

Refereed Journal Publications

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3. Levin, D.A., R.J. Collins, and G.V. Candler, "Computations for Support and Design of Measurements of Radiation from Low Velocity Shock Heated Air," *Journal of Thermophysics and Heat Transfer*, Vol. 5, No. 4, pp. 463-468, Oct.-Dec. 1991.
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65. Martin, P., and G.V. Candler, “DNS and Data Analysis of Reacting Turbulent Boundary Layers,” 2nd AFOSR International Conference on Direct Numerical Simulation and Large Eddy Simulation, New Brunswick, NJ, Aug. 1999.
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118. Subbareddy, P., G.V. Candler, “Numerical Investigations of Supersonic Base Flows Using DES,” *AIAA 2005-0886*, Jan. 2005.
119. Coblish, J., M. Smith, T. Hand, G.V. Candler, and I. Nompelis “Double-Cone Experiment and Numerical Analysis at AEDC Hypervelocity Wind Tunnel No. 9,” *AIAA 2005-0902*, Jan. 2005.
120. MacLean, M., G.V. Candler, and M.S. Holden, “Numerical Evaluation of Flow Conditions in the LENS Reflected Shock-Tunnel Facilities,” *AIAA 2005-0903*, Jan. 2005.
121. Nompelis, I., T. Drayna and G.V. Candler, “A Parallel Unstructured Implicit Solver for Hypersonic Reacting Flow Simulation,” *AIAA 2005-4867*, June 2005.
122. Johnson, H.B., and G.V. Candler, “Hypersonic Boundary Layer Stability Analysis Using PSE-Chem,” *AIAA 2005-5023*, June 2005.

123. Wan, T., R. Suzuki, and G.V. Candler, S.O. Macheret, and M. Shneider, "Three Dimensional Simulation of Electric Field and MHD Power Generation During Re-Entry," *AIAA 2005-5045*, June 2005.
124. Candler, G.V., "Hypersonic Nozzle Analysis Using an Excluded Volume Equation of State," *AIAA 2005-5202*, June 2005.
125. Kandala, R., and G.V. Candler, "Numerical Studies of Laser-Induced Energy Deposition for Supersonic Flow Control," 3rd MIT Conference on Computational Fluid and Solid Mechanics, June 2005.
126. Drayna, T.W., I. Nompelis and G.V. Candler, "Hypersonic Inward Turning Inlets: Design and Optimization," *AIAA 2006-0297*, Jan. 2006.
127. Trumble K., and G.V. Candler, "Flow Control of Swept Fin Shock Interactions by Laser-Induced Plasmas," *AIAA 2006-0405*, Jan. 2006.
128. Peterson D., and G.V. Candler, "DES Investigation of Injection into Supersonic Crossflow Using a Hybrid Unstructured Solver," *AIAA 2006-0903*, Jan. 2006
129. Johnson H.B., G.V. Candler, and M.J. Wright, "Boundary Layer Stability Analysis of Mars Science Laboratory Aeroshell," *AIAA 2006-0920*, Jan. 2006.
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132. Peterson, D., and G.V. Candler, "DES Simulations of Injection into a Supersonic Freestream Through Several Orifice Geometries," *AIAA 2006-3326*, June 2006.
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135. Subbareddy, P., G.V. Candler, and I. Marusic, "A Synthetic Inflow Generation Method Using the Attached Eddy Hypothesis," *AIAA 2006-3672*, June 2006.

Book Chapters

1. Candler, G.V., and D.R. Olynick, "Hypersonic Flow Simulations Using a Diagonal Implicit Method," in *Computing Methods in Applied Sciences and Engineering*, Ed. R. Glowinski, Nova Science Publishers, New York, pp. 29-47, 1991.
2. Candler, G.V., "A Lower-Upper Relaxation Method for CFD on Massively Parallel Computers," in *First Industry / Academy Symposium on High Speed Civil Transport Vehicles*, Greensboro, NC, Dec. 1994.
3. Candler, G.V., D. Bose, and J. Olejniczak, "Interfacing Nonequilibrium Models with Compu-

tational Fluid Dynamics Methods,” in *Molecular Physics and Hypersonic Flows*, Ed. M. Capitelli, Kluwer Academic Publishers, Dordrecht, pp. 625-644, 1996.

4. Candler, G.V., “Finite-Difference Methods for Dynamic Programming Problems,” in *Computational Methods for the Study of Dynamic Economies*, Cambridge University Press, Cambridge, England, 1998.

5. Marusic, I., G.V. Candler, V. Interrante, P.K. Subbareddy, A. Moss, “Real Time Feature Extraction for Analysis of Turbulent Flows,” in *Data Mining for Scientific and Engineering Applications*, Ed. R.L. Grossman, C. Kamath, P. Kegelmeyer, V. Kumar, and R.R. Namburu, Kluwer Academic Publishers, 2001.

6. Candler, G.V., “Multi-Dimensional Flow Modeling of Nonequilibrium Air Discharges,” forthcoming in *Nonequilibrium Air Plasmas*, Ed. R. Barker, 2004.

7. Candler, G.V., “Numerical Simulation of High-Enthalpy Shock-Boundary Layer Interactions,” forthcoming in *Shock Boundary Layer Interactions*, Ed. J. Harvey, H. Babinsky, Cambridge University Press, Cambridge, England, 2004.

Invited Lectures at National and International Conferences

1. Deiwert, G.S. and G.V. Candler, “Three-Dimensional Supersonic and Hypersonic Flows Including Separation, Reacting Flows,” *AGARD-FDP-VKI Special Course Notes*, May and July 1989. Also AGARD Report No. 764.

2. Candler, G.V., “Enhancements to the Modeling of Thermo-chemical Nonequilibrium Flows,” invited lecture at *APS Physics Computing '91*, San Jose, CA, June 1991.

3. Candler, G.V. and D.R. Olynick, “Hypersonic Flow Simulations Using a Diagonal Implicit Method,” invited lecture at *The 10th International Conference on Computing Methods in Applied Sciences and Engineering*, Paris, France, Feb. 1992. Also appears in *Computing Methods in Applied Sciences and Engineering*, Ed. R. Glowinski, Nova Science Publishers, New York, 1991.

4. Candler, G.V., “The Effect of Thermo-Chemical Nonequilibrium on the Aerodynamics of Hypersonic Vehicles,” invited lecture at the *1992 International Computational Fluid Dynamics Symposium*, Dayton, OH, Sept. 1992.

5. Candler, G.V., “A Perspective on Computational Aerothermodynamics: Current Modeling Difficulties,” invited lecture at the *Second European Symposium on Aerothermodynamics for Space Vehicles*, Noordwijk, The Netherlands, Nov. 1994.

6. Candler, G.V., “A Lower-Upper Relaxation Method for CFD on Massively Parallel Computers,” invited lecture at the *First Industry / Academy Symposium on High Speed Civil Transport Vehicles*, Greensboro, NC, Dec. 1994.

7. Candler, G.V., “Aerothermochemistry for Hypersonic Technology,” short course at the von Karman Institute for Fluid Dynamics, Rhode-St. Genèse, Belgium, April 1995.

8. Candler, G.V., “Interfacing Nonequilibrium Models with Computational Fluid Dynamics Methods,” invited lecture at the *1995 NATO Advanced Study Institute on Molecular Physics and Hy-*

personic Flows, Maratea, Italy, May 1995.

9. Candler, G.V., J. Olejniczak, and B. Harrold, "Detailed Simulation of Nitrogen Dissociation in Stagnation Regions," invited paper at the 27th AIAA Fluid Dynamics Meeting, New Orleans, LA, June 1996.

10. Candler, G.V., "Finite-Difference Methods for Dynamic Programming Problems," invited lectures at the 7th Summer School of the European Economic Association on *Computational Methods for the Study of Dynamic Economies*, Florence, Italy, Sept. 1996.

11. Martin, M.P., and G.V. Candler, "Evaluation of a Subgrid-Scale Model for the Temperature Fluctuations in Reacting Turbulence," invited paper at the 35th AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, Jan. 1997.

12. Candler, G.V., "Nitrogen Dissociation Rates in Complex Hypersonic Flows," invited paper at the 32nd AIAA Thermophysics Conference, Atlanta, GA, June 1997.

13. Candler, G.V., "High Enthalpy Flow Simulation Challenges," invited plenary paper at the 29th AIAA Plasmadynamics and Lasers Conference, Albuquerque, NM, June 1998.

14. Campbell, C.H., and G.V. Candler, "Detailed Simulation of Nitrogen Dissociation in Shock Waves," invited paper at the 33rd AIAA Thermophysics Conference, Norfolk, VA, June 1999.

15. Candler, G.V., "Numerical Simulation Approaches for High-Speed Reacting Flows," 3rd MAP-INT Symposium on Multidisciplinary Applications and Interoperable Computing, Dayton, OH, Aug. 1999.

16. Candler, G.V., "Hypersonic Computational Fluid Dynamics," University of Tennessee Space Institute Short Course on Hypersonic Systems, Technology and Testing, Huntsville, AL, Apr. 2000.

17. Candler, G.V., "Computational Methods for Hypersonic Flows: Application to Double-Cone Flows," Symposium on Compressible Flow with Chemical Reaction, U.S. National Congress on Theoretical and Applied Mechanics, Blacksburg, VA, June 2002.

18. Candler, G.V., "Numerical Simulation of Hypersonic Double-Cone Experiments," First International Conference on Flow Dynamics, Sendai, Japan, Nov. 2004.

19. Candler, G.V., "Physical Model Implementation in Computational Fluid Dynamics," International Summer School on Molecular Physics and Plasmas in Hypersonics, Erice, Italy, Aug. 2005.

20. Candler, G.V., "Stability and Transition Analysis for Hypersonic Flows," invited talk at the U.S. National Congress on Theoretical and Applied Mechanics, Boulder, CO, June 2006.

21. Candler, G.V., "High-Temperature Flows and Finite-Rate Reactions," invited talk at the Symposium on Chemistry in Extreme Environments at the National American Chemical Society Meeting, San Francisco, CA, Sept. 2006.

Recent Invited Seminars and Lectures

"Effect of Internal Energy Excitation on Supersonic Blunt Body Aerodynamics," Stanford University Thermosciences Seminar, Nov. 2000

“Numerical Simulation of Plasma Aerodynamics Experiments,” Purdue University Aeronautics and Astronautics Seminar, Mar. 2001

“Plasma Aerodynamics: Fact or Fiction?” and “Code Validation Results for Hypersonic Flows,” NASA Ames Research Center, Aug. 2001

“Critical Review of Test Cases for Shock Boundary Layer Interactions,” Fourth European Symposium on Aerothermodynamics for Space Vehicles, Capua, Italy, Oct. 2001

“Numerical Simulation of Plasma Aerodynamics Experiments,” California Institute of Technology Fluid Mechanics Seminar, Nov. 2001

“External Aerodynamics of Access to Space Vehicles,” Materials/Structures/Magnetogasdynamics for Access to Space DARPA Meeting, Apr. 2002.

“Hypersonic Aerothermodynamics: A Perspective on Research Issues,” JASON Group Summer Study in Hypersonics, July 2002.

“Insect-Scale Aerodynamics,” IT Campus Preview Day, University of Minnesota, Nov. 2002.

“Numerical Simulation of Hypersonic Double Cone Experiments,” University of Michigan Aerospace Engineering Seminar, Feb. 2003.

“Spacecraft Thermal Protection: Re-Entry Physics,” Minnesota Space Frontier Society, Sept. 2003.

“Numerical Simulation of Hypersonic Double Cone Experiments,” University of Maryland Aerospace Engineering Seminar, Sept. 2003.

“Perspectives on Numerical Methods for Hypersonic Flows,” California Institute of Technology Center for Advanced Computing Research Seminar, Sept. 2003.

“Synthesizing Numerical Analysis Data to Design and Develop Hypersonic Engines and Airframes,” National Academies Committee on the National Aerospace Initiative, Oct. 2003.

“CFD Analysis of AEDC Tunnel 9,” Arnold Engineering and Development Center, Oct. 2003.

“Numerical Simulation of Hypersonic Double Cone Experiments,” Princeton University Mechanical and Aerospace Engineering Seminar, Feb. 2004.

“Hypersonics Research at the University of Minnesota,” Honeywell Inc., Oct. 2004.

“Overview of Hypersonics Research at the University of Minnesota,” NASA Ames Research Center, Oct. 2004.

“Recent Progress in the Modeling and Simulation of Hypersonic Flows,” Korea Advanced Institute of Science and Technology, Nov. 2004.

“High-Fidelity Simulation Tools at the University of Minnesota,” NIA Hypersonic Technology Planning Meeting, Georgia Institute of Technology, Jan. 2005.

“Hypersonics Research at the University of Minnesota,” Budapest University of Technology and Economics, July 2005.

“Development of Parallel Unstructured CFD Code and Application to Inward-Turning Hypersonic

Inlets,” University of Illinois Urbana-Champaign, Nov. 2005.

“Introduction to Hypersonics: Shock Waves, High Temperature Flows, and Re-Entry,” Regents Professors Lunch, Feb. 2006.

“Hypersonics Research at the University of Minnesota,” NASA Ames Research Center, March 2006.
Stanford University, May 2006

Service Activities

Associate Editor of *AIAA Journal*.

Past Associate Editor of *Journal of Thermophysics and Heat Transfer*.

Reviewer for *AIAA Journal*, *Journal of Thermophysics and Heat Transfer*, *Journal of Spacecraft and Rockets*, *Physics of Fluids*, *Computers and Fluids*, *Journal of Computational Physics*, *Journal of Fluid Mechanics*, *Journal of Propulsion and Power*, *Chemical Physics*, *International Journal of Computational Fluid Dynamics*, *International Journal of Numerical Methods in Heat and Fluid Flow*, *Journal of Engineering Mechanics*.

Past Member of AIAA Thermophysics Technical Committee.

Past Member of AIAA Fluid Dynamics Technical Committee.

Member of NATO RTO Working Group 10 on Technologies for Propelled Hypersonic Flight.

Member of the Scientific Advisory Committee for the 2nd Europe/United States High Speed Flow Field Conference and Workshop, Houston, TX, Nov. 1996.

Member of the Peer Review Panel of the NASA Ames Research Center Space Technology Division, May 1999 and Feb. 2002.

Member of the External Advisory Review Panel of the Sandia National Laboratories ASCI/ESRF/V&V Activities, Jan. 2001.

Member of the Scientific Organizing Committee for VECPAR 2000, 4th International Meeting on Vector and Parallel Processing, Porto, Portugal, June 2000.

Member of University of Minnesota Supercomputing Institute Committees: Planning Committee, IBM SP Advisory Committee (Chair), Research Scholarship Peer Review Panel (Chair).

Chair of AEM Fluid Mechanics Search Committee (1997-98) and AEM Computational Fluid Dynamics Search Committee (1999-00) and Fluid Mechanics Courses Committee.

Member of AEM Committees: Professional Aerospace Engineering Courses Committee, Solid Mechanics Service Courses Committee, Courses Related to Computations Committee, Computing Equipment Advisory Committee, Graduate Advisory Committee, Seminar Committee.

Member of the Institute of Technology Promotion and Tenure Committee (2001-03); Chair (2003).

Member of the University of Minnesota EVPP Conflict Review Committee.

Member of the Technology Review for Aerocapture Inflatable Decelerators Review Panel, NASA

Marshall Spaceflight Center (2004).

Member of the Advisory Panel for Flow Augmented Thermal Management for Entry and Re-entry Environments, NASA (2004).

Ph.D. Advisees Graduated

D. Brian Landrum, *Vibration-Dissociation Coupling in Nonequilibrium Flows*, 1992; Associate Professor, University of Alabama, Huntsville.

Basil Hassan, *Thermo-Chemical Nonequilibrium Effects on the Aerothermodynamics of Hypersonic Vehicles*, 1993; Research Staff, Sandia National Laboratories.

James A. Keenan, *Thermo-Chemical Ablation of Heat Shields Under Earth Re-Entry Conditions*, 1994; Research Staff, Sandia National Laboratories.

Eric R. Perrell, *Computation of Combustion Heated Hypersonic Wind Tunnel Flows in Phase Nonequilibrium*, 1994; Assistant Professor, Embry-Riddle Aeronautical University.

Mary L. Hudson, *Linear Stability of Hypersonic Flows in Thermal and Chemical Nonequilibrium*, 1996; Research Staff, Lockheed-Martin Skunk Works.

Deepak Bose, *Advanced Nitric Oxide Formation Modeling in Hypersonic Flows*, 1997; Research Staff, NASA Ames Research Center.

Joseph Olejniczak, *Computational and Experimental Study of Nonequilibrium Chemistry in Hypersonic Flows*, 1997; Research Staff, NASA Ames Research Center.

Michael J. Wright, *A Family of Parallel Implicit Methods for the Navier-Stokes Equations*, 1997; Research Staff, NASA Ames Research Center.

V. Gregory Weirs, *A Numerical Method for the Direct Simulation of Compressible Turbulence*, 1998; Research Staff, Sandia National Laboratories.

Debra J. Schwarz-Olejniczak, *A Parallel Implicit Method for the DNS of Compressible Turbulence*, 1998; Research Staff, TRW Inc.

Camille George, *Numerical Simulation of Non-Transferred DC Arcs*, 1998 (co-advised with Prof. E. Pfender, Mechanical Engineering, University of Minnesota); Assistant Professor, University of St. Thomas.

M. Pino Martin, *DNS and the LES Closure of Reacting Turbulence in Hypersonic Flows*, 1999; Assistant Professor, Princeton University.

Heath B. Johnson, *Thermochemical Interactions in Hypersonic Boundary Layer Stability*, 2000; Senior Research Associate, University of Minnesota.

Krishnendu Sinha, *Analysis of the $k-\epsilon$ Turbulence Model for Simulation of Compressible Flows*, 2001; Assistant Professor, Indian Institute of Technology, Madras.

Manoj K. Nagulapally, *Modeling of Discharges in Flowing Plasmas*, 2001; Research Staff, Fluent Inc.

Kostantinos Hennighausen, *Fluid Mechanics of Microscale Flight*, 2001; Research Staff, MIT Lincoln Laboratories.

Ioannis Nompelis, *CFD Code Validation in High-Enthalpy Hypersonic Flows*, 2004; Post-Doctoral Research Associate, University of Minnesota.

Jo-Einar Emblemsvåg, *Embedded Grid Method for Microscale Aerodynamics*, 2004.

Ramnath Kandala, *Numerical Simulations of Laser Energy Deposition for Supersonic Flow Control*, 2005; Research Engineer, Honeywell Inc.

Charles Campbell, *A Flux Consistent Implementation of Flux Vector Splitting*, expected 2005.

M.S. Advisees Graduated

Michael Barnhardt, Deepak Bose, Patrick Canupp, Travis Drayna, Gunnar Einarrson, Jo-Einar Emblemsvåg, Ryan Gosse, Peter Gumulak, John Hatfield, Heath Johnson, Ramnath Kandala, Brian Mader, M. Pino Martin, Alin Moss, Manoj Nagulapally, Sandeep Nijhawan, Ioannis Nompelis, Joseph Olejniczak, Timothy Peterson, Stacey Rock, Trevor Seipp, Krishnendu Sinha, Debra Schwarz-Olejniczak, Joseph Stecher, Tian Wan, V. Gregory Weirs, Michael Wright

Post-Doctoral Researchers Supervised

Marie-Claude Druguet, Leonard Imas, Heath Johnson, David Kolman, Kimiya Komurasaki, Junhui Liu, M. Pino Martin, Ioannis Nompelis, Joseph Olejniczak, Ram Rao, Krishnendu Sinha, Xiao-Yen Wang, Michael Wright