collision partners are selected is an appropriate subset of the population of the cell. Sandia National Laboratories is a multi-program laboratory operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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Date submitted: 08 Jul 2010

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