CYRUS K. MADNIA
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1. EDUCATION:

Ph.D. Aerospace Engineering, The University of Michigan, Ann Arbor, Michigan, May 1989.

M.S.E. Aerospace Engineering, The University of Michigan, August 1982.

B.S.E. Aerospace Engineering, The University of Michigan, August 1980 *(magna cum laude)*.

2. EMPLOYMENT HISTORY:

Associate Professor, Department of Mechanical and Aerospace Engineering, State University of New York at Buffalo, September 1999-present.

Assistant Professor, Department of Mechanical and Aerospace Engineering, State University of New York at Buffalo, September 1994-August 1999.

Research Assistant Professor, Department of Mechanical and Aerospace Engineering, SUNY at Buffalo, September 1992-August 1994.

Postdoctoral Research Associate, Department of Mechanical and Aerospace Engineering, SUNY at Buffalo, October 1989-August 1992.

Visiting Scientist, Theoretical Flow Physics Branch, NASA Langley Research Center, Hampton, Virginia, June-August 1990.

3. HONORS AND AWARDS:

Profile appeared as "Most Accurate Model of Turbulent Reacting Flows Produced" in *SEAS UB News* (Publication of University at Buffalo), Vol. VIII, Number I, Spring 2002.

Profile appeared as "13 Receive SUNY Chancellor's Award" in *Reporter* (Publication of University at Buffalo), Vol. 34, No. 1, August 29, 2002.

"SUNY Chancellor's Award for Excellence in Teaching," University at Buffalo, May 2002.

Research profile appeared as " Novel Simulations of Turbulent Reacting Flows Provide Insight Into Physics of Internal Combustion" on University at Buffalo National News Web page (http://www.buffalo.edu/news), released January 9, 2002.

Research profile appeared as " Access News Brief" on the National Center for Supercomputing Applications (NCSA) Web page (http://access.ncsa.uiuc.edu/Briefs/020115.JFM.html), released January 15, 2002.

Research profile appeared as " Science Success Spotlight" on the National Center for Supercomputing Applications (NCSA) Web page (www.ncsa.uiuc.edu/News/Access/Stories/flame), August 2001.

Research profile featured in *ACCESS* (Publication of NSF supported NCSA), Vol. 14, No. 2, Summer 2001.

Invited Panelist, NSF review of proposals for CISE-Major Research Instrumentation (MRI) Program , National Science Foundation, Arlington, VA, March 30, 2000.

CAREER Award, National Science Foundation (1996-2001).

Professor Madnia's name appeared in the Honor Roll section of the Buffalo News, October 27, 1996.

Paper entitled "Structure of a Turbulent Reacting Mixing Layer," (by R.S. Miller, C.K. Madnia and P. Givi, *Combustion Science and Technology*, **99**, 1-36, 1994) selected for inclusion in the book *ONR Investing in the Future 1946-1996*, pp. 581-617, in celebration of the 50th Anniversary of the Office of Naval Research, Washington, DC, May 1996.

Ralph R. Teeter Educational Award, Society of Automotive Engineers, 1996.

Recipient, BOEING Fellowship (1984-1989).

Member, *Tau Beta Pi* Engineering Honor Society, 1980.

4. SERVICE ACTIVITIES

4.1. University and SEAS:

Representative of University at Buffalo at University Space Research Association (2003-present).

Deputy Director of Education for the AIAA Northeast Region I (1999-present).

AIAA Faculty Advisor, SUNY-Buffalo (1993-present).

ASME Human Powered Vehicle Faculty Advisor, SUNY-Buffalo (1997-2001).

Member, SEAS Computing Committee (1997-1998).

4.2. MAE:

Chair, Faculty Search Committee for Fluids and Thermal Sciences (2002-present).

Member, Graduate Studies Committee (Spring 2002-present).

Director, Undergraduate Studies in Aerospace Engineering (Spring 1999-Fall 2000).

Organizer, Departmental Seminar Series (Fall 1998).

Organizer, Turbulence Seminar Series (1998-present).

Member, Undergraduate Programs Committee (1998-present).

Subcommittee Chair, Curriculum Revision (1998-Fall 2000).

Member, Ph.D. Qualifying Exam Committee (1997, 1999, 2000, 2001).

Member, Committee to restore the J79 turbojet engine in Furnas Hall (1996).

4.3. Professional Memberships and Activities:

Council member, AIAA Niagara Frontier Professional chapter.

Member, American Physical Society.

Member, Combustion Institute.

Member, American Institute of Aeronautics and Astronautics (AIAA).

Member, American Society For Engineering Education.

Reviewer, Journal of Fluid Mechanics, Physics of Fluids, AIAA Journal, Combustion Institute, Combustion Science and Technology.

5. COURSES TAUGHT

Spring 2003:

MAE 519/CIE 561, "Turbulent Flows," graduate course.

MAE 422. "Gas Dynamics," senior level required course.

Fall 2002:

MAE 424, "Aerodynamics (lecture and lab)," senior level required course.

Spring 2002:

MAE 519/CIE 561, "Turbulent Flows," graduate course.

MAE 422. "Gas Dynamics," senior level required course.

Fall 2001:

MAE 424, "Aerodynamics (lecture and lab)," senior level required course.

Spring 2001:

MAE 519/CIE 561, "Turbulent Flows," graduate course.

MAE 422. "Gas Dynamics," senior level required course.

Fall 2000:

MAE 424, "Aerodynamics (lecture and lab)," senior level required course.

Spring 2000:

MAE/ASE 422. "Gas Dynamics," senior level required course.

Fall 1999:

MAE/ASE 424, "Aerodynamics (lecture and lab)," senior level required course.

Spring 1999:

MAE 519/CIE 561, "Turbulent Flows," graduate course.

MAE/ASE 422. "Gas Dynamics," senior level required course.

Fall 1998:

MAE/ASE 424, "Aerodynamics (lecture and lab)," senior level required course.

MAE 459. "Design Project," senior level required course.

Spring 1998:

MAE 519/CIE 561, "Turbulent Flows," graduate course.

MAE/ASE 422. "Gas Dynamics," senior level required course.

Fall 1997:

MAE/ASE 424, "Aerodynamics."

Spring 1997:

MAE/ASE 422. "Gas Dynamics."

MAE 459. "Design Project."

Fall 1996:

EAS 140. "Engineering Solutions," freshman level required course.

Spring 1996:

MAE/ASE 415. "Aerospace Structures I," senior level required course.

MAE 459. "Design Project."

Fall 1995:

EAS 140. "Engineering Solutions."

Spring 1995:

MAE/ASE 422. "Gas Dynamics."

MAE 459. "Design Project." Fall 1994:

EAS 103. "Introduction to Engineering."

Spring 1994:

MAE/ASE 422. "Gas Dynamics."

MAE 459. "Design Project."

Fall 1993:

EAS 103. "Introduction to Engineering."

Spring 1993:

MAE/ASE 422. "Gas Dynamics."

MAE 459. "Design Project."

Fall 1992:

EAS 103. "Introduction to Engineering."

6. RESEARCH PERSONNEL SUPERVISION

6.1. Postdoctoral:

Dr. Farhad A. Jaberi (June 1996-August 1999). Ph.D. in Mechanical Engineering from SUNY at Buffalo in June 1996.

6.2. Current Student Advisee:

Ph.D.:

Cosmin Safta (1997-present).

M.S.:

Vincent Moerman (2002- present)

Farzin Jalilalghadr (2002-present)

6.3. Former Graduate Student Advisee:

Ph.D.:

Daniel Livescu (1996-2001). Ph.D. in Mechanical Engineering, September 2001. Dissertation: "Mixing and Chemical Reaction in Compressible Turbulence," Current position: Research Scientist, Los Alamos National Laboratory, Los Alamos, NM.

Sunil James (1994-1998). Ph.D. in Mechanical Engineering, February 1998. Dissertation: "Realistic Chemistry in Large Scale Numerical Simulations of Methane Diffusion Flames," co-advised with P. Givi. Current Position: Senior Project Engineer, Allison Engine Company, Indianapolis, IN.

Craig J. Steinberger (1992-1997). Ph.D. in Mechanical Engineering, February 1997. Dissertation: "Computational Analysis of Some Physical Issues in Nonpremixed and Premixed Turbulent Flames," co-advised with P. Givi. Current Position: Systems Engineer, Xerox Corporation, Rochester, NY.

Farhad A. Jaberi (1992-1996). Ph.D. in Mechanical Engineering, June 1996. Dissertation: "Mathematical Modeling and Computational Analysis of Turbulent Mixing and Reacting Systems," co-advised with P. Givi. Current Position: Research Scientist, SUNY at Buffalo.

Richard S. Miller (1993-1995). Ph.D. in Mechanical Engineering, June 1995. Dissertation: "Passive Scalar, Magnetic Field, and Solid Particle Transport in Homogeneous Turbulence," co-advised with P. Givi. Current Position: Research Scientist, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA.

Steven H. Frankel (1990-1993). Ph.D. in Aerospace Engineering, June 1993, Dissertation: "Probabilistic and Deterministic Description of Turbulent Flows with Nonpremixed Reactants," co-advised with P. Givi. Current Position: Assistant Professor, School of Mechanical Engineering, Purdue University, West Lafayette, IN.

M.S.:

Stefan Enachescu (1996-1999). M.S. in Aerospace Engineering, September 1999. Thesis title: "Laminar Diffusion Flame-Vortex Ring Interaction."Current Position: Project Engineer, MSX International, Dearborn, MI.

Jeffrey Hewett (1994-1996). M.S. in Aerospace Engineering, September 1996. Thesis title: "Flame-Vortex Interaction in a Reacting Vortex Ring."

Sunil James (1992-1994). M.S. in Aerospace Engineering, June 1994. Thesis: "Direct Numerical Simulation of Vortex Rings," advisor in the capacity of a Research Assistant Professor.

Richard S. Miller (1992-1993). M.S. in Aerospace Engineering, June 1993. Thesis: "Structure of a Reacting Turbulent Mixing Layer," co-advised with P. Givi.

Craig J. Steinberger (1989-1991). M.S. in Aerospace Engineering, June 1991. Thesis: "Mixing and Non-Equilibrium Chemical Reaction in a Compressible Mixing Layer," co-advised with P. Givi.

6.4. Undergraduate Research Aides:

Christopher M. Nuckols (1995-1996), supported by NASA/CORNELL Fellowship Award. Project: Three-dimensional Visualization of Vortical Reacting Flows.

Ward W. Vuillemot (1997-1998), supported by ACS-PRF as an undergraduate research aide. Project: Flow Visualization of Reacting Turbulent Flows.

6.5. Graduate Committee Assignments:

Ph.D.:

Mazlan Abdul Wahid, Dissertation: "Rotating Flame Characteristics," February 2003 (Chair: N. Ashgriz).

Suchuan Dong, Dissertation: "Direct Numerical Simulation of the Mixing Tab Flow," August 2001 (Chair: H. Meng).

Laurent Y.M. Gicquel, Dissertation: "Velocity Filtered Density Function for Large Eddy Simulation of Turbulent Flows," June 2001 (Chair: P. Givi).

Chang-Fang Hsu, Dissertation:"Numerical Simulation of a Droplet Impact on a Porous Substrate," February 2001 (Chair: N. Ashgriz).

Jens Knoell, Dissertation: "Modeling the Reynolds Stresses in Turbulent Shear Flows," June 2000 (Chair: D.B. Taulbee).

Virgil Adumitroaie, Dissertation: "Quasi-Explicit Algebraic Turbulence Closures in Compressible Reacting Flows," June 1997 (Chair: P. Givi).

Paul J. Colucci, Dissertation: "Large Eddy Simulation of Turbulent Reactive Flows: Stochastic Representation of the Subgrid Scale Scalar Fluctuations," February 1998, (Chair: P. Givi).

Sunil James, Dissertation: "Realistic Chemistry in Large Scale Numerical Simulations of Methane Diffusion Flames," February 1998, (Chair: P. Givi).

Richard S. Miller, Dissertation: "Passive Scalar, Magnetic Field, and Solid Particle Transport in Homogeneous Turbulence," June 1995, (Chair: P. Givi).

M.S.:

Jennifer Richards, Comprehensive Exam, April 2002.

Charlton Benjamin, Comprehensive Exam, May 2001.

Hongbin Bian, Thesis: "Experimental Study of Bubble Dynamics," June 2001, (Chair: N. Ashgriz).

Yining Lin, Thesis: "Surface Characterization of Plain Paper as Applied to Paper-Ink Interactions in Ink-Jet Printing," Department of Chemical Engineering, September 1999, (Chair: P. Alexandridis).

Ercan Dumlupinar, Thesis: "Computational Modeling of Centrifugal Blower Performance," September 2000, (Chair: D.B. Taulbee).

Marcus Johansson, Thesis: "A Nonlinear Stress-Strain Model Accounting for Dissipation Anisotropies," June 2000, (Chair: D.B. Taulbee).

Malcolm Arvidsson, Thesis: "Improvements of an Algebraic Reynolds Stress Model for Adverse Pressure Gradient Boundary Layers," February 2000, (Chair: D.B. Taulbee).

Stephan Gamard, Thesis: "A New Similarity Analysis of the Turbulence Energy Spectrum," February 1999, (Chair: W.K. George).

Jens Knoell, Thesis: "A Non-linear Stress-Strain Model for Wall-Bounded Turbulent Flows," September 1998, (Chair: D.B. Taulbee).

Richard S. Miller, Thesis: "Structure of a Reacting Turbulent Mixing Layer," June 1993, (Chair: P. Givi).

7. PUBLICATIONS

Invited publications are identified by ⋆

7.1. Book Chapters and Lead Articles:

Livescu, D. and Madnia, C.K., "Non-premixed flame-turbulence interaction in compressible turbulent flow," in *Advances in Turbulence IX*, pp. 809-822, Editors: I.P. Castro, P.E. Hancock, and T.G. Thomas, CIMNE publishers, Barcelona, Spain, 2002.

⋆ Livescu, D. and Madnia, C.K., "Compressibility Effects on the Scalar Mixing in Reacting Homogeneous Turbulence," in *Turbulent Mixing and Combustion*, pp. 125-135, Editors: A. Pollard and S. Candel, Kluwer Academic Publishers Dordrecht, The Netherlands, 2002.

⋆ Livescu, D. and Madnia, C.K., "Anisotropy in Reacting Compressible Turbulent Shear Flow," in *DNS/LES Progress and Challenges*, pp. 613-620, Editors: C. Liu, L. Sakell, T. Beutner, Greyden Press, Columbus, Ohio, October 2001.

⋆ Jaberi, F.A., Mashayek, F., Madnia, C.K., Taulbee, D.B. and Givi, P., "Advances in Analytical Description of Turbulent Reacting Flows," in *Advances in Chemical Propulsion*, Editor: G.D. Roy, Taylor & Francis, Washington, D.C., 2000.

⋆ Madnia, C.K. and Givi, P., "Direct Numerical Simulation and Large Eddy Simulation of Reacting Homogeneous Turbulence," Chapter 15 in *Large Eddy Simulations of Complex Engineering and Geophysical Flows*, pp. 315-346, Editors: Boris Galperin and Steven A. Orszag, Cambridge University Press, New York, NY, 1993.

⋆ Givi, P. and Madnia, C.K., "Spectral Methods in Combustion," Chapter 8 in *Numerical Modeling in Combustion*, pp. 409-452, Editor: T.J. Chung, Taylor & Francis, Washington, D.C., 1993.

7.2. Journal Articles and other Refereed Publications:

Livescu, D., Jaberi, F.A. and Madnia, C.K., "The Effects of Heat Release on the Energy Exchange in Reacting Turbulent Shear Flow," *Journal of Fluid Mechanics*, Vol. **450**, pp. 35-66, 2002.

Safta, C., Enachescu, S. and Madnia, C.K., "Interaction of a Vortex Ring With a Diffusion Flame," *Physics of Fluids*, Vol. **14**, No. 2, pp. 668-681, 2002.

Livescu, D., Jaberi, F.A. and Madnia, C.K., "Passive-Scalar Wake Behind a Line Source in Grid Turbulence," *Journal of Fluid Mechanics*, Vol. **416**, pp. 117-149, 2000.

Jaberi, F.A., Livescu, D. and Madnia, C.K., "Characteristics of Chemically Reacting Compressible Homogeneous Turbulence," *Physics of Fluids*, Vol. **12**, No. 5, pp. 1189-1209, 2000.

Hewett, J.S. and Madnia, C.K., "Flame-Vortex Interaction in a Reacting Vortex Ring," *Physics of Fluids*, Vol. **10**, No. 1, pp. 189-205, 1998.

Jaberi, F.A. and Madnia, C.K., "Effects of Heat of Reaction on Homogeneous Compressible Turbulence," *Journal of Scientific Computing*, Vol. **13**, No. 2, pp. 202-228, 1998.

⋆ Hewett, J.S. and Madnia, C.K., "Flame Evolution in a Reacting Vortex Ring," in *Advanced Computation & Analysis of Combustion*, pp. 371-387, Editors: Roy, G. D. *et al.*, ENAS Publishers, Moscow, Russia, 1997.

James, S., Madnia, C.K., "Direct Numerical Simulation of a Laminar Vortex Ring," *Physics of Fluids*, Vol. **8**, No. 9, pp. 2400-2414, 1996.

Jaberi, F.A., Miller, R.S., Madnia, C.K. and Givi, P., "Non-Gaussian Scalar Statistics in Homogeneous Turbulence," *Journal of Fluid Mechanics*, Vol. **313**, pp. 241-282, 1996.

Miller, R.S., Madnia, C.K. and Givi, P., "Near Field Entrainment and Mixing in Small-aspect-ratio Non-circular Jets," *Computers & Fluids*, Vol. **24**, No. 1, pp. 1-25, 1995.

Miller, R.S., Jaberi, F.A., Madnia, C.K. and Givi, P., "The Structure and the Small-Scale Intermittency of Passive Scalars in Homogeneous Turbulence," *Journal of Scientific Computing*, Vol. **10**, No. 1, pp. 151-180, 1995.

Madnia, C.K. and Bernal, L.P., "Interaction of a Turbulent Round Jet with the Free Surface," *Journal of Fluid Mechanics*, Vol. **261**, pp. 305-332, 1994.

Miller, R.S., Madnia, C.K. and Givi, P., "Structure of a Turbulent Reactive Mixing Layer," *Combust. Sci. and Tech.*, Vol. **99**, No. 1-3, p. 1, 1994.

⋆ Frankel, S.H., Madnia, C.K., McMurtry P.A. and Givi, P., "Binary Scalar mixing and Reaction in Homogeneous Turbulence: Some Linear Eddy Model Results," *Energy and Fuels*, Vol. **7**, No. 6, pp. 827-834, 1993.

Miller, R.S., Frankel, S.H., Madnia, C.K. and Givi, P., "Johnson- Edgeworth Translation for Probability Modeling of Binary Scalar Mixing in Turbulent Flows," *Combust. Sci. and Tech.*, Vol. **91**, No. 1-3, pp. 21-52, 1993.

Frankel, S.H., Madnia, C.K. and Givi, P., "Comparative Assessment of Closures in Turbulent Reacting Flows," *AIChE J.*, Vol. **39**, No. 5, pp. 899-903, 1993.

Frankel, S.H., Adumitroaie, V., Madnia, C.K. and Givi, P., "Large Eddy Simulation of Turbulent Reacting Flows by Assumed PDF Methods," in *Engineering Applications of Large Eddy Simulations*, editors: S.A. Ragab and U. Piomelli, ASME Publication, FED-Vol. **162**, pp. 81-101, 1993.

Madnia, C.K., Frankel, S.H. and Givi, P., "Reactant Conversion in Homogeneous Turbulence: Mathematical Modeling, Computational Validations and Practical Applications," *Theoretical and Computational Fluid Dynamics*, Vol. **4**, pp. 79-93, 1992.

Frankel, S.H., Madnia, C.K. and Givi, P., "Modeling of the Reactant Conversion Rate in a Turbulent Shear Flow," *Chemical Engineering Communications*, Vol. **113**, pp. 197-209, 1992.

Frankel, S.H., Madnia, C.K. and Givi, P., "On the Modeling of the Unmixedness in Homogeneous Reacting Turbulence," *Chemical Engineering Communications*, Vol. **104**, pp. 117-125, 1991.

Givi, P., Madnia, C.K., Steinberger, C.J., Carpenter, M. H. and Drummond, J. P., "Effects of Compressibility and Heat Release in a High Speed Reacting Mixing Layer," *Combust. Sci. and Tech.*, Vol. **78**, No. 1-3, pp. 33-68, 1991.

Madnia, C.K., Frankel, S.H. and Givi, P., "Direct Numerical Simulations of the Unmixedness in Homogeneous Reacting Turbulence," *Chemical Engineering Communications*, Vol.**109**, pp. 19-29, 1991.

7.3. Conference Proceedings:

Safta,C, and Madnia, C.K. "Unsteady Non-Premixed CH4/H2 Flame Structure: Detailed and Reduced Kinetic Models," Third Joint Meeting of the U.S. Sections of The Combustion Institute, 2003.

Madnia, C.K., and Safta, C.,"Flame Dynamics and Curvature Effects in Methane Diffusion Flame-Vortex Ring Interactions," *Bulletin of American Physical Society*, Vol. 47, No. 10, P. 86, 55th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Dallas, Texas, November 24-26, 2002.

Safta, C., and Madnia, C.K.,"Unsteady Effects in Methane Diffusion Flame-Vortex Ring Interactions," *Bulletin of American Physical Society*, Vol. 47, No. 10, P. 85, 55th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Dallas, Texas, November 24-26, 2002.

Livescu, D., and Madnia, C.K.,"Non-premixed Flame Structure in Compressible Turbulence ," *Bulletin of American Physical Society*, Vol. 47, No. 10, P. 192, 55th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Dallas, Texas, November 24-26, 2002.

Livescu, D., and Madnia, C.K.,"Compressibility Effects on the Development of Turbulent Reacting Shear Flow," *Bulletin of American Physical Society*, Vol. 46, No. 10, P. 143, 54th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, San Diego, California, November 18-20, 2001.

Livescu, D. and Madnia, C.K. "Anisotropy in Reacting Compressible Shear Flow," Third AFOSR International Conference on Direct Numerical Simulation and Large Eddy Simulation (TAICDL), University of Texas at Arlington, August 5 - 9, 2001.

Livescu, D. and Madnia, C.K. "Compressibility Effects on the Scalar Mixing in Reacting Compressible Turbulence," IUTAM Symposium on Turbulent Mixing and Reaction, Queen's University at Kingston, Canada, June 3 - 6, 2001.

Madnia, C.K., Livescu, D. and Jaberi, F.A., "Heat Release Effects on Dilatational Motions in Turbulent Reacting Shear Flow," *Bulletin of American Physical Society*, Vol. 45, No. 9, p. 147, 53rd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Washington D.C., November 19-21, 2000.

Livescu, D., Jaberi, F.A. and Madnia, C.K.," The Structure of Turbulent Reacting Shear Flow," *Bulletin of American Physical Society*, Vol. 45, No. 9, p. 147, 53rd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Washington D.C., November 19-21, 2000. 2000.

Safta, C., and Madnia, C.K., "Characteristics of Laminar Vortex Ring-Diffusion Flame Interaction," *Bulletin of American Physical Society*, Vol. 45, No. 9, p. 171, 53rd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Washington D.C., November 19-21, 2000.

Madnia, C.K., Enachescu, S., Safta, C., "Vortex Ring-Diffusion Flame Interaction: A Numerical Study," *Bulletin of American Physical Society*, Vol. 44, No. 8, p. 159, 52nd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, New Orleans, Louisiana, November 21-23, 1999.

Livescu, D., Jaberi, F.A., Madnia, C.K., "Evolution of Turbulent Kinetic Energy in Reacting Turbulent Shear Flows," *Bulletin of American Physical Society*, Vol. 44, No. 8, p. 117, 52nd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, New Orleans, Louisiana, November 21-23, 1999.

Safta, C. and Madnia, C.K., "Numerical Simulation of a Reacting Vortex Ring Using Detailed Chemical Kinetics," *Bulletin of American Physical Society*, Vol. 44, No. 8, p. 43, 52nd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, New Orleans, Louisiana, November 21-23, 1999.

Safta, C., Enachescu, S., Madnia, C.K., "Interaction of a Vortex Ring With a Diffusion Flame," *Bulletin of American Physical Society*, Vol. 43, No. 9, p. 2050, 51th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Philadelphia, PA, November 22-24, 1998.

Madnia, C.K., Livescu, D., Jaberi, F.A.,"Numerical Study of Decaying Isotropic Turbulent Reactive Flows," *Bulletin of American Physical Society*, Vol. 43, No. 9, p. 2115, 51th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Philadelphia, PA, November 22-24, 1998.

Livescu, D., Jaberi, F.A., Madnia, C.K.,"Direct Numerical Simulation of Reacting Turbulent Shear Flows," *Bulletin of American Physical Society*, Vol. 43, No. 9, p. 2115, 51th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Philadelphia, PA, November 22-24, 1998.

Livescu, D., Jaberi, F.A., and Madnia, C.K., "A DNS of Passive Scalar Mixing in Homogeneous Turbulence," *Bulletin of American Physical Society*, Vol. 42, No. 11, p. 2189, 50th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, San Francisco, CA, November 23-25, 1997.

Madnia, C.K. and Jaberi, F.A., "Flame - Turbulence Interaction in Homogeneous Flows" *Bulletin of American Physical Society*, Vol. 42, No. 11, p. 2221, 50th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, San Francisco, CA, November 23-25, 1997.

Madnia, C.K. and Hewett, J.S., "Vorticity Dynamics in Reacting Vortex Rings," *Bulletin of American Physical Society*, Vol. 41, No. 9, p. 1724, 49th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Syracuse, NY, November 24-26, 1996.

Hewett, J.S. and Madnia, C.K., "Flame Evolution in Reacting Vortex Rings," *Bulletin of American Physical Society*, Vol. 41, No. 9, p. 1726, 49th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Syracuse, NY, November 24-26, 1996.

Jaberi, F.A., Miller, R.S., Madnia, C.K. and Givi, P. "Non-Gaussian Scalar Statistics in Homogeneous Turbulence," Proceedings of Tenth Symposium on Turbulent Shear Flows, pp. 31.13-31.18, University Park, PA, August 14-16, 1995.

Madnia, C.K. and James,S., "Direct Numerical Simulation of Laminar Vortex Rings ," *Bulletin of American Physical Society*, Vol. 39, No. 9, p. 1874, 47th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Atlanta, GA, November 20-22, 1994.

⋆ Frankel, S.H., Madnia, C.K. and Givi, P., "Computational-Mathematical Modeling of Plug Flow Mixers and Reactors," *Proceedings of the Second U.S. National Congress on Computational Mechanics*, Washington D.C. , Aug. 16-18, 1993.

Miller, R.S., Madnia, C.K. and Givi, P., " Near Field Entrainment and Mixing in Non-Circular Jets," *Bulletin of American Physical Society*, Vol. 38, No. 12, p. 2281, 46th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Albuquerque, NM, November 21-23, 1993.

Frankel, S.H., Adumitroaie, V., Madnia, C.K. and Givi, P., "Large Eddy Simulation of Turbulent Reacting Flows by Assumed PDF Methods," Proceedings of the Fluids Engineering Conference, Washington, D.C., June 20-24, 1993.

⋆ Frankel, S.H., Madnia, C.K., McMurtry, P.A. and Givi, P., "Binary Scalar Mixing and Reaction in Homogeneous Turbulence: Some Linear Eddy Model Results," 7th Annual Technical Conference of the Advanced Combustion Engineering Research Center," Park City, UT, March 3-4, 1993.

Madnia, C.K., Miller, R.S., Frankel, S.H. and Givi, P., "Method of Translation for Stochastic Modeling of Binary Scalar Mixing in Isotropic Turbulence," *Bulletin of American Physical Society*, Vol. 37, No. 8, p. 1756, 45th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Tallahassee, FL, November 22-24, 1992.

Frankel, S.H., Madnia, C.K. and Givi, P., "Probabilistic and Deterministic Description of Reacting Turbulent Flows," *Bulletin of American Physical Society*, Vol. 37, No. 8, p. 1754, 45th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Tallahassee, FL, November 22-24, 1992.

Miller, R.S., Madnia, C.K. and Givi, P., "Laminar Diffusion Flamelet Modeling for turbulent Reacting Flows," *Bulletin of American Physical Society*, Vol. 37, No. 8, p. 1755, 45th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Tallahassee, FL, November 22-24, 1992.

Madnia, C.K. and Givi, P., "Mathematical Modeling of the Reactant Conversion Rate by Single-Point PDF Methods," in *Chemical and Physical Processes in Combustion*, pp. 26.1-26.4, Proceedings of the Fall Technical Meeting of the Combustion Institute, Eastern Section, Cornell University, Ithaca, New York, Oct. 14-16, 1991.

⋆ Madnia, C.K. and Givi, P., "LES and DNS of Homogeneous Reacting Turbulence," Invited Presentations at International Workshop on "Large Eddy Simulations - Where Do We Stand?" St. Petersburg, Florida, Dec. 19-21, 1990.

Steinberger, C.J., Madnia, C.K. and Givi, P., "A Computational Study of Compressibility, Heat Release and Extinction in a High Speed Mixing Layer," in *Chemical and Physical Processes in Combustion*, pp. 99.1-99.4, Proceedings of the Fall Technical Meeting of the Combustion Institute, Eastern Section, Orlando, Florida, Dec. 3-5, 1990.

Madnia, C.K. and Givi, P., "On DNS and LES of Reacting Compressible Homogeneous Turbulence," in *Chemical and Physical Processes in Combustion*, pp. 117.1-117.4, Proceedings of the 24th Fall Technical Meeting of the Combustion Institute, Eastern Section, Orlando, Florida, Dec. 3-5, 1990.

⋆ Givi, P., Madnia, C.K. and Steinberger, C.J., "Heat Release and Compressibility in a High Speed Reacting Mixing Layer," JANNAF Scramjet Combustor Modeling Workshop, 26th AIAA/SAE/ASME/ASEE Joint Propulsion Conference, Orlando, Florida, July 19, 1990.

Givi, P., Madnia, C.K., Steinberger, C.J., Niu, Y. Y. and Frankel, S. H., "On DNS and LES of Turbulent Reactive Flows," Proceedings of the Third Office of Naval Research Propulsion Meeting and Contractor's Review, Held in Middletown, Rhode Island, October 15-17, 1990.

Anthony, D.G., Willmarth, W. W., Madnia, C. K. and Bernal, L. P., "Turbulence Measurements in a Submerged Jet Near a Free Surface," Proceedings of the 18th Symposium on Naval Hydrodynamics, August 1990.

Bernal, L.P. and Madnia, C.K., "Interaction of a Turbulent Round Jet with the Free Surface," 17*th* Symposium on Naval Hydrodynamics, Hague, Netherlands, August 1988.

Madnia, C.K. and Bernal, L.P., "A Comparative Study of Free surface Jets and Wall Jets," *Bulletin of the American Physical Society*, Vol. 34, No. 10, p. 2335, 42nd Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Palo Alto, California, November 21, 1989.

Madnia, C.K. and Bernal, L.P., "Dynamics of Turbulent Jets Near a Free Surface," *Bulletin of the American Physical Society*, Vol. 33, No. 10, p. 2238, 41st Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Buffalo, NY, November 19-22, 1988.

Madnia, C.K. and Bernal, L.P., "Interaction of an Axisymmetric Turbulent Water Jet with the Free Surface," *Bulletin of the American Physical Society*, Vol. 32, No. 10, p. 2045, 40th Anniversary Meeting of the Division of Fluid Dynamics, Eugene, OR, November 22-24, 1987.

7.4. Reports:

Givi, P., Madnia, C.K. and Taulbee, D.B., "Stochastic Modeling and Simulation of Multiphase Reacting Turbulent Flows with Complex Chemistry," Final Report to the Office of Naval Research for Grant N00014-94-1-0667, April 1998.

Mashayek, F., Jaberi, F.A., James, S., Madnia, C.K., Taulbee, D.B. and Givi, P., "Modeling and Simulation of Complex Reacting Flows," *Proceedings of the Tenth ONR Propulsion Meeting*, pp. 126-131, Monterey, CA, October 7-10, 1997.

Adumitroaie, V., Frankel, S.H., Madnia, C.K. and Givi, P., "Large Eddy Simulations and Direct Numerical Simulations of High Speed Turbulent Reacting Flows," Final Report to NASA Langley Research Center for Grant NAG-1-1122, October 1993.

Givi, P., Madnia, C.K., Frankel, S.H., Miller, R.S., Steinberger, C.J. and Adumitroaie, V.A., "DNS, LES and Stochastic Modeling of Turbulent Reacting Flows," Proceedings of Sixth ONR Propulsion Meeting, Boulder, Colorado, pp. 126-131, August 31 - September 2, 1993.

Drummond, J.P., Givi, P., Madnia, C.K., Frankel, S.H. and Adumitroaie, V, "High-Speed Turbulent Reacting Flows," *NAS Technical Summaries*, p. 104, NASA Ames Research Center, Moffet Field, CA, 1993.

Givi, P., Frankel, S.H., Adumitroaie, V.A., Sabini, G. and Madnia, C.K., "Large Eddy Simulations and Direct Numerical Simulations of High Speed Turbulent Reacting Flows," Semiannual Report submitted to NASA Langley Research Center for the Grant NAG-1-1122, February 1993.

Givi, P., Madnia, C.K., Frankel, S.H. and Miller, R.S., "DNS, LES and Modeling of Turbulent Reacting Flows," Annual Report to Office of Naval Research for the Grant N00014-90-J-4013, August 1992.

Givi, P., Madnia, C.K., Steinberger, C.J. and Frankel, S.H., "Large Eddy Simulations and Direct Numerical Simulations of High Speed Turbulent Reacting Flows," semi-annual Report submitted to NASA Langley Research Center for the Grant NAG-1-1122, January 1992.

Drummond, J.P., Givi, P., Madnia, C.K., and Steinberger, C.J., "Fuel-Air Mixing Enhancement by Jet-Shock Interactions," *NAS Technical Summaries*, p. 48, NASA Ames Research Center, Moffet Field, CA, 1992.

Givi, P., Madnia, C.K., Steinberger, C.J., Frankel, S.H. and Vidoni, T.J. "Large Eddy Simulations and Direct Numerical Simulations of High Speed Turbulent Reacting Flows," semi-annual Report submitted to NASA Langley Research Center for the Grant NAG-1-1122, October 1991.

Givi, P., Frankel, S.H., Jiang, T.-L., Madnia, C.K. and Steinberger C.J., "Large Eddy Simulations and Direct Numerical Simulations of Compressible Turbulent Reacting Flows," Annual Report to Office of Naval Research for the Grant N00014-90-J-4013, May 1991.

Drummond, J.P., Givi, P., Madnia, C.K., and Steinberger, C.J., "Compressible Reacting Turbulent Flows," *NAS Technical Summaries*, p. 27, NASA Ames Research Center, Moffet Field, CA, 1991.

Givi, P., Madnia, C.K., Steinberger, C.J. and Tsai, A., "Large Eddy Simulations and Direct Numerical Simulations of High Speed Turbulent Reacting Flows," semi-annual Report submitted to NASA Langley Research Center for the Grant NAG-1-1122, April 1991.

Madnia, C.K. and Givi, P., "On DNS and LES of Reacting Homogeneous Turbulence," Turbulent Research Laboratory at SUNY-Buffalo *TRL Report 125*, March 1991.

Givi, P., Madnia, C.K. and Steinberger, C.J., "Large Eddy Simulations and Direct Numerical Simulations of High Speed Turbulent Reacting Flows," semi-annual Report submitted to NASA Langley Research Center for the Grant NAG-1-1122, December 1990.

Madnia, C.K. and Bernal, L.P., "Interaction of a Turbulent Round Jet with the Free Surface," *The University of Michigan Technical Report No. 89-05*, August 1989.

8. PUBLIC LECTURES & CONFERENCE PRESENTATIONS

Invited lectures are identified by $\star$

"Flame Dynamics and Curvature Effects in Methane Diffusion Flame-Vortex Ring Interactions," 55th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Dallas, Texas, November 25, 2002.

"Non-Premixed Flame-Turbulence Interaction in Compressible Turbulence," EUROMECH 9th European Turbulence Conference Proceedings, University of Southampton, UK, July 3, 2002.

$\star$ "Tackling Turbulent Combustion with Supercomputers," Center for Computational Research, University at Buffalo, Buffalo, NY, January 15, 2002.

$\star$ "Compressibility Effects on the Scalar Mixing in Reacting Homogeneous Turbulence," IUTAM Symposium on Turbulent Mixing and Combustion, Kingston, Canada, June 4, 2001.

$\star$ "Anisotropy in Reacting Compressible Turbulent Shear Flow," 3rd AFOSR International Conference on DNS/LES, Arlington, Texas, August 7, 2001.

"Heat Release Effects on Dilatational Motions in Turbulent Reacting Shear Flow," 53rd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Washington D.C., November 20, 2000.

"Vortex Ring-Diffusion Flame Interaction: A Numerical Study," 52nd Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, New Orleans, Louisiana, November 23, 1999.

"Numerical Study of Decaying Isotropic Turbulent Reactive Flows," 51st Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Philadelphia, PA, November 24, 1998.

"Flame-Turbulence Interaction in Homogeneous Flows," 50th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, San Francisco, CA, November 24, 1997.

⋆ "Flame-Vortex Interaction in a Reacting Vortex Ring," International Colloquium on Advanced Computation & Analysis of Combustion, Moscow, Russia, May 13, 1997.

⋆ "Flame-Vortex Interaction: A Numerical Study," Department of Mechanical Engineering, Aeronautical Engineering & Mechanics, Rensselaer Polytechnic Institute, Troy, NY, April 4, 1997.

⋆ "Direct Numerical Simulation of Reacting Vortex Rings," Department of Physics, State University of New York, Buffalo, NY, March, 11 1997.

"Vorticity Dynamics in Reacting Vortex Rings," 49th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Syracuse, NY, November 25, 1996.

"Direct Numerical Simulation of Laminar Vortex Rings," 47th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Atlanta, GA, November 20, 1994.

"Method of Translation for Stochastic Modeling of Binary Scalar Mixing in Isotropic Turbulence," 45th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Tallahassee, FL, November 23, 1992.

⋆ "Some Issues of Interest in Computational and Mathematical Analysis of Turbulent Reacting Flows," Theoretical Flow Physics Branch, NASA Langley Research Center, Hampton, VA, May 15, 1992.

"Mathematical Modeling of the Reactant Conversion Rate by Single-Point PDF Methods," Fall Technical Meeting of the Combustion Institute, Eastern Section, Cornell University, Ithaca, NY, October 15, 1991.

"On DNS and LES of Reacting Compressible Homogeneous Turbulence," Fall Technical Meeting of the Combustion Institute, Eastern Section, Orlando, FL, December 4, 1990.

"Interaction of a Turbulent Round Jet with a Solid Surface," The University of Michigan Gas Dynamics Laboratory Meeting, Ann Arbor, MI, March 24, 1989.

"A Comparative Study of Free surface Jets and Wall Jets," 42nd Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Palo Alto, CA, November 21, 1989.

"Free Surface Signature of a Submerged Turbulent Jet," Annual Midwestern Universities Fluid Mechanics Retreat, Geneva Center, Rochester, IN, April 14, 1989.

"Dynamics of Turbulent Jets Near a Free Surface," 41st Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Buffalo, NY, November 21, 1988.

"Interaction of an Axisymmetric Turbulent Water Jet with the Free Surface," 40th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Eugene, OR, November 22, 1987.

"Turbulent Jets: Surface Waves and Surface Motions," University of Michigan Gas Dynamics Laboratory Meeting, Ann Arbor, Michigan, October 14, 1987.

9. GRANT SUPPORT

9.1. Funded:

Principal Investigator, "Modeling and Numerical Simulation of Complex Turbulent Nonpremixed Flames,"American Chemical Society-Petroleum Research Fund, $80,000, 2002-2004. Research Grant Number: ACS-PRF 38333-AC9.

Principal Investigator, "Modeling and Direct Numerical Simulation of Hydrocarbon Flame-Vortex Interactions,"American Chemical Society-Petroleum Research Fund, $60,000, 2000-2002. Research Grant Number: ACS-PRF 35064-AC9.

Co-Principal Investigator, "Filtered Mass Density Function for Design Simulation of High Speed Air-breathing Propulsion Systems," NASA, (Co-PI with P. Givi), 9/1999-8/2002, $94,817.

Principal Investigator, CAREER Award, NSF, $207,500, 1996-2001. Research Grant Number: CTS-9623178.

Principal Investigator, "Numerical Simulation and Modeling of Methane Flames," American Chemical Society-Petroleum Research Fund, $20,000, 1996-1998. Research Grant Number: ACS-PRF 30619-G9.

Co-Principal Investigator, "Physical Chemistry of Inks Wetting Paper," Xerox Corporation, $7500 1998-1999, (Co-PI with P. Alexandridis).

Co-Principal Investigator, "Simulation of High-Speed Turbulent Reacting Flows," NASA Langley Research Center, Hampton, VA, Research Grant Number: NAG 1-1122, $95,616, August 1996-July 1999. Research Foundation of SUNY Identification Number: 150-4113A (Co-PIs: P. Givi and D.B. Taulbee).

Co-Principal Investigator, "High Speed Complex Turbulent Reacting Flows: Modeling, Simulations and Experimental Validations" Wright Patterson Air Force Base though NASA Grant NAG-1-1122, $47,520, September 1996 - August 1997. Research Foundation of SUNY Identification Number: 150-4113A (Co-PIs: P. Givi and D.B. Taulbee).

Co-Principal Investigator, "Stochastic Modeling and Simulation of Multiphase Reacting Turbulent Flows with Complex Chemistry," Office of Naval Research, Research Grant Number: N00014-94-1-0677, $364,844, May 1994-May 1998. Research Foundation of SUNY Identification Number: 150-4233B (Co-PIs: P. Givi and D.B. Taulbee).

Co-Principal Investigator, "LES, DNS and RANS for the Analysis of High-Speed Turbulent Reacting Flows," NASA Langley Research Center, Hampton, VA, Research Grant Number: NAG 1-1122, $195,000, August 1993-July 1996. Research Foundation of SUNY Identification Number: 150-4113A (Co-PIs: P. Givi and D.B. Taulbee).

9.2. Others:

Principal Investigator, several grants on national supercomputer facilities including: National Center for Supercomputing Allocations at the University of Illinois at Urbana, Pittsburgh Supercomputing Center, San Diego Supercomputering Center, NAS at the NASA Ames

Research Center, Cornell National Supercomputer Facility,and Computational Facilities of the NASA Langley Research Center (1988-present).