

Program

THE AERODYNAMICS OF HEAVY VEHICLES II: TRUCKS, BUSES AND TRAINS

Dedicated to the memory of Dr. Sid Diamond

August 26-31, 2007

Granlibakken Conference Center
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Conference theme statement

The consideration of aerodynamics is critical in the improvement of commercial transportation systems and in minimizing the impact on the environment and climate change. Hybrid vehicles and fuel cell powered vehicles are likely to have less power available, so to maintain performance, aerodynamic efficiency will need to increase. Light weight construction will have to be pursued more vigorously but this introduces increased problems in side winds. Hence aerodynamics and safety take on a more important role.

The focus of the first conference in 2002 was the interplay between CFD and experiment in minimizing aerodynamic drag. The present conference will address a similar goal: the development and application of advanced aerodynamic computational and experimental methods for the analysis and design of trucks, buses, and trains. In addition to studies leading to improved physical understanding of flow phenomena, we wish to emphasize studies incorporating optimization methods for vehicle design.

We are also aware that successful implementation of new technology will require that train, bus, and truck transportation be provided with the solutions that give consideration to operational issues, safety, cost, and driver/operator satisfaction.

Sunday, August 26, 2007

17:00 – 19:00	Registration
19:00 – 20:30	Dinner
20:30 – 21:30	Welcome Reception, Registration

Monday, August 27, 2007

- 07:30 – 08:30 Breakfast
- 08:30 – 08:45 Welcome and Conference Overview
Conference Chairs: Fred Browand, Jim Ross, Rose McCallen
ECI Technical Liaison: Jules Routbort
- 08:45 – 09:45 *Keynote Speaker*
Peter Bearman, Imperial College, UK
Bluff Body Flow Control with Potential Applications to Vehicles
- 09:45 – 10:35 Invited Sessions
Part A: Flow Field Characteristics
Chair: Bahram Khalighi, General Motors, USA
- *Large Eddy Simulations and Acoustic Predictions in Automotive Applications*
Gianluca Iaccarino, Frank Ham, Yaser Khalighi, Dan Bodony, Parviz Moin, Stanford University, USA; Bahram Khalighi, General Motors R&D Center, USA
 - *The Immersed Boundary CFD Approach for Complex Aerodynamics Flow Predictions*
Bahram Khalighi, Shailesh Jinda, James Johnson, Kou-Huey Chen, General Motors, USA; Gianluca Iaccarino, Stanford University, USA
- 10:35 – 11:00 Coffee Break
- 11:00 – 12:40 *Part B: Flow Field Characteristics*
Chair: Bahram Khalighi, General Motors, USA
- *Experimental Characterization of the Unsteady Flow Field behind Two Outside Rear View Mirrors*
Bahram Khalighi, General Motors, USA; Richard Lee, National Research Council Canada, Canada
 - *Bouyancy Driven Flow in a Simplified Full Scale Underhood – Part I, PIV and Temperature Measurements*
Parviz Merati, C.H. Leong, Western Michigan University, USA; K.H. Chen, J.P. Johnson, General Motors Corporation, USA
 - *Bouyancy Driven Flow in a Simplified Full Scale Underhood – Part II, Numerical Study*
Kuo-Huey Chen, James P. Johnson, General Motors Corporation, USA; Parviz Merati, C.H. Leong, Western Michigan University, USA
 - *The Flow Environment of Road Vehicles in Winds and Traffic*
Simon Watkins, Riccardo Pagliarella, RMIT University, Melbourne, Australia
- 12:40 – 14:00 Lunch
- 14:00 – 18:00 *ad hoc* discussions and/or free time

Monday, August 27, 2007 (continued)

- 18:00 – 19:15 Dinner
- 19:15 – 20:00 Industry Speaker
Ron Schoon, International Truck and Engine Corporation, USA
Recent Accomplishments in Tractor-Trailer Aerodynamic Integration
- 20:00 – 21:00 *An Industrial Perspective: Panel Discussion*
Facilitator: Jim Ross, NASA Ames Research Center, USA
Coordinator: Bruce Storms, NASA Ames Research Center, USA
Marty Fletcher, U.S. Xpress Enterprises, USA
Bhaskar Bhatnagar, Freightliner LLC, USA
Alec Wong, Kenworth Truck Company/PACCAR, Inc, USA
Ron Schoon, International Truck and Engine Corporation, USA
Charlie Fetz, Great Dane Trailers, USA
Jules Routbort, Office of FreedomCAR and Vehicle Technologies, US
Department of Energy and Argonne National Laboratory, USA
- 21:00 – 22:30 Social Hour

Tuesday, August 28, 2007

- 07:30 – 08:30 Breakfast
- 08:30 – 09:30 Invited Speaker
Israel Wygnanski, University of Arizona, USA
On Separation Control from Bluff Bodies
- 09:30 – 10:20 Invited Sessions
Part A: Separation Control for Drag Reduction
Chair: Israel Wygnanski, University of Arizona, USA
- *Heavy Trucks Base-Drag Reduction using Active Flow Control*
Avraham Seifert, G. Arwatz, V. Palei, I. Fono, E. Ben-Hamou, D. Sperber, S. David, I. Dayan, O. Stalnov, Tel Aviv University, Israel
 - *Reduction of Vehicle Drag using Plasma Actuators*,
Dick Spivey, Mach Zero Associates, USA; Thomas Corke and Ryan Hewit, Notre Dame, USA
- 10:20 – 10:50 Coffee Break
- 10:50 – 12:05 *Part B: Separation Control for Drag Reduction*
Chair: Israel Wygnanski, University of Arizona, USA
- *Closed-Loop Post-Stall Separation Control*
Lou Cattafesta, Ye Tian, Qi Song, University of Florida, USA; Rajat Mittal, George Washington University, USA
 - *Investigation of Tractor Base Bleeding for Heavy Vehicle Aerodynamic Drag Reduction*
Jason Ortega, Kambiz Salari, Lawrence Livermore National Laboratory, USA; Bruce Storms, NASA Ames Research Center, USA
 - *Drag Reduction on a Generic Tractor-Trailer Using Active Flow Control in Combination with Segmented Base Flaps*
Christian Navid Nayeri, David Greenblatt, Johannes Haff, Christian Oliver Paschereit, ISTA (HFI), TU-Berlin, Germany; Lennart Loefdahl, Chalmers University of Technology, Sweden
- 12:00 – 14:00 Lunch
- 14:00 – 18:00 *ad hoc* discussions and/or free time
- 18:00 – 19:15 Dinner

Tuesday, August 28, 2007 (continued)

19:15 – 21:00

Invited Session

Design Optimization Techniques Related to Vehicle Aerodynamics

Chair: Ilhan Bayraktar, Oshkosh Truck Corp., USA

- *Advanced Aerodynamics and Cooling System Solutions for Higher Fuel Efficiency and Decreased Emissions*
Ilhan Bayraktar, Oshkosh Truck Corp., USA
- *Optimization of the Aerodynamic Properties of High-Speed Train with CFD and Response Surface Approximations*
Sinisa Krajnovic, Chalmers University of Technology, Sweden
- *Design Considerations for Maximizing Cooling Package Performance*
Bhaskar Bhatnagar, Dan Schlesinger, Freightliner LLC, USA
- *Optimization and Correlation of a Class 8 Truck Cooling System*
Clinton Lafferty, Volvo Trucks North America, USA; Kevin Horrigan, Ales Alajbegovic, Exa Corporation, USA

21:00 - 22:30

Social Hour

Wednesday, August 29, 2007

- 07:30 – 08:30 Breakfast
- 08:30 – 09:30 Invited Speaker
Remi Gregoire, Alstom Transport, France
Aerodynamic Aspects of the TGV World Record
- 09:30 – 10:20 Invited Session
Part A: Train Aerodynamics
Chair: Alexander Orellano, Bombardier Transportation, Europe
- *Aerodynamic Improvements and Associated Energy Demand Reduction of Trains*
Alexander Orellano, Stefan Sperling, Center of Competence for Aerodynamics and Thermodynamics, Bombardier Transportation, Germany
 - *The Use of Aeronautical Experimental Facilities and Measurement Techniques for the Aerodynamic Investigation of High Speed Trains*
Andreas Dillmann, German Aerospace Center, DLR
- 10:20 – 10:45 *Coffee Break*
- 10:45 – 12:00 Invited Session
Part B: Train Aerodynamics
Chair: Alexander Orellano, Bombardier Transportation, Europe
- *Reduction of Skin-Friction Drag on a Generic Train Configuration*
Sigfried Loose, German Aerospace Center, DLR
 - *Head Pressure Effects of Trains and Locomotives – Engineering Calculation Approaches for Homologation Purpose*
Arnd Rueter, Siemens AG, Transportation Systems, Germany
 - *Numerical Analysis for Aerodynamics of High-Speed Trains Passing Tunnels*
Zhaojing, Renxian Li, National Key Laboratory of Traction Power, Southwest Jiaotong University, China
- 12:00 – 14:00 Lunch
- 12:30 – 16:30 Optional boat cruise (box lunch provided) – boat leaves dock at 12:30 sharp
- 14:00 – 18:00 *ad hoc* discussions and/or free time
- 18:00 – 19:30 Conference Dinner
- 19:30 – 20:30 Keynote Speaker
Global Warming: The Earth's Carbon Budget
David Schimel, The National Center for Atmospheric Research (NCAR), USA

Wednesday, August 29, 2007 (continued)

20:30 – 22:30

Poster Session / Social Hour

Chair: Ramesh Pankajakshan, University of Tennessee SimCenter at Chattanooga, USA

- *A Study on Influence of Aerodynamic Force to Human Body Near High-Speed Trains*
Renxian Li, Jing Zhao, Shu Zhang, Yuming Peng, National Key Laboratory of Traction Power, Southwest Jiaotong University, China
- *The Numerical Simulation of Reducing Drag Coefficient in Coach*
Y.C. Chang, C.H. Tai, J.C. Leong, Taiwan National Pingtung University of Science and Technology, Taiwan
- *Application of CFD to Rail Car and Locomotive Aerodynamics*
James C. Paul, Richard W. Johnson, Airflow Sciences Corporation, USA;
Robert G. Yates, The Greenbrier Companies, USA
- *Data Acquisition of a Tractor-Trailer Combination to Register Aerodynamic Performances*
Gandert M.R. Van Raemdonck, Michel J.L. van Tooren, Aerospace Engineering, Delft University of Technology, The Netherlands
- *Automotive Testing in the DNW-LLF Wind Tunnel*
Eddy Willemsen, German Dutch Wind Tunnels, The Netherlands
- *An Experimental Study of Tractor Base Bleed for Heavy Vehicle Aerodynamic Drag Reduction*
Bruce Storms, NASA Ames Research Center, USA; Jason Ortega and Kambiz Salari, Lawrence Livermore National Laboratory, USA
- *Tractor-Trailer Truck Aerodynamics and Drag Reduction*
Andrzej Wortman, ISTAR Inc, USA
- *The Aerodynamic Design of a Trailer for a Tractor-Trailer Truck*
Josh Weissert and Tom Campbell, Silver Eagle Manufacturing, USA;
Richard Wood, SOLUS, USA
- *Towards LES of Detailed Trucks*
Mark Farrall and Fred Mendonca, CD-adapco; Anders Tenstam, Volvo Technology, UK

Thursday, August 30

- 07:30 – 08:30 Breakfast
- 08:30 – 09:30 Invited Speaker
Application of High Fidelity Numerical Simulations for Vehicle Aerodynamics
Parviz Moin, Stanford University, USA
- 09:30 – 10:45 Invited Sessions
Part A: CFD, Numerical Methods, and Application
Chair: Florian Menter, ANSYS/Fluent/CFX
- *Scale-Adaptive Simulation in the Context of Unsteady Flow Simulations*
Florian Menter, ANSYS/Fluent/CFX
 - *Computational Simulation of the GCM Tractor-Trailer Configuration*
Kidambi Sreenivas, Brent Mitchell, Stephen Nichols, Daniel Hyams, David Whitfield, University of Tennessee SimCenter at Chattanooga, USA
 - *Full-Scale Simulations of Drag Reduction Devices for Class 8 Trucks*
Ramesh Pankajakshan, Brent J. Mitchell, David L. Whitfield, University of Tennessee SimCenter at Chattanooga, USA
- 10:45 – 11:15 Coffee Break
- 11:15- 12:30 *Part B: CFD, Numerical Methods, and Application*
Chair: Florian Menter, ANSYS/Fluent/CFX
- *Applicability of Commercial CFD Tools for Assessment of Heavy Vehicle Aerodynamic Characteristics*
W. David Pointer, Tanju Sofu, Jimmy Chang, David Weber, Argonne National Laboratory, USA
 - *Detached Eddy Simulations of a Simplified Tractor/Trailer Geometry*
Christopher J. Roy, Harshavardhan A. Ghuge, Aerospace Engineering Department, Auburn University, USA
 - *A Hybrid RANS/LES Turbulence Model for use in the Simulation of Turbulent Separated Flows*
Kambiz Salari, Paul Castellucci, Lawrence Livermore National Laboratory, USA
- 12:30 – 14:00 Lunch
- 14:00 – 18:00 *ad hoc* discussions and/or free time
- 18:00 – 19:15 Dinner

Thursday, August 30 (continued)

19:15 – 21:00

Invited Session

Vehicle and Tire Spray and Vehicle Interaction

Chair: Simon Watkins, RMIT University, Melbourne, Australia

- *Spray from Commercial Vehicles: A Method of Evaluation and Results from Road Tests*
Simon Watkins, RMIT University, Melbourne, Australia
- *Spray from a Rolling Tire*
Charles Radovich, Dennis Plocher, Fred Browand, University of Southern California, USA
- *Computational Simulation of Dust Resuspension due to Heavy Vehicle Traffic*
Florian Iser, Thomas Hoermann, Wolfgang Puntigam, The Virtual Vehicle Competence Center, Austria
- *Experiments and Calculations Relevant to Aerodynamic Effects During Highway Passing Maneuvers*
Branislav Basara, AVL List GmbH, Austria, Sharath S. Girimaji, Texas A&M University, USA; Suad Jakirlic, Darmstadt University of Technology, Michael Schrefl, BMW AG

21:00 – 22:00

Social Hour

Friday, August 31, 2007

- 07:30 – 08:30 Breakfast
- 08:30 – 09:30 Invited Speaker
Racecar Optimization at Swift Engineering – from Open-Wheel to Dragsters
Mark Page, Chief Scientist, Swift Engineering, USA
- 09:30 – 10:20 Invited Session
Part A: Drag Reduction
Chair: Jason Leuschen, National Research Council (NRC), Canada
- *Full-Scale Wind Tunnel Tests of Production and Prototype, Second-Generation Aerodynamic Drag-Reducing Devices for Tractor-Trailers*
Jason Leuschen, National Research Council, Canada
 - *A Fleet Operator's Perspective on Commercial Vehicle Drag Reduction*
Rejean Laflamme, Robert Transport, Canada
- 10:20 – 10:50 Coffee Break
- 10:50 – 12:30 Invited Session
Part B: Drag Reduction
Chair: Jason Leuschen, National Research Council (NRC), Canada
- *Class 8 Vehicle Fuel Savings using Sealed Single and Dual Open Aft Cavities*
Kenneth D. Visser, Kevin Grover, Clarkson University, USA
 - *A Novel Approach to Heavy Vehicle Drag Reduction*
Alec Wong, Kenworth Truck Company, USA; Kevin Horrigan, EXA Corporation, USA
 - *European Truck Aerodynamics*
Linus Hjelm, Volvo 3P, Sweden
 - *Advanced Experimental Methods for the Analysis and Aerodynamic Design of Heavy Vehicles*
Mike Camosy, Andre Brown, Henri Kowalczyk, Gaylord Couthier, Auto Research Center, USA
- 12:30 – 12:45 Closing Comments
- 12:45 Pick up boxed lunches; departure