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Aerodynamics of a Cryogenic Semi-Tanker JASON ORTEGA, KAMBIZ SALARI, Lawrence Livermore National Laboratory — The design of a modern cryogenic semi-tanker is based primarily upon functionality with little consideration given to aerodynamic drag. As a result, these tankers have maintained the appearance of a wheeled cylinder for several decades. To reduce the fuel usage of these vehicles, this study investigates their aerodynamics. A detailed understanding of the flow field about the vehicle and its influence on aerodynamic drag is obtained by performing Reynolds-Averaged Navier-Stokes simulations of a full-scale tractor and cryogenic tanker-trailer operating at highway speed within a crosswind. The tanker-trailer has a length to diameter ratio of 6.3. The Reynolds number, based upon the tanker diameter, is 4.0×10^6, while the effective vehicle yaw angle is 6.1°. The flow field about the vehicle is characterized by large flow separation regions at the tanker underbody and base. In addition, the relatively large gap between the tractor and the tanker-trailer allows the free-stream flow to be entrained into the tractor-tanker gap. By mitigating these drag-producing phenomena through the use of simple geometry modifications, it may be possible to reduce the aerodynamic drag of cryogenic semi-tankers and, thereby, improve their fuel economy. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

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