

CURRICULUM VITAE

James C. Hermanson

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March 2023

I. PERSONAL INFORMATION

1. Education

- Ph.D. in Aeronautics, California Institute of Technology 1985
- M.S. in Aeronautics, California Institute of Technology 1980
- B.S. (magna cum laude) in Aeronautics and Astronautics, University of Washington 1977

2. Professional Experience

- University of Washington, Seattle, WA 8/02-present
Chair, Department of Aeronautics and Astronautics 7/10-9/14
Associate Chair, Department of Aeronautics and Astronautics 1/09-6/10
Professor, Department of Aeronautics and Astronautics 9/08-present
Associate Professor, Department of Aeronautics and Astronautics 8/02-8/08
- ZARM (Center for Applied Space Technology and Microgravity), Universität Bremen, Bremen, Germany 7/16-present
Visiting (Fulbright) Professor
- Kungliga Tekniska Högskolan, Stockholm, Sweden 4/22-8/22
Visiting Professor, Department of Mechanics 1/15-8/15
- Stanford University, Palo Alto, CA 10/14-11/14
Visiting Professor, Department of Aeronautics and Astronautics
- Worcester Polytechnic Institute, Worcester, MA 3/95-7/02
Professor, Mechanical Engineering Department 7/02
Associate Professor, Mechanical Engineering Department 7/97-6/02
Assistant Professor, Mechanical Engineering Department 3/95-6/97
- University of Connecticut, Storrs, CT 1/93-6/93
Visiting Associate Professor, Department of Mechanical Engineering
- United Technologies Research Center, East Hartford, CT 7/88-3/95
Research Scientist, Chemical Sciences
- University of Washington Applied Physics Laboratory, Seattle, WA 2/86-7/88
Senior Engineer, Ocean Systems; also Research Assistant Professor, Department of Aeronautics and Astronautics
- Universität Göttingen, Göttingen, Germany 7/85-12/85
Research Fellow, Institut für Physikalische Chemie

Professional Experience (continued)

- California Institute of Technology, Pasadena, CA
Graduate Research Assistant, Aeronautics 6/80-6/85
- Boeing Aerospace Company, Seattle, WA
Engineer, Propulsion Technology 7/77-7/79

II. RESEARCH AND SCHOLARSHIP

3. Publications

3.1 Refereed Journal Articles

1. Gonzalez, J.C., Allen, J.S., and Hermanson, J.C., “Convective Structure Evolution and Impact on Heat Transfer in Cyclically-superheated, Evaporating Films” *International Journal Thermofluids*, under revision, 2023.
2. Bellur, K., Medici, E.F., Hussey, D.S., Jacobson, D.L., LaManna, J., Leao, J.B., Schershlight, J., Hermanson, J.C., Choi, K.-C. and Allen, J.S. “Data from cryo-neutron phase change experiments with LH2 and LCH4,” *Data in Brief* **43**, 108474, 2022.
3. Bellur, K., Medici, E.F., Hussey, D.S., Jacobson, D.L., LaManna, J., Leao, J.B., Schershlight, J., Hermanson, J.C., Choi, K.-C. and Allen, J.S. “Results from neutron imaging phase change experiments with LH2 and LCH4,” *Cryogenics* **125**, 103517, 2022.
4. Meyer, F., Eigenbrod, C., Wagner, V. Paa, W., and Hermanson, J.C., Ando, S. and Avila, M. “Oxygen Droplet Combustion in Hydrogen under Microgravity Conditions,” *Combustion and Flame*, **241**, 112081, July, 2022.
5. Meyer, F., Eigenbrod, C., Wagner, V. Paa, W., and Hermanson, J.C., “Apparatus to Investigate Liquid Oxygen Droplet Combustion in Hydrogen under Microgravity Conditions,” *Rev. Scientific Instruments* **91** (10), <https://doi.org/10.1063/5.0020988>, 2020.
6. Bellur, K., Medici, E.F., Choi, C.-K., Hermanson, J.C., and Allen, J.S., “Multi-scale approach to model steady meniscus evaporation in a wetting fluid,” *Physical Review Fluids* **5**, 024001, 2020.
7. Gonzalez, J.C., Allen, J.S., and Hermanson, J.C., “Evolution of Convective Structure and Heat Transfer of Evaporating Films under Cyclic Superheating Conditions” *AIAA Journal of Thermophysics and Heat Transfer*, **57** (9), 3924-3932, 2019.
8. Bellur, K., Hussey, D., Jacobson, D., Lamana, J., Medici, E., Hermanson, J.C., Allen, J.S. and Choi, C.-K., “Neutron attenuation analysis of cryogenic propellants,” *J. Heat Transfer-Transactions of the ASME* **140** (3), 030904-1, 2018.
9. Bellur, K., Medici, E.F., Hermanson, J.C., Choi C.K., and Allen, J.S., “Determining solid-fluid interface temperature distribution during phase change of cryogenic propellants using transient thermal modeling,” *Cryogenics* **91**, 103-111, 2018.
10. Liao, Y.-H. and Hermanson, J.C., “OH-PLIF Imaging of the Reaction Zone in Swirled, Strongly-Pulsed Jet Diffusion Flames with a Low Reynolds Number,” *Combustion Science and Technology* **190** (4), 615-631, 2018.
11. Kimball, J., Hermanson, J.C. and Allen, J.S., “Convective Structure Evolution and Heat Transfer in Transient Evaporating Films,” *AIAA Journal of Thermophysics and Heat Transfer*, **78**, 125105, 2017.

Refereed Journal Articles (continued)

12. Albernaz, D.L., Do-Quang, M., Hermanson, J.C. and Amberg, G. "Droplet deformation and heat transfer in isotropic turbulence," *Journal of Fluid Mechanics*, **820**, 61-85, 2017.
13. Albernaz, D.L., Do-Quang, M., Hermanson, J.C. and Amberg, G. "Real fluids near the critical point in isotropic turbulence," *Physics of Fluids* **28** (12), 125105, 2016.
14. Lin, E.P., Kim, Y.-J., and Hermanson, J.C., "The Structure of Compression Waves on Supersonic Droplets," *AIAA Journal* **54** (2), pp. 777-781, 2016.
15. Bellur, K., Medici, E.F., Kulshrestha, M., Konduru, V., Tamilarasan, A., McQuillen, J., Leao, J.B., Hussey, D.S., Scherschlight, J., Hermanson, J.C., Choi, K.-C., and Allen, J.S., "A new experiment for investigating evaporation and condensation of cryogenic propellants," *Cryogenics* **74**, pp. 131-137, 2016.
16. Bellur, K., Medici, E.F., Allen, J.S., Choi, K.-C., Hermanson, J.C., Tamilarasan, A., Hussey, D.S., Jacobson, D., Leao, J.B., and McQuillen, J., "Neutron Radiography of Condensation and Evaporation of Hydrogen in a Cryogenic Condition," *J. Heat Transfer* **137** (8), 080901, 2015.
17. Narendranath, A.D., Hermanson, J.C., Kolkka, R.W., Struthers, A.A. and Allen, J.S., "The Effect of Gravity on the Stability of an Evaporating Liquid Film," *Microgravity Science and Technology* **26** (3), 189-199, 2014.
18. Liao, Y.-H. and Hermanson, J.C., "The CO/NO_x Emissions of Swirled, Strongly-Pulsed Jet Diffusion Flames," *Combustion Science and Technology* **186**, 849-868, 2014.
19. Liao, Y.-H. and Hermanson, J.C., "Turbulent Structure and Dynamics of Swirled, Strongly Pulsed Jet Diffusion Flames," *Combustion Science and Technology*, **185**, 1602-1623, 2013.
20. Narendranath, A.D., Kimball, J., Hermanson, J.C. and Allen, J.S., "Manifestation of Instability Mechanisms in Liquid Films," *Journal of Heat Transfer-Transactions of the ASME* **134** (8), 2012.
21. Kim, Y.J. and Hermanson, J.C., "Breakup and Vaporization of Droplets under Locally Supersonic Conditions," *Phys. Fluids* **24** (7), 076102, 2012.
22. Kim, Y.J. and Hermanson, J.C., "Disruption of Volatile and Non-volatile Droplets under Locally Supersonic Conditions," *AIAA Journal* **50** (8), 1754-1765, 2012.
23. Kimball, J.T., Hermanson, J.C. and Allen, J.S., "Convective Structure Evolution and Heat Transfer in Quasi-Steady Evaporating Liquid Films," *Phys. Fluids* **24**, 052102, 2012.
24. Fregeau, M., Hermanson, J.C., Stocker, D.P., and Hegde, U.G., "Turbulent Structure Dynamics of Buoyant and Non-buoyant Pulsed Jet Diffusion Flames," *Combustion Science and Technology*, **183**, 309-330, 2010.
25. Fregeau, M. and Hermanson, J.C., "NO_x/CO Emissions of Strongly-Pulsed Jet Diffusion Flames," *Combustion Science and Technology*, **181**, 536-554, 2009.
26. Kimball, J.T., Bailey, M.F., and Hermanson, J.C., "Ultrasonic measurement of condensate film thickness," *Journal of the Acoustical Society of America* **124** (4), EL196-202, 2008.
27. Hermanson, J.C., "Dynamics of Supersonic Droplets of Volatile Liquids," *AIAA Journal*, Vol. 45 No. 3, 730-733, 2007.
28. Som, S.M., Kimball, J.T., Hermanson, J.C., and Allen, J.S., "Stability and Heat Transfer Analysis of Unsteady Condensing and Evaporating Films," *International Journal of Heat and Mass Transfer* Vol. 50, 1927-1937, 2007.

Refereed Journal Articles (continued)

29. Hermanson, J.C., 22nd Annual Gallery of Fluid Motion, *Physics of Fluids* **17** (9), 2005.
30. Chen, Z.-Q., Hermanson, J.C., Shear, M.A., and Pedersen, P.C., "Ultrasonic Monitoring of Interfacial Motion and Growth of Condensing and Non-condensing Liquid Films," *Flow Measurement and Instrumentation* **16** (6), 353-362, 2005.
31. Hermanson, J.C., Johari, H., Stocker, D.P., and Hegde, U.G. "Buoyancy effects in strongly-pulsed turbulent diffusion flames," *Combustion and Flame* **139**, 61-76, 2004.
32. Hermanson, J.C., Ghaem-Maghani, E. and Johari, H., "CO/Unburned Hydrocarbon Emissions of Strongly-Pulsed Turbulent Diffusion Flames," *Combustion Science and Technology* **176**, 1855-1866, 2004.
33. Tew, D.E., Waitz, I.A., and Hermanson, J.C., "Impact of Compressibility on Mixing Downstream of Lobed Mixers," *AIAA Journal* **42** (11), 2393-2396, 2004.
34. Hermanson, J.C., Sangras, R., Usowicz, J.E., and Johari, H., "Co-Flow Effects on Turbulent Flame Puffs," *AIAA Journal* **40** (7), 1355-1362, 2002.
35. Olinger, D.J. and Hermanson, J.C., "Integrated Thermal-Fluid Experiments in WPI's Discovery Classroom," *ASEE Journal of Engineering Education*, **91** (2), 239-243, April 2002.
36. Obata, S., and Hermanson, J.C., "Numerical Simulation of Shock-enhanced Mixing in Planar, Non-uniform density, Turbulent Jets," *AIAA Journal* **38** (11), 2113-2119, 2000.
37. Hermanson, J.C., Dugnani, R., and Johari, H., "Structure and Flame Length of Fully-modulated, Turbulent Diffusion Flames," *Combustion Science and Technology*, **155**, 203-225, 2000.
38. Hermanson, J.C. and Cetegen, B.M., "Shock-Induced Mixing of Nonhomogeneous Density Turbulent Jets," *Physics of Fluids*, **12** (5), 1210-1225, 2000.
39. Pedersen, P.C., Cakareski, Z., and Hermanson, J.C., "Ultrasonic Monitoring of Film Condensation," *Ultrasonics* **38**, 486-490, 2000.
40. Johari, H., Pacheco-Tougas, M., and Hermanson, J.C., "Penetration and Mixing of Fully-modulated Turbulent Jets in Crossflow," *AIAA Journal*, **37** (7), 842-850, 1999.
41. Hermanson, J.C. and Cetegen, B., "Mixing Enhancement of Non-uniform Density Turbulent Jets Interacting with Normal Shock Waves," *Twenty-seventh Symposium (International) on Combustion*, The Combustion Institute, 2047-2053, 1998; also presented at the 27th Symposium in Boulder, CO, July 1998.
42. Hermanson, J.C., Wahba, A., and Johari, H., "Duty-cycle Effects on the Penetration of Fully-modulated, Turbulent Jets in a Cross-Flow," *AIAA Journal* **36** (10), 1935-1937, 1998.
43. Hermanson, J.C., Colket, M.B., and Sangiovanni, J.J., "Stability and Emissions of Lean, Turbulent, Premixed Flames with a Very Lean Co-Flow," *AIAA Journal* **35** (11), 1705-1711, 1997.
44. Johari, H., Desabrais, K.J., and Hermanson, J.C., "Experiments on Impulsively-Started Jet Diffusion Flames," *AIAA Journal* **35** (6), 1012-1017, 1997.
45. Hermanson, J.C. and Roman, W.C., "Diagnostic Techniques for Temperature and Species Determination in Advanced Materials Processing," *High Temperature and Materials Science* **35**, 43-64, 1996.

Refereed Journal Articles (continued)

46. Chin, D., Hermanson, J.C. and Spadaccini, L.J., "Thermal Stability and Heat Transfer Characteristics of Methane and Natural Gas Fuels," *ASME Transactions* **117**, 462-467, 1995.
47. Cetegen, B.M. and Hermanson, J.C., "Mixing Characteristics of Compressible Vortex Rings Interacting with Normal Shock Waves," *Combustion and Flame* **100**, 232-240, 1995, also presented at the 25th *Symposium (International) on Combustion*, Irvine, CA, July 1994.
48. Roman, W.C. and Hermanson, J.C., "Diagnostic Techniques for Plasma Reactor Temperature and Species Determination in Advanced Materials Processing," *Journal of Pure and Applied Chemistry* **66 (6)**, 1259-1266, 1994.
49. Hermanson, J.C., Papas, P. and Kay, I.W., "Structure and Penetration of a Supercritical Fluid Jet in Supersonic Flow," *Journal of Propulsion and Power* **10 (3)**, 387-394, 1994.
50. Hermanson, J.C. and Winter, M., "Mie Scattering Imaging of a Transverse, Sonic Jet in Supersonic Flow," *AIAA Journal* **31 (1)**, 129-132, 1993.
51. Hermanson, J.C. and Vranos, A., "Preferential Thermal and Multi-component Species Transport Effects in Strained Diffusion Flames," *AIAA Journal* **30 (12)**, 2982-2985, 1992.
52. Hermanson, J.C. and Vranos, A., "Combined Effects of Preferential Thermal and Species Transport in a Strained, Laminar Diffusion Flame," *Combustion Science and Technology* **75**, 339-345, 1991.
53. Hermanson, J.C. and Dimotakis, P.E., "Effects of Heat Release in a Turbulent, Reacting Shear Layer," *Journal of Fluid Mechanics* **199**, 333-375, 1989.
54. Hermanson, J.C., Mungal, M.G. and Dimotakis, P.E., "Heat Release Effects on Shear Layer Growth and Entrainment," *AIAA Journal* **25 (4)**, 578-583, 1987.
55. Mungal, M.G., Hermanson, J.C. and Dimotakis, P.E., "Reynolds Number Effects on Mixing and Combustion in a Reacting Shear Layer," *AIAA Journal* **23 (9)**, 1418-1423, 1985.

Refereed Journal Article in Preparation

Ferris, F.R., Esmaceli, A., and Hermanson, J.C., "High-speed Imaging of Homogeneous Nucleation and Explosive Evaporation in Superheated Droplets," to be submitted to *Physics of Fluids*.

3.2 Conference Papers

1. Bellur, K., Medici, Hermanson, J.C., Choi, K.-C. and Allen, J.S. "Resolving Discrepancy in Accommodation Coefficients: Rethinking Local Equilibrium Constructs in Evaporation Modeling," *ASME 2023 Heat Transfer Summer Conference* paper SHTC2023-107376, Washington, DC, July 2023.
2. Meyer, F., Eigenbrod, C., Wagner, V., Paa, W., Hermanson, J.C. and Ando, S. "Single Droplet Combustion of Liquid Oxygen in Hydrogen under Microgravity Conditions," *44th COSPAR Scientific Assembly - COSPAR 2022*, Athens, Greece, July 2022.
3. Sciuto, P., Hermanson, J.C., and Knowlen, C. "Design and Configuration of a Tridyne Propulsion System for CubeSat Applications," "Development of a Tridyne Propulsion System for CubeSat Applications" *AIAA SciTech Forum*, January, 2022.
4. Meyer, F., Eigenbrod, C., Wagner, V., Paa, W., Hall, J.D., Zody, M., Frydman, J. and Hermanson, J.C. "Combustion of Single Oxygen Droplets in Hydrogen under Microgravity Conditions," *AIAA SciTech Forum*, January, 2021.

Conference Papers (continued)

5. Henderson, B.R., Hermanson, J.C., and Knowlen, C., “Development of a Tridyne Propulsion System for CubeSat Applications” *AIAA SciTech Forum*, January, 2021.
6. Meyer, F., Eigenbrod, C., Wagner, V., Paa, W., Hall, J.D., Zody, M., Frydman, J. and Hermanson, J.C. “Combustion of Single Liquid Oxygen Droplets in Hydrogen under Microgravity Conditions,” Paper No. 123, *23rd International Symposium on Transport Phenomena*, Honolulu, HI (online), October 2020.
7. Meyer, F., Eigenbrod, C., Hermanson, J.C., Frydman, J., Paa, W., and Wagner, V., “Microgravity Experiments and Numerical Simulations on the Combustion of Single Oxygen Droplets in Hydrogen,” *69th International Astronautical Congress (IAC)*, Bremen, Germany, October 2018.
8. Gonzalez, J.C., Allen, J.S., and Hermanson, J.C., “Evolution of Convective Structure and Heat Transfer of Evaporating Films under Cyclic Conditions” AIAA paper 2018-1546, *56th Aerospace Sciences Meeting/SciTech 2018*, Kissimmee, FL, January 2018.
9. Vijlee, S.Z., Hermanson, J.C., Kramlich, J.C. and Malte, P.C., “Effects of Fuel Composition on NO_x Emissions for Traditional and Alternative Jet Fuels” *Western States Section of the Combustion Institute 2016 Spring Technical Meeting*, Seattle, WA, March 2016.
10. Lin, E.P. and Hermanson, J.C., “Compression Wave Structure on Droplets under Supersonic Conditions,” AIAA Paper 2014-3946, *AIAA Propulsion and Energy Forum 2014*, Cleveland, OH, July 2014.
11. Kimball, J.T., Hermanson, J.C. and Allen, J.S. “Convective Structure and Heat Transfer of Evaporating Films under Transient Conditions,” Paper No. 96, *23rd International Symposium on Transport Phenomena*, Auckland, New Zealand, November 2012.
12. Liao, Y. -H. and Hermanson, J. C. “Reaction Zone Structure of Swirled, Strongly-Pulsed Turbulent Jet Diffusion Flames,” Paper No. 57, *23rd International Symposium on Transport Phenomena*, Auckland, New Zealand, November 2012.
13. Narendranath, A.D., Hermanson, J.C., Struthers, A.A., Kolkka, R.W., and Allen, J.S. “Stability of an Evaporating Liquid Film under Nonequilibrium Conditions with Variable Gravity,” *ASME Fluids Engineering Division Summer Meeting*, Puerto Rico, USA, July 2012.
14. Kim, Y.J. and Hermanson, J.C., “Dynamics, Disruption, and Vaporization of Droplets under Supersonic Conditions,” AIAA Paper 2011-5762, *47th AIAA/ASME/SAE/ASEE Joint Propulsion Conference*, San Diego, CA, August 2011.
15. Liao, Y.-H. and Hermanson, J.C., “The Effects of Swirl on the Structure of Strongly-Pulsed Turbulent Diffusion Flames,” Paper T-33, *7th US National Combustion Meeting*, Atlanta, GA, March 2011.
16. Liao, Y.-H. and Hermanson, J.C., “The CO/NO_x Emissions of Strongly-Pulsed Turbulent Jet Diffusion Flames with Swirl,” Paper T-34, *7th US National Combustion Meeting*, Atlanta, GA, March 2011.
17. Kim, Y.J. and Hermanson, J.C., “Injection and Disruption of Supersonic Droplets in an Air Stream,” *AIAA Paper 2010-752, AIAA 48th Aerospace Sciences Meeting*, Orlando, FL, January 2010.
18. Kimball, J.T., Hermanson, J.C., and Allen, J.S., “Convective Structure and Heat Transfer of Thin, Evaporating Films,” Paper No. 259, *20th International Symposium on Transport Phenomena*, Victoria, BC, July 2009.

Conference Papers (continued)

19. Fregeau, M., Hermanson, J.C., Stocker, D.P. and Hegde, U.G., "Buoyancy Effects on Strongly-pulsed Turbulent Jet Flame Structure and Exhaust Emissions," AIAA Paper 2008-1016, *AIAA 46th Aerospace Sciences Meeting*, Reno, NV, January 2008.
20. Fregeau, M., Hermanson, J.C., Stocker, D.P., and Hegde, U., "Dynamics of Strongly-pulsed Turbulent Diffusion Flame Structures under Buoyant and Non-Buoyant Conditions," *5th US Combustion Meeting* paper B27, San Diego, CA, March 2007.
21. Hermanson, J.C., Fregeau, M., and Stocker, D.P., "Flame Structure Dynamics and Buoyancy Effects in Pulsed Turbulent Diffusion Flames," AIAA Paper 2006-1451, *44th Aerospace Sciences Meeting*, Reno, NV, January 2006.
22. Fregeau, M, Tsai, P.Y. and Hermanson, J.C., "CO/NO Emissions of Strongly-Pulsed Turbulent Nonpremixed Flames," AIAA Paper 2006-809, *44th Aerospace Sciences Meeting*, Reno, NV, January 2006.
23. Som, S.M., Hermanson, J.C. and Allen, J.S., "Unsteady Film Condensation and Pumped Films on the Underside of a Flat Plate," AIAA Paper 2006-0357, *AIAA 44th Aerospace Sciences Meeting*, Reno, NV, January 2006.
24. Padate, S., Allen, J.S., and Hermanson, J.C., "Dynamics of evaporating films under reduced gravity," AIAA Paper 2006-0738, *AIAA 44th Aerospace Sciences Meeting*, Reno, NV, January 2006.
25. Fregeau, M., Tsai, P.Y. and Hermanson, J.C., "CO and NO_x Emissions of Strongly-Pulsed Turbulent Jet Diffusion Flames," Paper 05F-66, *Western States Section/The Combustion Institute 2005 Fall Meeting*, Stanford, CA, October 2005.
26. Som, S.M., Hermanson, J.C. and Allen, J.S., "Unsteady film condensation and pumped films on the underside of a flat plate," *AIAA Region 6 Student Conference*, San Luis Obispo, CA, April 2005. Award: Best Paper (Graduate Division).
27. Phariss, M.R., Yanson, L.M., and Hermanson, J.C., "Effects of Liquid Superheat on Droplet Disruption in a Supersonic Stream," AIAA paper 2005-0351, *43rd AIAA Aerospace Sciences Meeting*, Reno, NV 10-13 January 2005.
28. Som, S.M., Hermanson, J.C. and Allen, J.S. "Stability and Heat Transfer of an Unsteady Condensing Film," paper number IAC-040-IAF-J.2.08, *55th International Astronautical Congress*, Vancouver, Canada, Oct. 4-8 2004.
29. Hermanson, J.C., Som, S.M., Allen, J.S. and Pedersen, P.C., "Stability and Heat Transfer of Condensing and Evaporating Films," *Strategic Research to Enable NASA's Exploration Missions*, Cleveland, OH June 22-23, 2004 (Invited Paper).
30. Hermanson, J.C., Johari, H., Stocker, D.P. and Hegde, U.G., "Thermal Characteristics and Structure of Fully-Modulated, Turbulent Diffusion Flames in Microgravity," AIAA Paper 2004-0959, *AIAA 42nd Aerospace Sciences Meeting*, Reno, NV, January 2004. Award: Best Paper, *18th Microgravity Science and Space Processing Symposium* at the 42nd Aerospace Sciences Meeting.
31. Hermanson, J.C., Ghaem-Maghani, E. and Johari, H., "Fully-Modulated Turbulent Diffusion Flame Emissions," Paper 03F-84, *Western States Section/The Combustion Institute 2003 Fall Meeting*, Los Angeles, CA, October 2003.

Conference Papers (continued)

32. Hermanson, J.C., Johari, H., Ghaem-Maghani, E., Stocker, D.P., Hegde, U.G. and Page, K.L., "Buoyancy Effects in Fully-Modulated, Turbulent Diffusion Flames," *7th International Workshop on Microgravity Combustion and Chemically Reacting Systems*, Cleveland, OH, June 2003 (Invited Paper).
33. Page, K.L., Stocker, D.P., Hegde, U.G., Hermanson, J.C. and Johari, H., "Buoyancy Dependence of Thermal Characteristics of Fully-Modulated, Turbulent Diffusion Flames," *Third Joint Meeting of the U.S. Sections of The Combustion Institute*, Chicago, IL, March 2003.
34. Johari, H., Ghaem-Maghani, E., and Hermanson, J.C., "Exhaust Emissions of Fully-Modulated Turbulent Diffusion Flames," AIAA paper 03-1015, *AIAA 41st Aerospace Sciences Meeting*, Reno, NV, January 2003.
35. Hermanson, J.C., Usowicz, J.E., Johari, H., Sangras, R., Stocker, D.P. and Hegde, U.G., "Structure and Flame Length of Fully-Modulated, Turbulent, Diffusion Flames in Microgravity," AIAA paper 02-1076, *AIAA 40th Aerospace Sciences Meeting*, Reno, NV, January 2002.
36. Dollenmayer, D.B. and Hermanson, J.C., "Fachübergreifende Lehre in den USA ... Bericht über eine experimentelle Lehrveranstaltung auf Deutsch," *Perspektiven Interdisziplinärer Technikforschung*, Krebs, Gehrlein, Pfeiffer and Schmidt, Eds., Agenda Verlag, Münster, pp. 255-261, 2002.
37. Ueno, T., Nagashima, T., Obata, S., and Hermanson, J.C. "Numerical Analysis of Pulsed Hydrogen Combustion Enhancement," *Proceedings of the Conference on Aerospace Propulsion* **41**, 86-91, 2001.
38. Hermanson, J.C., Johari, H., Usowicz, J.E., Sangras, R., Stocker, D.P., Hegde, U.G., Nagashima, T., and Obata, S., "An Experimental Investigation of Fully-Modulated, Turbulent Diffusion Flames in Reduced Gravity," *Sixth International Microgravity Combustion Workshop*, Cleveland, OH, May 2001 (Invited paper).
39. Sangras, R., Usowicz, J.E., Hermanson, J.C., and Johari, H., "Flame Length and Emissions of Fully-Modulated Turbulent Diffusion Flames," AIAA paper 01-0188, *AIAA 39th Aerospace Sciences Meeting*, Reno, NV, January 2001.
40. Obata, S. and Hermanson, J.C., "A Numerical Study of Mixing Enhancement by Shock Passing Through Axisymmetric, Non-uniform Density Turbulent Jets," AIAA paper 01-0149, *AIAA 39th Aerospace Sciences Meeting*, Reno, NV, January 2001.
41. Hermanson, J.C. and Olinger, D.J., "Implementation of Integrated ThermoFluid Experiments in WPI's Discovery Classroom," *2000 ASEE Annual Conference*, St. Louis, MO, June 2000.
42. Hermanson, J.C., Usowicz, J.E., and Johari, H., "An Experimental Study of Isolated Turbulent Flame Puffs with a Co-Flow," AIAA Paper 2000-0813, *AIAA 38th Aerospace Sciences Meeting*, Reno, NV, January 2000.
43. Pedersen, P.C., Cakareski, Z., and Hermanson, J.C., "Ultrasonic Monitoring of Film Condensation," *1999 World Congress on Ultrasonics*, Lyngby, Denmark, June 1999.
44. Obata, S. and Hermanson, J.C., "Numerical Simulation of Shock-Enhanced Mixing in Non-uniform Density Turbulent Jets," AIAA Paper 99-0161, *AIAA 37th Aerospace Sciences Meeting*, Reno, NV, January 1999.
45. Obata, S. and Hermanson, J.C., "Shear Layer Mixing Enhancement by Shock Passing," *JSASS 12th International Sessions, 36th Aircraft Symposium*, Yokosuka, Japan, October 1998.

Conference Papers (continued)

46. Pacheco-Tougas, M., Johari, H., and Hermanson, J.C., "Penetration and Mixing of Fully-modulated Turbulent Jets in Cross Flow," AIAA paper 98-2908, *AIAA 29th Fluid Dynamics Conference*, Albuquerque, NM, June 1998.
47. Pashaie-Rad, S., Hermanson, J.C., and Rencis, J.J., "Development of Component-Level Thermal Models of a Ceramic Pin Grid Array," *Proceedings of the 6th Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITherm '98)*, Seattle, WA, May 1998.
48. Hermanson, J.C., Dugnani, R., and Johari, H., "Structure and Flame Length of Fully-Modulated, Pulsed Diffusion Flames," AIAA Paper 98-00561, *AIAA 36th Aerospace Sciences Meeting*, Reno, NV, January 1998.
49. Hermanson, J.C., Dugnani, R., and Johari, H., "Length of Fully-modulated Diffusion Flames," *Combustion Institute Eastern States Section Fall Technical Meeting*, Hartford, CT, October 1997.
50. Tew, D.E., Waitz, I.A., and Hermanson, J.C., "Impact of Compressibility on Mixing with Large-Scale Streamwise Vortices," AIAA Paper 97-2637, *33rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference*, Seattle, WA, July 1997.
51. Hermanson, J.C., Colket, M.B. and Sangiovanni, J.J., "Combustion Characteristics of Lean, Turbulent, Premixed Flames with a Very Lean Co-flow," AIAA Paper 97-0254, *AIAA 35th Aerospace Sciences Meeting*, Reno, NV, January 1997.
52. Hermanson, J.C., Berger, B. and Cetegen, B.M., "Interaction of Normal Shock Waves with Non-Uniform Density Turbulent, Axisymmetric Jets," *Combustion Institute Eastern States Section Fall Technical Meeting*, Hilton Head, SC, December 1996.
53. Johari, H., Desabrais, K.J., and Hermanson, J.C., "Experiments on Impulsively Started Jet Diffusion Flames," AIAA paper 96-1930, *27th AIAA Fluid Dynamics Conference*, New Orleans, LA, June 1996.
54. Hermanson, J.C., Sangiovanni, J.J. and Colket, M.B., "Stability and Emissions of Lean, Turbulent, Premixed Flames with a Very Lean Co-flow," *Eastern States Section Fall Technical Meeting*, Hartford, CT, October 1995.
55. Tew, D.E., Waitz, I.A., Hermanson, J.C., Greitzer, E.M. and Tan, C.S., "Streamwise Vorticity Enhanced Compressible Mixing Downstream of Lobed Mixers," *AIAA Paper 95-2746, 31st AIAA/ASME/SAE/ASEE Joint Propulsion Conference*, July 1995.
56. Chin, D., Hermanson, J.C. and Spadaccini, L.J., "Thermal Stability and Heat Transfer Characteristics of Methane and Natural Gas Fuels," Paper 94-GT-390, *ASME International Gas Turbine and Aeroengine Congress*, The Hague, Netherlands, June 1994.
57. Hermanson, J.C. and Cetegen, B.M., "Interaction of Compressible Vortex Rings with Normal Shock Waves," *Eastern States Section of the Combustion Institute Fall Technical Meeting*, Princeton, NJ, October 1993.
58. Roman, W.C., Hermanson, J.C., Hay, S.O, and Breen, J., "Diagnostic Techniques for Hot Hydrogen Testing of Materials for SNTP," *Tenth Symposium on Space Nuclear Power and Propulsion*, Albuquerque, NM, January 1993 (Invited).
59. Hermanson, J.C., Papas, P., Kay, I.W., "Structure and Penetration of a Transverse Fluid Jet Injected at Supercritical Pressure into Supersonic Flow," AIAA Paper 92-3652, *AIAA/SAE/ASME/ASEE 28th Joint Propulsion Conference*, Nashville, TN, July 1992.

Conference Papers (continued)

60. Winter, M.W., Hermanson, J.C. and Dobbs, G.M., "Imaging of Molecular Mixing in a Gas-phase Turbulent Jet by Collisional Energy-transfer Fluorescence," AIAA Paper 92-0381, *AIAA 30th Aerospace Sciences Meeting*, Reno, NV, January 1992.
61. Hermanson, J.C. and Winter, M., "Imaging of a Transverse, Sonic Jet in Supersonic Flow," AIAA Paper 91-2269, *AIAA/SAE/ASME/ASEE 27th Joint Propulsion Conference*, Sacramento, CA, June 1991.
62. Ho, P.Y., Decher, R. and Hermanson, J.C., "Grid Induced Errors in Stream Function Solutions," AIAA Paper 91-2261, *AIAA/SAE/ASME/ASEE 27th Joint Propulsion Conference*, Sacramento, CA, June 1991.
63. Hermanson, J.C. and Vranos, A., "Preferential Thermal and Multi-Component Species Transport in a Strained, Laminar Diffusion Flame," *Eastern Section of the Combustion Institute Fall Technical Meeting*, Orlando, FL, December 1990.
64. Hermanson, J.C. and Winter, M., "Laser-Induced Fluorescence Imaging of Supersonic Shear Flow," AIAA Paper 90-0501, *AIAA 28th Aerospace Sciences Meeting*, Reno, NV, January 1990.
65. Hermanson, J.C. and Vranos, A., "Combined Differential Thermal and Species Transport in a Strained, Laminar Diffusion Flame," *Eastern Section of the Combustion Institute Fall Technical Meeting*, Albany, NY, October 1989.
66. Beyer, K., Dembny, C., Hermanson, J.C., Jander, H. and Wagner, H.Gg., "Pyrolysis of Benzene in the Post-Flame of an Atmospheric C₂H₂ flame," *Joint Meeting of the Combustion Institute, German and Italian Sections*, Ravello, Italy, September 1989.
67. Ho, P.Y., Decher, R. and Hermanson, J.C., "Computational Modeling of Axisymmetric Propeller-Hull Interaction on Slender Low Drag Bodies," AIAA Paper 89-2674, *AIAA/SAE/ASME/ASEE 25th Joint Propulsion Conference*, Monterey, CA, July 1989.
68. Hermanson, J.C., Mungal, M.G., and Dimotakis, P.E., "Heat Release Effects on Shear Layer Growth and Entrainment," AIAA Paper 85-0142, *AIAA 23rd Aerospace Sciences Meeting*, Reno, NV, January 1985.
69. Mungal, M.G., Dimotakis, P.E. and Hermanson, J.C., "Reynolds Number Effects on Mixing and Combustion in a Reacting Shear Layer," AIAA Paper 84-0371, *AIAA 22nd Aerospace Sciences Meeting*, Reno, NV, January 1984.

3.3 Book

Hermanson, J.C., *"Introduction to Orbital Mechanics: A Concise and Practical Approach,"* in progress, under contract with John Wiley & Sons, Inc., Hoboken, NJ.

3.4 Technical Reports

- Moore, R.C. and Hermanson, J.C. "Evaluating the Complete Pool Boiling Curve for Liquid Nitrogen," Final Report for NASA Grant and Cooperative Agreement Number 80NSSC19K1630, January 2022.
- Hermanson, J.C., Knowlen, C., and Sciuto, P.J. Henderson, B.R., and Barry, N.S., "Further Development of a Tridyne Microthruster Propulsion System for CubeSat Applications," Joint Center for Aerospace Technology Innovation (JCATI) Final Report, July 2021.

Technical Reports (continued)

- Eigenbrod, C., Meyer, F., Paa, W., Wagner, V., Hermanson, and Gupta, M. „LOX-Tropfenverbrennung in einer Wasserstoffumgebung im Druckbereich zwischen 0,5 und 55 bar unter Mikrogravitationsbedingungen“ (LOX Droplet Burning in a Hydrogen Environment for Pressures between 0.5 and 55 bar in Microgravity Conditions), Interim Report to the DLR (Deutsche Luft- und Raumfahrt), April 2021.
- Hermanson, J.C., Knowlen, C., Henderson, B.R., and Barry, N.S., “Development of a Tridyne Microthruster Propulsion System for CubeSat Applications,” Joint Center for Aerospace Technology Innovation (JCATI) Final Report, October 2020.
- Eigenbrod, C., Meyer, F., Paa, W., Wagner, V., Hermanson, J.C., Hall, J. and Zody, M., „Untersuchung der Verbrennung einzelner LOX-Tropfen in einer Wasserstoffumgebung unter Mikrogravitationsbedingungen“ (Investigation of the combustion of single LOX droplets in a hydrogen environment in microravity), Final report to the DLR (Deutsche Luft- und Raumfahrt), June 2020.
- Hermanson, J.C., “Collaborative Research: Numerical and Experimental Study of the Instability Mechanisms and Bubble Growth due to Explosive Boiling,” NSF Grant 1511152 Final Report, October 2018.
- Hermanson, J.C. and Allen, J.S., “Stability, Cellular Structure and Heat Transfer of Evaporating Films in Normal and Reduced Gravity,” NASA Cooperative Agreement NNX09AL02G, Final Report, December 2014.
- Hermanson, J.C., “Collaborative Research: Fuel Droplet Disruption under Locally Supersonic Conditions,” Final Report, NSF Grant Number 0853817, December 2011.
- Hermanson, J.C., and Allen, J.S “Collaborative Research: Interfacial Instability, Convective Motion and Heat Transfer in Evaporating Films,” Final Report, NSF Grant Number 0651755, July 2011.
- Hermanson, J.C., Johari, H., Riley, J.J., Stocker, D.P. and Hegde, U.G., “Modification of Turbulent Non-premixed Flames by Pulsed Fuel Injection,” NASA Cooperative Agreement NNC04AA37A, Final Report, January 2009.
- Hermanson, J.C. and Allen, J.S., “Dynamics and Heat Transfer of Evaporating Films in Reduced Gravity,” NASA Cooperative Agreement NNC04GA76G, Final Report, January 2009.
- Hermanson, J.C., Allen, J.S., Pedersen, P.C., Durgin, W.W., and Alexandrou, A.N., “Stability and Heat Transfer Characteristics of Condensing Films in Reduced Gravity,” NASA Cooperative Agreement NAG3-2395/2879, Final Report, June 2006.
- Hermanson, J.C., “CAREER: Disruption and Vaporization of Superheated Droplets in Compressible Flow,” NSF Final Report 0302728, October 2005.
- Hermanson, J.C., Johari, H., Stocker, D.P., Nagashima, T., and Obata, S., ”Combustion Characteristics of Fully-modulated, Turbulent Diffusion Flames in Reduced Gravity,” Final Report, NASA Cooperative Agreement NCC3-673, August 2004.
- Johari, H. and Hermanson, J.C., “Acquisition of a Laser Doppler Velocimeter for Non-Intrusive Flow Measurements,” National Science Foundation Report NSF 9977265, December 2000.
- Hermanson, J.C., Pedersen, P. and Durgin, W.W., “A Study of the Behavior of Condensing Films in Simulated Reduced Gravity Using Ultrasound,” *NCMR (National Center for Microgravity Research) Report NCC3-544*, July 1999.

Technical Reports (continued)

- Olinger, D.J. and Hermanson, J.C., “Integrated ThermoFluid Experiments for WPI’s Discovery Classroom,” National Science Foundation Report *NSF DUE-9650800*, October 1998.
- Freeman, T.J. *et al.*, “NASP Phase 3D Draft Test Report for Concept Demonstration Engine (CDE), Test ID C-1571.1-01-01,” *Pratt & Whitney Report X30SP94007*, January 1995.
- Spadaccini, L.J., Colket, M.B., Chin, D., Hermanson, J.C. and Peschke, W.T. “JFY 1992 Hypersonic Transport Ramjet (HYTRAM) Propulsion Systems Study, Task 3 - Fuel Characterization,” Report prepared for the New Energy and Industrial Technology Development Organization (NEDO), May 1993.
- Hermanson, J.C. and Vranos, A., “Preferential Thermal and Multi-component Species Transport Effects in Strained, Laminar Diffusion Flames with Fast Chemistry” *UTRC Report 92-3*, April 1992.
- Hermanson, J.C., “Survey of Recent NOx Research,” *UTRC Report 90-37*, January 1991.
- Katz, P.L. and Hermanson, J.C., “Artificial Targets' Viewpoint of Submarine Configurations and Signatures,” APL Document (October 1986) (Secret)
- Katz, P.L. and Hermanson, J.C., “A Technology Assessment for the Advanced Target Program,” APL Report to Naval Sea Systems Command, Code 63Y321 (July 1986) (Confidential).
- Hermanson, J.C., “Rußbildung in Flammen. I. Die Benzol-Luft-Flamme bei hohem Druck. II. Ein Pyrolysebrenner. III. Das Messen von Teilchengrößen mit der Photonenkorrelationsmethode,” Forschungsbericht zu DAAD-Kurzstipendium Nr. 315/402/117/5, Juli-Dez. 1985.
- Hermanson, J.C., “Heat Release Effects in a Turbulent, Reacting Shear Layer,” Ph.D. Thesis, Caltech, 1985.

4. Other Scholarly Work

4.1 Abstract-only Conference Presentations

1. Moore, R.C., Hartwig, J.W., and Hermanson, J.C., “valuating Pool-boiling Data and Correlations for Liquid Nitrogen” *37th Annual Meeting of the American Society for Gravitational and Space Research*, November 2021.
2. Hall, J.D., Zody, M., Frydman, J., Hermanson, J.C., Meyer, F., Eigenbrod, C., Wagner, V. and Paa, W., “Numerical Simulation of Liquid Oxygen Droplet Combustion in Hydrogen in Microgravity” *36th Annual Meeting of the American Society for Gravitational and Space Research*, October 2020.
3. Hall, J.D., Zody, M., Frydman, J., Hermanson, J.C., Meyer, F., Eigenbrod, C., Wagner, V. and Paa, W., “Numerical Simulation of Liquid Oxygen Droplet Combustion in Hydrogen in Microgravity” *35th Annual Meeting of the American Society for Gravitational and Space Research*, Denver, CO, November 2019.
4. Meyer, F., Eigenbrod, C., Wagner, V. Paa, W., Hall, J.D., Zody, M., Frydman, J., and Hermanson, J.C., “Liquid Oxygen Droplet Combustion in Hydrogen under Microgravity Conditions” *35th Annual Meeting of the American Society for Gravitational and Space Research*, Denver, CO, November 2019.

Abstract-only Conference Presentations (continued)

5. Hall, J.D., Zody, M., Frydman, J., Hermanson, J.C., Meyer, F., Eigenbrod, C., Wagner, V. and Paa, W., "Numerical Simulation of Liquid Oxygen Droplet Combustion in Hydrogen" *American Physical Society Division of Fluid Dynamics 72nd Annual Meeting*, Seattle, WA, November 2019.
6. Meyer, F., Eigenbrod, C., Wagner, V. Paa, W., Hall, J.D., Zody, M., Frydman, J., and Hermanson, J.C., "Liquid Oxygen Droplet Combustion in Hydrogen under Microgravity Conditions" submitted to the *American Physical Society Division of Fluid Dynamics 72nd Annual Meeting*, Seattle, WA, November 2019.
7. Asadollahi, A., Esmaeeli, A., Ferris, R., and Hermanson, J.C., "Computer simulations of unstable bubble growth," submitted to the *American Physical Society Division of Fluid Dynamics 72nd Annual Meeting*, Seattle, WA, November 2019.
8. Ferris, F.R., Hermanson, J.C., Asadollahi, A. and Esmaeeli, A., "Vaporization and bubble growth dynamics of explosively boiling droplets at the superheat limit," *Bulletin of the American Physical Society*, 63, *Division of Fluid Dynamics 71st Annual Meeting*, Atlanta, GA, November 2018.
9. Asadollahi, A., Esmaeeli, A., Ferris, F.R. and Hermanson, J.C., "Numerical investigations on the origin of rapid evaporation," *Bulletin of the American Physical Society*, 63, *Division of Fluid Dynamics 71st Annual Meeting*, Atlanta, GA, November 2018.
10. Bellur, K., Medici, E.F., Hermanson, J.C., Choi C.K., and Allen, J.S., "Mass Accommodation Coefficients of Cryogenic Propellants," *34th Annual Meeting of the American Society for Gravitational and Space Research*, Bethesda, MD, October 2018.
11. Ferris, F.R., Hermanson, J.C., Asadollahi, A. and Esmaeeli, A., "High-Speed imaging of explosive droplet boiling at the superheat limit" *Bulletin of the American Physical Society*, 62, *Division of Fluid Dynamics 70th Annual Meeting*, Denver, CO, November 2017.
12. Asadollahi, A., Esmaeeli, A., Ferris, F.R. and Hermanson, J.C., "DNS of unstable bubble growth in a superheated liquid," *Bulletin of the American Physical Society*, 62, *Division of Fluid Dynamics 70th Annual Meeting*, Denver, CO, November 2017.
13. Bellur, K., Medici, E.F. Medici, Konduru, V., Tamilarasan, A., Hermanson, J.C., Choi, C.K. and Allen, J.S., "Neutron radiography for determining the evaporation/condensation coefficients of cryogenic propellants," *Bulletin of the American Physical Society*, 61, *Division of Fluid Dynamics 69th Annual Meeting*, Portland, OR, November 2016.
14. Lin, E.P. and Hermanson, J.C., "Compression wave structure on droplets under supersonic conditions," *Bulletin of the American Physical Society*, 59 (20), *Division of Fluid Dynamics 67th Annual Meeting*, San Francisco, CA, November 2014.
15. Gonzalez, J.C., Hermanson, J.C. and Allen, J.S., "Heat transfer and convective structure of evaporating films under pressure-modulated conditions," *Bulletin of the American Physical Society*, 59 (20), *Division of Fluid Dynamics 67th Annual Meeting*, San Francisco, CA, November 2014.
16. Narendranath, A.D., Hermanson, J.C., Kolkka, R.W., Struthers, A.A., and Allen, J.S., "Thermocapillarity driven Instabilities in thin liquid layers subject to long-wave analysis," *Bulletin of the American Physical Society*, 57, *American Physical Society Division of Fluid Dynamics 65th Annual Meeting*, San Diego, CA, November 2012.

Abstract-only Conference Presentations (continued)

17. Kim, Y.J., Cerff, R.G., and Hermanson, J.C., "Laser-Induced Fluorescence Imaging of Droplet Vaporization and Fuel Dispersion in Supersonic Flow," *Bulletin of the American Physical Society*, 55 (16), *Division of Fluid Dynamics 63rd Annual Meeting*, Long Beach, CA, November 2010.
18. Kimball, J.T., Hermanson, J.C. and Allen, J.S., "Convection and evaporation rate of planar liquid films subjected to impulsive superheating," *Bulletin of the American Physical Society*, 55 (16), *Division of Fluid Dynamics 63rd Annual Meeting*, Long Beach, CA, November 2010.
19. Narendranath, A., Kimball, J.T., Hermanson, J.C. and Allen, J.S., "Inclusion of buoyancy effects in the evaporating liquid film evolution equation," *Bulletin of the American Physical Society*, 55 (16), *Division of Fluid Dynamics 63rd Annual Meeting*, Long Beach, CA, November 2010.
20. Liao, Y.-H. and Hermanson, J.C., "Effects of Swirl on Strongly-Pulsed Turbulent Diffusion Flames," accepted for presentation at the *American Physical Society Division of Fluid Dynamics 62nd Annual Meeting*, Minneapolis, MN, November 2009.
21. Kimball, J.T., Hermanson, J.C. and Allen, J.S., "Convective Structure and Heat Transfer of Liquid Films Evaporating into a Pure Vapor Environment," accepted for presentation at the *American Physical Society Division of Fluid Dynamics 62nd Annual Meeting*, Minneapolis, MN, November 2009.
22. Kim, Y.J., Cerff, R.G., and Hermanson, J.C., "Injection and Disruption of Supersonic Droplets," *Bulletin of the American Physical Society*, 54 (19), *Division of Fluid Dynamics 62nd Annual Meeting*, Minneapolis, MN, November 2009.
23. Fregeau, M., Liao, Y.-H., Hermanson, J.C., Stocker, D.P. and Hegde, U.G., "Dynamics of Isolated and Interacting Flame Structures in Strongly-Pulsed, Turbulent Jet Flames," *Bulletin of the American Physical Society*, 60 (9), *Division of Fluid Dynamics 60th Annual Meeting*, Salt Lake City, UT, November 2007.
24. Kimball, J.T., Bailey, M.F., Hermanson, J.C. and Allen, J.S., "Ultrasound Measurement of Dynamic Film Thickness in Condensing and Evaporating Films" *Bulletin of the American Physical Society* 60 (9), *Division of Fluid Dynamics 60th Annual Meeting*, Salt Lake City, UT, November 2007.
25. Hermanson, J.C., Johari, H., Stocker, D., and Hegde, U.G., "Buoyancy Effects in Strongly-Pulsed, Turbulent Diffusion Flames," *Bulletin of the American Physical Society* 49 (9), *Division of Fluid Dynamics 57th Annual Meeting*, Seattle, WA, November, 2004.
26. Sangras, R., Hermanson, J.C., Johari, H., Stocker, D.P. and Hegde, U.G., "Fully Modulated Turbulent Diffusion Flames in Microgravity," *Bull. Am. Phys. Soc.* 46 (10), *American Physical Society Division of Fluid Dynamics 54th Annual Meeting*, San Diego, CA, November 2001.
27. Hermanson, J.C. and Demmons, N., "Stability Enhancement of Lean, Premixed Flames by Flameholder Heating," *Bull. Am. Phys. Soc.* 46 (10), *American Physical Society Division of Fluid Dynamics 54th Annual Meeting*, San Diego, CA, November 2001.
28. Hermanson, J.C., Kotikalapudi, K., and Alexandrou, A.N., "The Spreading Behavior of Viscous Drops," *Bull. Am. Phys. Soc.* 45 (9), *American Physical Society Division of Fluid Dynamics, 53rd Annual Meeting*, Washington, DC, November 2000.
29. Usowicz, J.E., Hermanson, J.C. and Johari, H., "Pulsed Turbulent Diffusion Flames in a Coflow," *Bull. Am. Phys. Soc.* 45 (9), *American Physical Society Division of Fluid Dynamics, 53rd Annual Meeting*, Washington, DC, November 2000.

Abstract-only Conference Presentations (continued)

30. Hermanson, J.C. and Newman, A.N., “Disruption of Superheated Droplets Injected into a Supersonic Stream, *Bull. Am. Phys. Soc.* 44 (8), *American Physical Society Division of Fluid Dynamics, 52nd Annual Meeting*, New Orleans, LA, November 1999.
31. Johari, H., Hermanson, J.C. and Usowicz, J.E., “Fully-modulated Diffusion Flames,” *Bull. Am. Phys. Soc.* 44 (8), *American Physical Society Division of Fluid Dynamics, 52nd Annual Meeting*, New Orleans, LA, November 1999.
32. Obata, S. and Hermanson, J.C., “Numerical Simulation of Turbulent Jets Interacting with Normal Shock Waves,” *Bull. Am. Phys. Soc.* 43 (9), *American Physical Society Division of Fluid Dynamics, 51st Annual Meeting*, Philadelphia, PA, November 1998.
33. Hermanson, J.C. and Cetegen, B., “Interaction of Normal Shock Waves with Turbulent Jets,” *Bull. Am. Phys. Soc.* 42 (11), *American Physical Society Division of Fluid Dynamics, 50th Annual Meeting*, San Francisco, CA, November 1997.
34. Pacheco-Tougas, M., Johari, H., and Hermanson, J.C., “Penetration and Mixing of a Pulsed Turbulent Jet,” *Bull. Am. Phys. Soc.* 42 (11), *American Physical Society Division of Fluid Dynamics, 50th Annual Meeting*, San Francisco, CA, November 1997.
35. Dugnani, R., Hermanson, J.C. and Johari, H., “Flame Length of Pulsed Diffusion Flames,” *Bull. Am. Phys. Soc.* 41 (9), *American Physical Society Division of Fluid Dynamics, 49th Annual Meeting*, Syracuse, NY, November 1996.
36. Hermanson, J.C., Wahba, A. and Johari, H., “Penetration of Pulsed, Transverse, Turbulent Jets,” *Bull. Am. Phys. Soc.* 41 (9), *American Physical Society Division of Fluid Dynamics, 49th Annual Meeting*, Syracuse, NY, November 1996.
37. Hermanson, J.C., Mungal, M.G. and Dimotakis, P.E. “Heat Release Effects on a Shear Layer,” *Bull. Am. Phys. Soc.* 28 (9), *American Physical Society Division of Fluid Dynamics, 36th Annual Meeting*, Houston, TX, November 1983.

4.2. Poster Presentations

1. Henderson, B.R., Barry, N.S., Hermanson, J.C., Knowlen, C., Sebastian, C., and Jakubek, M.T., “Development of a Tridyne Microthruster Propulsion System for CubeSat Applications,” *Joint Center for Aerospace Applications and Innovation Symposium* (online), April 2020.
2. Meyer, F, Eigenbrod, C., Frydman, J., Hermanson, J.C., Wagner, V., and Paa, W., “Combustion of Single Oxygen Droplets in Hydrogen at Sub- and Supercritical Conditions,” *37th Symposium (International) on Combustion*, Dublin, Ireland, July 2018.
3. Frydman, J., Hermanson, J.C., Eigenbrod, C., Meyer, F., Paa, W., and Wagner, W., “Numerical Simulation of a Liquid Oxygen Droplet Combusting in Hydrogen,” *37th Symposium (International) on Combustion*, Dublin, Ireland, July 2018.
4. Liao, Y.-H. and Hermanson, J.C., “OH-Zone Structure of Swirled, Strongly-Pulsed Turbulent Jet Diffusion Flames,” *35th Symposium (International) on Combustion*, San Francisco, CA, August 2014.
5. Kramlich, J.C., Mescher, A., Malte, P.C., and Hermanson J.C., “Advanced Bio-Derived Aviation Fuel Combustion: Particulate Emissions, NO_x, and Flame Stability,” *Joint Center for Aerospace Applications and Innovation Symposium*, Pullman, WA, April 2014.

Poster Presentations (continued)

6. Narendranath, A.D., Kimball, J.T., Hermanson, J.C., Allen, J.S., and Narendranath, D., "Manifestation of Instability Mechanisms in Liquid Films," *ASME 2011 International Mechanical Engineering Conference (IMECE)*, Denver, CO, November 2011.
7. Hermanson, J.C., Fregeau, M. and Stocker, D.P., "Large-Scale Structure Dynamics and Buoyancy Effects in Strongly-Pulsed Turbulent Jet Diffusion Flames," *31st Symposium (International) on Combustion*, Heidelberg, Germany, August 2006.
8. Fregeau, M., Hermanson, J.C. and Tsai, P.-Y., "CO and NO Emissions of Strongly-Pulsed Turbulent Jet Diffusion Flames," *31st Symposium (International) on Combustion*, Heidelberg, Germany, August 2006.
9. Som, S.M., Hermanson, J.C. and Allen, J.S. "Stability and Heat Transfer of an Unsteady Condensing Film," *American Physical Society Division of Fluid Dynamics 57th Annual Meeting: Gallery of Fluid Motion* (video presentation), November, 2004.
10. Hermanson, J.C., Ghaem-Maghani, E., and Johari, H., "Exhaust Emissions of Strongly-Pulsed, Turbulent Diffusion Flames," *30th Symposium (International) on Combustion*, Chicago, Ill, July 2004.
11. Hermanson, J.C., Johari, H., Stocker, D.P. and Hegde, U.G., "Buoyancy Effects in Strongly-Pulsed, Turbulent Diffusion Flames," *30th Symposium (International) on Combustion*, Chicago, Ill, July 2004.
12. Hermanson, J.C., Johari, H., Stocker, D.P. and Hegde, U.G., "Buoyancy Effects in Strongly-Pulsed, Turbulent Diffusion Flames *Strategic Research to Enable NASA's Exploration Missions*, Cleveland, OH June 22-23, 2004.
13. Hermanson, J.C., Som, S.M., Bailey, M.F., and Allen, J.S., "Stability and Heat Transfer Characteristics of Condensing and Evaporating Films," *NASA Conference-Workshop on Strategic Research to Enable NASA's Exploration Missions*, Cleveland, OH, June 2004.
14. Hermanson, J.C., Pedersen, P.C., Allen, J.S., Shear, M.A., Chen, Z.Q., Alexandrou, A.N., and Durgin, W.W., "Stability and Heat Transfer Characteristics of Condensing Films," *Sixth Microgravity Fluid Physics and Transport Phenomena Conference*, Cleveland, OH, August 2002 (Invited).
15. Hermanson, J.C., Ghaem-Maghani, E., Johari, H., Stocker, D.P, Hegde, U.G. and Page, K.L., "Fully-Modulated, Turbulent Diffusion Flames in Microgravity," *29th Symposium (International) on Combustion*, Sapporo, Japan, July 2002.
16. Hermanson, J.C., Allen, J.S., Pedersen, P.E., Alexandrou, A.N. and Durgin, W.W., "Stability and Heat Transfer Characteristics of Condensate Fluid Layers in Reduced Gravity," *Fifth Microgravity Fluid Physics and Transport Phenomena Conference*, Cleveland, OH, August 2000 (Invited).
17. Hermanson, J.C., Usowicz, J.E. and Johari, H. "An Experimental Study of Isolated Turbulent Flame Puffs with Co-Flow," *28th Symposium (International) on Combustion*, Edinburgh, United Kingdom, July-August 2000.
18. Hermanson, J.C., Johari, H., Usowicz, J.E., Stocker, D.P., Nagashima, T. and Obata, S., "An Experimental Investigation of Fully-Modulated, Turbulent Diffusion Flames in Reduced Gravity," *5th International Microgravity Combustion Workshop*, May 1999 (Invited).
19. Olinger, D.J. and Hermanson, J.C., "Integrated Thermo-fluid Experiments in WPI's Discovery Classroom," *ASEE 1998 Annual Conference*, Seattle, WA, June 1998.

Poster Presentations (continued)

20. Hermanson, J.C. and Vranos, A. "Combined Preferential Thermal and Multicomponent Species Transport in a Strained, Laminar Diffusion Flame," *23rd Symposium (International) on Combustion*, Orleans, France, July 1990.

4.3 Selected Photographs/Figures in Books

1. Hermanson, J.C., Mungal, M.G., and Dimotakis, P.E. (2001) "Spark schlieren photograph of a turbulent, chemically reacting, mixing layer," Fig. 12.11, *Principles of Fluid Mechanics*, A.N. Alexandrou, Prentice-Hall, Upper Saddle River, New Jersey.
2. Hermanson, J.C., Papas, P. and I.W. Kay, I.W. (2001) "Spark shadowgraph image showing transition to vapor of a nitrogen jet injected at supercritical pressure into a supersonic flow with Mach number equal to 1.84," Fig. 12.10, *Principles of Fluid Mechanics*, A.N. Alexandrou, Prentice-Hall, Upper Saddle River, New Jersey.

4.4 Seminars and Invited Presentations

Universität Göttingen (1985), University of Washington A&A Department (1986, 1996, 2000, 2001), Rutgers University (1987, 2007), University of Colorado (1988), Sandia National Laboratories (Livermore, 1988), United Technologies Research Center (1988, 2013), Massachusetts Institute of Technology (1988, 1996), University of Florida (1990), University of Connecticut (1990, 1993, 1997, 2013), Oregon State University (1993), Portland State University (1993), Worcester Polytechnic Institute (1994 × 2, 2000), NASA Lewis (Glenn) Research Center (1997, 2001, 2006), University of Tokyo (1998), Kawasaki Heavy Industries (1998), Mitsubishi Heavy Industries (1998 × 2), Ishikawajima-Harima Heavy Industries (1998), North Carolina State University (2002), Deutsche Zentrum für Luft und Forschung, Lampholdshausen (2002), Technische Universität Darmstadt (2002), Universität Stuttgart (2002), Zentrum für angewandte Raumfahrttechnologie und Mikrogravitation (ZARM) - Universität Bremen (2002, 2014, 2018), University of California, San Diego (2004), Penn State University (2005), California Institute of Technology (2006), Technische Universität Berlin (2006), UW ME Department (2007), Michigan Technological University (2010), Stanford University (2012, 2014×2), Georgia Institute of Technology (2011, 2013), Lund Universitets (2013), Kungliga Tekniska Högskolan, Stockholm (2013, 2015, 2022), United Technologies Research Center (1988, 2013), Purdue University (2014), Chalmers Tekniska Högskola, Göteborg (2015), Air Force Research Laboratory (2016), Brigham Young University (2017), Institut för Rymdfysik, Kiruna (2022), Luleå Tekniska Universitet (2022).

5. Fellowships and Grants

5.1 Grants and Contracts Awarded

5.1.1 Grants and Contracts at the UW

- The National Science Foundation/Center for the Advancement of Science in Space (CASIS) awarded \$332,781 to the UW for an experiment to study film evaporation phenomena in microgravity on board the International Space Station. Principal Investigator; Co-investigator is A. Narendranath (Michigan Technological University). Space Tango, Inc. is serving as project Implementation Partner. The total project budget is \$720,000. The project period is 9/22-9/26.

Grants and Contracts (continued)

- The National Institutes of Health awarded \$2,609,000 for the development of analytical tools for concentration and real-time control of dissolved gases and their regulation of tissue function. Co-Investigator; the project is conducted jointly with the UW Diabetes Research Center (I. Sweet, Principal Investigator) and the UW ME Department (J. Kramlich, Co-investigator). The A&A portion is \$85,939. The project period is 9/22-8/26.
- Blue Origin (Kent, WA) awarded \$54,073 for an exploratory study of the enhancement of pool boiling by surface modification for cryogenic boiler applications. Principal Investigator; G. Grayson, Blue Origin technical monitor. The project period is 1/23-7/23.
- The Washington State Joint Center for Aerospace Innovation and Technology (JCATI) awarded \$84,609 for the development of a tridyne microthruster for CubeSat applications. The project is conducted jointly with Aerojet Rocketdyne of Redmond, WA. Principal Investigator; Co-investigator is C. Knowlen (UW A&A). The project period is 6/20-6/21.
- The National Aeronautics and Space Administration awarded \$69,800 for an exploratory research effort to develop the complete pool boiling curve for liquid nitrogen under both normal- and microgravity conditions. The project is conducted jointly with NASA Glenn Research Center. The grant period is 9/19-6/21.
- The Washington State Joint Center for Aerospace Innovation and Technology (JCATI) awarded \$84,609 for the development of a tridyne microthruster for CubeSat applications. The project was conducted jointly with Aerojet Rocketdyne of Redmond, WA. Principal Investigator; Co-investigator is C. Knowlen (UW A&A). The project period was 6/19-9/20.
- The National Science Foundation awarded \$313,600 for the study of the explosive evaporation behavior of supercritical liquid droplets. Co-investigator; PI A. Esmaeli of Southern Illinois University, Carbondale. The UW portion of the grant was \$130,000 for the period 9/15-9/18.
- US Fulbright Scholars Program, Flex Program, awarded 10,500 Euros to support travel and residency in Bremen, Germany in support of a joint research program at ZARM (Zentrum für angewandte Raumfahrttechnologie und Mikrogravitation), Universität Bremen, 8/16-9/18.
- The National Aeronautics and Space Administration awarded \$250,000 for a two-year program to determine the evaporation and condensation coefficients of cryogenic propellants and development of an efficient computational model of cryogenic film stability in microgravity. Co-investigator; PI J.S. Allen of Michigan Technological University. The UW portion of the grant was \$100,000 for the period 1/13-10/15.
- The Washington State Joint Center for Aerospace Innovation and Technology (JCATI) awarded \$166,600 for an experimental investigation of bio-derived aviation fuel particulate emissions, NO_x and flame stability. Co-Investigator; PI: J.C. Kramlich (UW ME). The grant period was 2/13-6/14.
- The National Science Foundation awarded a grant for the study of the disruption and evaporation of simulated fuel droplets in supersonic flow. The research was conducted in collaboration with Worcester Polytechnic Institute (WPI Co-Investigator: G. Tryggvason). The grant amount was \$85,000 for the period 9/09-8/11. Principal Investigator.
- The National Aeronautics and Space Administration, OBPR Physical Sciences Research Division, awarded \$326,000 over three years to investigate the stability and heat transfer characteristics of evaporating films in reduced gravity. Principal Investigator; Co-investigator was J.S. Allen of Michigan Technological University. The UW portion of the grant was \$237,240 for the period 7/09-6/12.

Grants and Contracts (continued)

- The National Science Foundation awarded a grant for the study of the stability and heat transfer of evaporating films. The research was conducted in collaboration with Michigan Technological University (MTU Co-Investigator: J.S. Allen). The grant amount was in the amount of \$349,998 (\$249,920 to the UW) for the period 4/07-3/11. Principal Investigator.
- The National Aeronautics and Space Administration, OBPR Physical Sciences Research Division, awarded \$459,929 over four years (\$361,455 over three years (1/04-9/07) for continued investigation of the combustion characteristics of fully-modulated, turbulent diffusion flames in reduced gravity. Principal Investigator; Co-investigators include J.J. Riley (UW ME), H. Johari (WPI), D.P. Stocker, U.G. Hegde and P.S. Greenberg (all of NASA GRC).
- The National Aeronautics and Space Administration, OBPR Physical Sciences Research Division, \$330,000 over three years (1/04-9/07) for the investigation of evaporating films in reduced gravity. Principal Investigator; Co-investigators included M.R. Bailey (UW APL) and J.S. Allen (NCMR).
- The National Aeronautics and Space Administration, Microgravity Research Division, awarded \$360,000 over four years (\$104,817 for the UW from 5/03–11/05) for an investigation of film condensation in reduced gravity. Principal Investigator; Co-investigators included Profs. P. Pedersen, A. Alexandrou, W. Durgin of WPI, and Dr. J. Allen of The National Center for Microgravity Research.
- The M.J. Murdock Charitable Trust awarded \$ 445,000 for the implementation of a Real-Time Data Acquisition System for Quantitative Visualization of Complex 3-D Phenomena. Program period 2/04-8/06. Co-Investigator team: T. Anderson, D. Dabiri, J.C. Hermanson, M. Mesbahi, K. Morgansen, and R. Rysdyk.

5.1.2 Grants and Contracts at WPI

- The National Aeronautics and Space Administration, Microgravity Research Division, awarded \$493,214 for an investigation of the combustion characteristics of fully-modulated, turbulent diffusion flames in reduced gravity (1/99-1/04). Principal Investigator; Co-investigators include Prof. H. Johari of WPI, Mr. D. Stocker of NASA Lewis Research Center, and Prof. T. Nagashima of the University of Tokyo.
- The National Science Foundation awarded in 1999 a grant for \$131,980 for the acquisition of a laser Doppler velocimeter system for non-intrusive flow measurements (Co-investigator; Prof. H. Johari, Principal Investigator).
- The National Center for Microgravity Research awarded \$47,273 in 1998 for the study of the fluid dynamics of condensing films using ultrasonic gauging. Principal Investigator; Co-investigators include Prof. P. Pedersen (WPI ECE Dept.) and Prof. W. Durgin.
- An NSF award under the CAREER program was made for the proposal “Disruption and Vaporization of Superheated Droplets in Compressible Flow,” \$245,000 (\$31,495 transferred to the UW), 6/99-5/04. Principal Investigator.
- United Technologies Corporation granted \$10,000 in 2000 to support the NSF CAREER program effort listed above.
- United Technologies Corporation granted \$20,000 (\$10,000 each year 1997 and 1998) to support an experimental study of Pulsed Laser Ablation Deposition (PLAD) technology.

Grants and Contracts (continued)

- A major equipment donation was made by UTRC in support of the PLAD research. Principal components include: pulsed Nd:YAG laser system, laser-Doppler velocimeter (LDV) system, stainless test chamber, high-vacuum system including turbomolecular pump, mechanical pumps, fittings, valves, and vacuum gages, optical traversing system, powder feed system, and quadrupole mass spectrometer, 1997. Total value: \$126,000.
- The National Science Foundation awarded a grant (jointly with Professor D. Olinger) entitled “Integrated Thermofluid Experiments for WPI’s Discovery Classroom” in the amount of \$51,338 (with \$51,338 in WPI matching funds), 1996.
- United Technologies Research Center made an equipment donation to WPI consisting of imaging system, photometer, plotter and flow meters, valued at \$8,400, 1995.

5.1.3 Grants and Contracts at UTRC and other institutions

- NASA Langley Research Center through subcontract from MIT to United Technologies Research Center for Experimental Investigation of the Flowfield and Mixing Characteristics Downstream of Lobed Mixers in Compressible Flow, 12/93-6/95, \$169,000. Sole UTRC Principal Investigator.
- United Technologies Corporation, Research Center Core Programs (competitive, peer-reviewed proposals) \$175,000 for Stability and Emissions of Partially-premixed Combustion Systems, 1/93-12/95, and \$56,000 for Supercritical Fuel Mixing, 1/94-12/94. Sole Principal Investigator in each case.
- Office of Naval Research to University of Washington Applied Physics Laboratory for Study of Propeller-Hull Interaction, 9/86-8/89, \$210,000. Principal Investigator; 2 Co-investigators.
- Deutscher Akademischer Austauschdienst (German Academic Exchange Service) Short-term Research Fellowship, 6/85-12/85, DM8,400. Sole principal investigator.

6. Post-doctoral Fellows Supervised

Post-doctoral fellows supervised:

- Dr. Zhenqian Chen (from Southeast University, Nanjing, China) worked on an investigation of film condensation in reduced gravity (NASA support; 2/01-8/03).
- Dr. Ravikiran Sangras (from the University of Michigan) worked on the combustion characteristics of fully-modulated, turbulent diffusion flames in reduced gravity (NASA support; 6/00-6/02).
- Dr. Shigeo Obata (from the University of Tokyo) conducted a numerical study of the interaction of normal shock waves with turbulent jets (Japanese Government support; 10/96-6/98).
- Dr. Haiyun Li (from Purdue University) worked on the injection and disruption of droplets in compressible flow (NSF support; 2/00-6/00).

7. Consulting

- United Technologies Research Center, 8/95-12/95. Provided consulting support for Axisymmetric Dump Combustor Program.
- Burkhart-Phelan Co., 8/98-6/02. Providing consulting on spectral analysis and acoustic behavior of musical instruments.

8. Patent Activity

- Personal Call Screening/Answer Feedback System, disclosed 9/97.
- Swirled Tube System to Decrease Fuel Coking, disclosed 6/94.

III. TEACHING

9. Teaching Experience

- University of Washington, Department of Aeronautics and Astronautics 8/02 - present
Courses taught include Energy Conversion I (AA 527), Gas Dynamics (AA 400), Rocket Propulsion (AA462), Fluid Mechanics (AA 402), Advanced Propulsion (AA 461), Aerospace Heat Transfer (AA 419), Propulsion (AA 360/460), Sounding Rockets and Instrumentation (AA 599), Compressible Flow (AA504), Viscous Flow (AA504) and Orbital Mechanics (AA 310), Space Power Systems (AA527). Average course evaluation (combined first four items): 4.5.
- Worcester Polytechnic Institute, Mechanical Engineering Department 3/95 - 7/02
Courses taught include Thermodynamics (ES3001), Heat Transfer (ES3003), Compressible Flow (ME4410/3410), Supersonic Aerodynamics (ME4712), Heat, Mass, and Momentum Transfer (ME546), Heat Transfer (ME593I/ME516), Introduction to Combustion (ME4412) and Technical Topics in German (ID360X). Course evaluations averaged (SA+A) 94%.
- University of Connecticut, Department of Mechanical Engineering 1/93-6/93
Taught graduate level course in statistical thermodynamics (ME311). Course evaluations averaged 9.77 of 10.0 possible.
- University of Washington, Department of Aeronautics and Astronautics 12/86-6/88
Taught a junior laboratory course (AA321, 322) and an undergraduate thermodynamics course (ENGR 260). The thermodynamics course evaluation was in the top 20% of all University courses for the quarter.

10. Teaching innovations

New course in Compressible Fluid Dynamics

I introduced at the UW a new graduate course in Compressible Flow, designated AA504. This course is part of the revised graduate curriculum in Fluids in the A&A Department. The new course combines all of the essential elements of compressible flow in a rigorous, fundamental course. The topics include the flow physics fundamental to compressible flow, steady and unsteady supersonic flows, shock and expansion waves, weak and finite-amplitude waves, the method of characteristics, real gas effects, and transonic and hypersonic flow. The result was an intense course, which was nonetheless well received by the 21 students who took the first offering of the course in 2010 (11 of them online), as indicated by their average course evaluation of 3.9.

Career Presentations and Discussions

I have taken advantage of my nine years of industrial experience by including a series of presentations and discussion on aerospace careers in the classroom. This was typically included as part of AA 322 (Aerospace Laboratory II) or AA460 (Introduction to Propulsion), depending on the year. The topics discussed include strategies for identifying engineering job opportunities, effective Teaching Experience networking and interviewing techniques, types of engineering positions, considerations for advancement, managing job and career changes, and more. Comments from the students on this activity have been uniformly and consistently positive.

Teaching Experience (continued)

Astroviewing Sessions in AA310

As part of teaching the course AA310 (Orbital Mechanics) I have been holding astroviewing sessions for the students. These have been primarily using a telescope on the A-Wing deck of the Astronomy/Physics Building, working with Dr. Ana Larson of the Astronomy Department. These viewing sessions have been very popular with the AA310 students, offering the opportunity to view planets, the moon, binary stars, and asteroids (all topics on AA310), as well as star clusters, nebulae, and galaxies. We have also held viewing sessions at Paramount Park in Shoreline, WA. Given the often-cloudy Seattle skies I have expanded these events to include sessions in both Autumn and Winter Quarters to increase the likelihood of finding clear nighttime skies.

Heat Transfer Experiments/WPI Heat Transfer Laboratory

An undergraduate course in heat transfer (ES3003) was re-defined to include a previously nonexistent laboratory component. I obtained funding for the necessary equipment through a National Science Foundation Grant (jointly with Professor D. Olinger). The new equipment included a conduction experiment, a free/forced convection wind tunnel, a radiation demonstration experiment, and a pool boiling apparatus. This equipment was in addition to an existing tube-in-tube heat exchanger experiment. The NSF proposal requested two major categories of equipment. Fluid mechanics experiments were proposed by D. Olinger. I was responsible for the heat transfer experiments, which represent the majority of the new equipment, and for their incorporation into ES3003 and into the WPI Discovery Classroom. This represented the major technical theme in the proposal.

The equipment (specifically the conduction, convection, and radiation experiments) was successfully incorporated in the teaching of ES3003 (Heat Transfer) in D-Terms 1997, 1998, 1999 and 2000. The equipment was used for in-class demonstrations and hands-on experiments using the Discovery Classroom. The capability to bring complete, physical experiments into the classroom has been helpful the effective teaching of heat transfer -- a notoriously difficult and challenging undergraduate course at WPI (and elsewhere).

A student survey regarding the use of the experiments was taken at the end of each term. Student feedback on the use of the experiments was strongly positive, with 75% of the 176 respondents in the four terms reporting that the laboratory experiments definitely helped in their understanding of the subject material. Beyond this, 80% stated that they preferred the new course format, with the experimental component, to a "lecture only" format (even though the new course format requires additional work on the part of the students). The use of experiments in ES3003 was expanded during D-Term, 1998, to include a *Heat Transfer Design Project*, which involved the design and performance estimation of a cross-flow heat exchanger array. Of the 91 students responding to the surveys in D-terms 1998, 1999 and 2000, 75% stated that they found the *Design Project*, useful in developing understanding of heat transfer. The outcomes of these course innovations were presented at *ASEE* conferences in June 1998 and June 2000, respectively, and have been published in the *ASEE Journal of Engineering Education*.

New Graduate Course in Heat Transfer (WPI)

I introduced at WPI, "from scratch" a new graduate course in Heat Transfer, designated ME593I (1999)/ME516 (2000). This course is part of the revised graduate curriculum in Mechanical Engineering. The new course combines all of the essential elements of heat transfer (conduction, convection, radiation, and phase change) into a single graduate course. The result was an intense, multi-subject course, which was nonetheless very well received by the 25 students who took the first offering of the course in 1999, as indicated by their 95% approval rating. The approval rating in 2000 (18 students) was 95%; in 2001 (9 students), 97%.

New Undergraduate Course in Technical German (WPI)

It is important to develop in students an enhanced awareness of the increasingly global nature of engineering, and to help impart the skills needed to effectively participate as a professional in today's global engineering community. With this in mind I introduced a new undergraduate technical course (IDGN 3515) conducted entirely in German. The intent of the course is to combine the development of foreign language skills with the acquisition of technical knowledge by conducting the course in a foreign language (German, in this specific case). The course was first offered D-term, 2000, and again in D-term, 2001. I assembled a German-speaking faculty team consisting of Professors R. Ludwig and C. Paar (Electrical and Computer Engineering), B. Servatius (Mathematics), Msrs. A. Köller and G. Gaubatz (Electrical and Computer Engineering), Professor D. Dollenmayer (Humanities and Arts Department), and myself to share in the teaching of the new course. Each team member presented several technical lectures, according to his/her specialty (in my case the topic was *Aerodynamik* = Aerodynamics). Class-end surveys indicated that nine of the ten students participating in the class in 2000, and all ten of the students in 2001, felt that their capability to speak technical German increased from taking the course. Similar numbers also stated that they would recommend the course for other WPI students of German. The course was formally added to the WPI catalog as a permanent offering in 2002. The results of this endeavor were published in the German publication *Perspektiven Interdisziplinärer Technikforschung, Darmstädter interdisziplinärer Beiträge*.

11. Courses taught at UW post 8/02:

Course	Term	Students	Evaluation* (comb. items 1-4)
AA 527 Energy Conversion	Autumn 2002	14	3.7
AA 400 Gas Dynamics	Winter 2003	13	4.1
AA 402 Fluid Mechanics	Spring 2003	4	4.6
AA 462 Rocket Propulsion	Spring 2003	17	None (team teaching effort)
AA 461 Advanced Propulsion	Autumn 2003	25	4.2
AA 419 Aerospace Heat Transfer	Winter 2004	30	4.5
AA 402 Fluid Mechanics	Spring 2004	16	4.3
AA 527 Energy Conversion	Autumn 2004	34	3.7
AA 419 Aerospace Heat Transfer	Winter 2005	26	4.2
AA 402 Fluid Mechanics	Spring 2005	12	4.4
AA 461 Advanced Propulsion	Autumn 2005	25	4.2
AA 400 Gas Dynamics	Winter 2006	13	4.1

AA 360 Propulsion	Spring 2006	42	4.2
AA 507 Viscous Flow I	Winter 2007	32	3.9
AA 360 Propulsion	Spring 2007	44	4.3
AA 461 Advanced Propulsion	Autumn 2007	26	4.2
AA 400 Gas Dynamics	Winter 2008	7	4.5
AA 360 Propulsion	Spring 2008	46	4.7
AA 400 Gas Dynamics	Winter 2009	11	4.0
AA599 Sounding Rockets	Winter 2009	11	None (team effort)
AA 360 Propulsion	Spring 2009	54	4.4
AA599 Sounding Rockets	Spring 2009	11	None (team effort)
AA 310 Orbital Mechanics	Autumn 2009	46	4.6
AA 400 Gas Dynamics	Winter 2010	15	4.2
AA 504 Compressible Fluid Mechanics	Winter 2010	21	4.5
AA 360 Propulsion	Spring 2010	52	4.4
AA 310 Orbital Mechanics	Autumn 2010	57	4.8
AA 310 Orbital Mechanics	Autumn 2011	63	4.6
AA 310 Orbital Mechanics	Autumn 2012	65	4.8
AA 310 Orbital Mechanics	Autumn 2013	58	4.6
AA 310 Orbital Mechanics	Autumn 2015	45	4.6
AA 461 Advanced Propulsion	Autumn 2015	16	4.3
AA 400 Gas Dynamics	Winter 2016	18	4.4
AA 260 Thermodynamics	Spring 2016	39	4.9
AA 527 Space Power Systems	Autumn 2016	12	4.2
AA 496 Undergraduate Seminar	Winter 2017	150	4.1 (team effort)
AA 321 Aerospace Laboratory I	Winter 2017	80	4.9
AA 321 Aerospace Laboratory II	Spring 2017	80	3.9 (team effort)

AA 461 Advanced Propulsion	Autumn 2017	45	4.3
AA 310 Orbital Mechanics	Autumn 2017	84	5.2
AA 321 Aerospace Laboratory I	Winter 2018	76	4.3
AA 321 Aerospace Laboratory II	Spring 2018	76	4.4 (team effort)
AA 527 Space Power Systems	Autumn 2018	36	4.1
AA 321 Aerospace Laboratory I	Winter 2019	76	4.1
AA 322 Aerospace Laboratory II	Spring 2019	71	3.9 (team effort)
AA 460 Propulsion	Autumn 2019	76	4.7
AA 462 Rocket Propulsion	Winter 2020	39	4.4
AA 460 Propulsion	Spring 2020	75	4.1
AA 310 Orbital Mechanics	Summer 2020	15	4.9
AA 322 Aerospace Laboratory II	Autumn 2020	72	3.0 (team effort)
AA 310 Orbital Mechanics	Autumn 2020	74	4.9
AA 462 Rocket Propulsion	Winter 2021	41	4.8
AA 260 Thermodynamics	Spring 2021	98	4.6
AA 310 Orbital Mechanics	Summer 2021	11	4.6
AA 310 Orbital Mechanics	Autumn 2021	83	4.9
AA 321 Aerospace Laboratory I	Winter 2022	70	4.7
AA 310 Orbital Mechanics	Autumn 2022	86	4.8
AA 527 Space Power Systems	Autumn 2022	23	4.2
AA 462 Rocket Propulsion	Winter 2023	52	pending

*The UW evaluates courses on a 1-5 scale; 5 being highest.

12. Graduate Students

12.1 Current Graduate Students

- Andrew Jansen (Ph.D.) Research topic: Convective flow structure in non-stationary, evaporating thin films. Co-advisor D. Dabiri.
- Mikael Godfrey (MS) Research topic: Developing a magnetic-confinement technique for suspending liquid oxygen droplets.
- Phani Ponduri (MS) Research topic: Combined modeling of the vaporization and combustion of liquid oxygen droplets in gaseous hydrogen, including radiative heat transfer.

Graduate Students (continued)

- Andrew Jacob (MS) Research topic: Enhancement of pool boiling for cryogenic boiler applications.

12.2 Completed Graduate Students

Ph.D.

- Juan Gonzales (Ph.D., 2015) Dissertation Title: “Heat Transfer and Convective Structure of Evaporating Films under Pressure-Modulated Conditions.” Outcomes to date: 2 journal articles, 2 conference papers.
- Ying-Hao Liao (Ph.D., 2012) Dissertation Title: “Flame Structure and Emissions of Strongly-Pulsed Turbulent Diffusion Flames with Swirl.” Outcomes: 3 journal articles, 4 conference papers.
- Yongmin (Jun) Kim (Ph.D., 2011) Dissertation Title: “Dynamics and Disruption of Superheated Droplets and Fuel/Air Mixing in Supersonic Flow.” Outcomes: 2 journal articles, 4 conference papers.
- Jeramy T. Kimball (Ph.D., 2010) Dissertation Title: Interfacial Instability, Convective Structure, and Heat Transfer in Liquid Films Undergoing Phase Change. Outcomes: 2 journal articles, 3 conference papers.
- Mathieu Fregeau (Ph.D., 2007) Dissertation Title: Strongly-Pulsed, Turbulent Diffusion Flames in Microgravity. Outcomes: 2 journal articles, 5 conference papers, 2 poster presentations.
- David E. Tew (Ph.D., MIT, 1997). Thesis title: “Streamwise vorticity enhanced compressible mixing downstream of lobed mixers“ (Co-advisor and PI for UTRC portion of proposal and research; MIT Advisor Prof. I.A. Waitz). Outcomes: 1 journal article, 2 conference papers.
- Peng Y. (John) Ho (Ph.D., UW, 1990). Dissertation title: “Self Propelled Slender Axisymmetric Body Flows: Errors in the Poisson Equation Field Calculation” (Co-advisor and PI for proposal and research; UW A&A Advisor Prof. R. Decher). Outcomes: 2 conference papers.

MSAA, M.S. and M.Eng:

- Peter Sciuto, “Design and configuration of a tridyne propulsion system for CubeSat applications,” MS Thesis, May 2021. Co-advisor C. Knowlen. Outcome: 1 conference proceeding.
- Mukund Gupta, “Numerical investigation of the combustion of liquid oxygen droplets in an environment of hydrogen under microgravity conditions,” MS Thesis, May 2021.
- Brian Henderson “Development of a tridyne propulsion system for CubeSat applications,” MS Thesis, September 2020. Co-advisor C. Knowlen. Outcome: 1 conference proceeding and 1 poster presentation.
- Robert Ferris “High-Speed Imaging of Unstable and Stable Homogeneous Nucleation of Diethyl Ether Droplets at the Superheat Limit,” MS Thesis (ME), December 2018. Outcomes: 4 conference proceedings.

Graduate Students (continued)

- Jonathan Frydman “Transient Oxygen Droplet Combustion in a Hydrogen Atmosphere: A Numerical Approach,” MS Thesis, June 2018. Outcomes: 1 conference proceeding and 2 poster presentations.
- Arun Tamilarasan “Numerical modelling of heat transfer and evaporation characteristics of cryogenic liquid propellant,” MS Thesis (ME), December 2015. Outcome: 2 journal articles.
- Irfan Syahdan “On the Mach number Effects on Droplet Breakup in Laminar Flow,” MS Thesis, August 2015.
- Juan Carlos Gonzalez-Pons, “An Experiment to Investigate the Stability of Evaporating Films in Micro-Gravity,” MS Thesis, June 2013. Outcome: 1 conference presentation.
- Eric P. Lin “Compressible Flow Structure of Droplets under Supersonic Conditions,” MS Thesis, March 2013. Outcomes: 1 journal article, 2 conference papers.
- Eric Olson (MSME, 2007) Research Topic: Film Condensation/Evaporation in Reduced Gravity. Non-thesis degree.
- Nathan C. Jordan, “Dynamic Response of Superheated Liquid Droplets in Steady Supersonic Airflow,” MS Thesis, March 2006. Outcome: 1 journal article.
- Pai-Ying (Jennifer) Tsai, “Turbulent Structure and NO_x/CO Emissions of Strongly-pulsed, Turbulent Diffusion Flames,” MS Thesis, June 2005. Outcomes: 2 conference presentations.
- Mark Phariss (MSAA) “Effects of liquid superheat on droplet disruption and vaporization in supersonic conditions,” MS Thesis, April 2005. Outcome: 1 conference paper.
- Logan Yanson (M.S., UW and WPI) Thesis: “Effects of Liquid Superheat on Droplet Disruption in a Supersonic Stream,” MS Thesis, March 2005. Outcome: 1 conference paper.
- Sanjoy Som “Stability of Heat Transfer of Unsteady Condensing Films,” MS Thesis, December 2004. Outcomes: 2 conference papers, 1 journal article.
- Alexander Vygoder (M.Eng., WPI – non-thesis), May 2003. Research area: Effect of Substrate Temperature on Hard-face Coatings by Pulsed Laser Ablation Deposition.
- Timothy Nguyen (B.S./M.S., WPI), May 2002. Research area: Effect of Substrate Temperature on Hard-face Coatings by Pulsed Laser Ablation Deposition.
- Arthur Farias (M.Eng., WPI), non-thesis degree, May 2002.
- James Usowicz (M.S., WPI). Thesis: “An Experimental Study of Flame Lengths and Emissions of Fully-Modulated Diffusion Flames” (Major Advisor; Co-advisor Prof. H. Johari), completed 5/01. Outcomes: 1 journal article, 3 conference papers, 2 conference presentations (abstract only).
- Nathaniel Demmons (B.S./M.S., WPI). Thesis: “Enhanced Stability of Lean, Premixed Flames by Flameholder Heating,” completed 5/01. Outcome: 1 conference presentation (abstract only).
- Krishna Kotikalapudi (M.S., WPI). Thesis: “Spreading of Initially Spherical Viscous Droplets” (Major Advisor, Co-advisor Prof. A. Alexandrou), completed 8/00. Outcomes: 1 journal article (submitted), 1 conference presentation (abstract only).

Graduate Students (continued)

- Aaron Newman (B.S./M.S., WPI). Thesis: “Injection and Disruption of Superheated Fuel Droplets in Supersonic Flow,” completed 4/99. Outcomes: 1 conference presentation (abstract only).
- Monica Pacheco-Tougas (M.S., WPI). Thesis: “Penetration and Mixing of Fully-modulated Turbulent Jets in Crossflow” (Co-advisor; Major Advisor H. Johari), completed 4/98. Outcomes: 1 journal article, 1 conference presentation (abstract only).
- Roberto Dugnani (M.S., WPI). Thesis: “Unsteady Fuel Jet Mixing and Combustion,” completed 5/97. Outcomes: 1 journal article, 2 conference papers, 1 conference presentation (abstract only).
- Sepideh Pashaie-Rad (M.S., WPI). Thesis: “The Development of Compact Thermal Models of the Pentium Processor for an Integrated Design Environment” (Co-advisor, Major Advisor J. Rencis), completed 5/97. Outcome: 1 conference paper.
- Theodore Perrotti (M.Eng., WPI). Directed Research Project: “Simulation of Pulsed Gas Jets in Crossflows,” completed 8/96.

13. Student Project Advising

13.1 Undergraduate Research Projects

- (2022-2023) J. Sykes is assisting with the design and implementation of a testbed for an evaporation experiment to be flown on the ISS.
- (2022-2023) E. Madewell is helping conduct experiments studying the boiling characterizes of liquid nitrogen for space-based cryoboiler applications.
- (2020-2021) N. Barry assisted with the design and implementation of a warm-gas, tridyne propellant system for CubeSat propulsion.
- (2019) M. Zody and J. Bethune assisted with determining the properties of water at low temperatures and pressures in support of numerical modeling of liquid oxygen droplet combustion in hydrogen surroundings.
- (2018) Z. Rotter assisted with conducting experimental studies of explosive droplet vaporization (NSF support).
- (2017) R. Mann assisted with the development and check-out of an experimental apparatus to study explosive droplet boiling (NSF support).
- (2016) T. Nguyen (Chem E.) analyzed thermodynamic properties of candidate fluids for an NSF-sponsored project on explosive droplet vaporization.
- (2013) S. Jax, S. Wall, and J. Erickson supported the design and development of an apparatus to study evaporating films under zero-g conditions.
- (2011) A. Babbitt and L. Jensen performed hardware design and conducted a NASA-sponsored reduced-gravity fluid transfer experiment.
- (2010) J. McDonald performed experimental flow field analysis for the supersonic flow external to disruption droplets.
- (2009) Gou-Shi Li carried out an extensive survey of liquid properties to ascertain their potential effectiveness as test fluids for supersonic droplet disruption experiments.

Undergraduate Research Projects (continued)

- (2009) C. McRae performed flow field analysis for the supersonic flow external to disruption droplets.
- (2008) E.J. Shin-White performed a preliminary determination of the celerity of large-scale turbulent flame structures from visual imaging results.
- (2008) J. Stoeffl contributed to the design and construction of a new, swirled turbulent jet flame combustor.
- (2006) M. Heikel developed, constructed, and tested an improved supersonic nozzle design in support of J. Kim's Ph.D. research.
- (2005) M. Gardiner conducted an experimental investigation of the emissions of strongly-pulsed, turbulent diffusion flames in support of M. Fregeau's Ph.D. research.
- (2003-2004) H. Devlin worked three quarters in the development of an apparatus for conducting fluid film experiments in reduced gravity in support of S. Som's MSAA research.
- (1997) E. Kieronski carried out a ten-week summer project at WPI under my supervision as part of the National Science Foundation Research Experiences for Undergraduates (REU) Program.
- (1996) A. Wahba conducted a ten-week summer project at WPI with my guidance under the REU Program. The work resulted in a successful experimental study of the penetration and mixing characteristics of unsteady, turbulent jets in a crossflow and was presented at the *41st American Physical Society Division of Fluid Dynamics Meeting*, November 1996. These results have also been published in the *AIAA Journal*.

13.2 WPI Major Qualifying Projects (the *MQP* is a required, year-long project for all seniors at WPI, and typically involves the design, fabrication, evaluation, and documentation of an engineering experiment or process).

- Film Condensation Heat Transfer Phenomena (2 students, completed D-term 2002).
- Supersonic Combustion (2 students, completed D-term 2002).
- Film Condensation (2 students, completed D-term 2001).
- Droplet Injection in a Supersonic Flow (2 students, completed D-term 2001).
- The Effect of Hydrogen Addition on Blow-off Velocity and NO_x Emissions of a Premixed Lean Methane/Air Flame (2 students, completed D-term 2000).
- Entrainment and Mixing of Turbulent Jets in Co-Flow (3 students; Principal Advisor; Professor H. Johari, Co-advisor, completed D-term 2000).
- Laser Doppler Velocimetry (2 students; Co-advisor; Professor H. Johari, Principal Advisor, completed C-term 2000).
- Enhanced Stability of Lean, Premixed Flames by Flameholder Heating (2 students, completed D-term, 1999).
- An Experimental Study of Steady and Unsteady Jets Utilizing Coflow Smoke Seeding (2 students; Principal Advisor; Professor H. Johari, Co-advisor, completed B-term 1998).
- Condensation Phenomena on the Underside of a Flat Plate under Simulated Reduced-Gravity Conditions (3 students, completed D-term 1998).
- Lean Premixed Swirl Flame Combustion (2 students, completed D-term 1998).

Major Qualifying Projects (continued)

- Combustion Characteristics of Premixed Swirled Flames (4 students, completed D-term 1997).
- Design of a Breech Fed Electromagnetic Rail Gun (3 students; Principal Advisor; Professor N. Gatsonis, Co-advisor, completed D-term 1996).
- GASCAN II Assembly (3 students; Co-advisor; Professor H. Johari, Principal Advisor, completed D-term 1996).
- Oil Droplet Injection into Compressible Flow (3 students, completed B-term 1996).**

**This MQP won Third Place at the 1997 ASME Region I Student Conference in Fairfield, CT and also won the Team Student Paper Competition at the 1997 AIAA Northeast Regional Student Conference at WPI.

13.3 WPI Interactive Qualifying Projects (the *IQP* is a required, year-long project for all juniors at WPI, and typically involves a detailed paper study of a technical topic).

- Lunar Mining (1 student (3 originally); Principal Advisor; Professor A. Alexandrou, Co-advisor, completed D-term 1996).
- Earth Orbital Debris (2 students; Principal Advisor, Professor R.C. Labonte, Co-advisor, completed D-term 1996).
- Lunar Mining (5 students, completed D-term 1997).
- Impact of Space Orbital Debris (2 students; completed D-term 1997).

13.4 Projects Involving International Students

- (2013) J.-P. Prime (Ecole d'ingénieurs du CESI) worked to develop a particle-tracking technique for fluid films undergoing evaporation.
- (2011) A. LeFloch (École Nationale Supérieure de Mécanique et d'Aérotechnique (ENSMA)) supported research on evaporating films under reduced-gravity conditions.
- (2008-2009) M. Göhler (Technische Universität Berlin) performed analytical modeling of the supersonic flow field associated with liquid droplet disruption in supersonic flow, as well as assisted in the conduct of experiments.
- (2008-2009) E. Vaast (École Nationale Supérieure de Mécanique et d'Aérotechnique (ENSMA)) supported work on turbulent, strongly-pulsed combustion with swirl by performing celerity analysis of the large-scale flame structure dynamics.

14. Independent Studies

- Independent graduate-level independent study in Gasdynamics at WPI, ME572, three graduate students, completed summer 1997.

IV. DIVERSITY, EQUITY AND INCLUSION (DEI)

15. DEI Activities at the UW

- Associate Director, Washington State Space Grant (2021-2022)
 - Space Grant is a NASA-sponsored program to enhance participation of under-represented groups in aerospace.
 - Co-hosted Rocketry Workshop at Central Washington University, March 2022.
 - Supported student rocket-launch events in June 2021 and March 2022.
- A&A Diversity Committee Chair (2017-2018)
 - Worked with Faculty Search Committee to ensure best practices in hiring for diversity.
 - Helped implement new holistic admissions process.
- 40% of current research group consists of students from underrepresented groups
- Participated in numerous DEI events and discussions, including:
 - *Disarming & defunding UW police: what does that look like? A Conversation for the University of Washington Community*, hosted by the Faculty Council on Multicultural Affairs; *Through Your Eyes: The Black Student Experience*, *The Responsive Online Classroom*, *Black Masculinity and its Proximity to Violence*, *Communicating respectfully with people of all gender expressions*, *DEI Statements*, and others.
 - *Awake in Aero*, Student-led DEI discussion group in A&A.
 - *JEDI Dialogues*, A&A Diversity, Equity, Inclusion and Mentoring (DEIM) Committee-led discussion group (topics to date in 2023: Workspace culture, Sexism in the workplace).
- Incorporated non-western technical material into courses
 - Example: Presenting Mayan astronomy in a course in Orbital Mechanics (AA 310)

V. SERVICE AND AWARDS

16. Honors, Awards, and Recognitions

- Commencement speaker (student elected), Aeronautics & Astronautics, 2021.
- *2019 Distinguished Educator*, Aeronautics & Astronautics, 2019.
- *Undergraduate Educator of the Year*, Aeronautics & Astronautics, 2018.
- Fulbright US Scholars Program Awardee, 2016.
- UW College of Engineering *Faculty Teaching and Learning Award Nominee*, 2016, 2017.
- University of Washington *Distinguished Teaching Award Nominee*, 2013, 2017 (Finalist).
- Best Paper Award, *18th Microgravity Science and Space Processing Symposium* (part of 42nd AIAA Aerospace Sciences Meeting), January 2004.
- Guest Editor, *Physics of Fluids*, 2005.
- Nominated for Professor of the Year, UW A&A Dept., 2004.
- ASME 2001 Curriculum Innovation Award - Honorable Mention, 2001.

Awards (continued)

- Awarded Russel M. Searle Instructorship in Mechanical Engineering at WPI, 2001.
- Fellow of the *ASME*, 2000.
- Associate Fellow of the *AIAA*, 1999.
- Awarded WPI George I. Alden Chair in Engineering, 1999.
- National Science Foundation CAREER Award recipient, 1998.
- Appointed Associate Editor for the *AIAA Journal*, 1997.
- Listed in *Lexington Who's Who*, 1999.
- Alpha Gamma Delta “Apple” Award for good teaching, February 1997.
- Sigma Xi, 1994.
- AIAA Senior Member, 1991.
- ARCS (Achievement Rewards for College Scientists) Fellowship, 1980-1981.
- Tau Beta Pi, awarded in Junior year, 1976.

16. Professional Societies

16.1 Memberships

- American Institute of Aeronautics and Astronautics (Associate Fellow) 1977-present
Associate Fellow 1999
Associate Editor, *AIAA Journal* 1998-2002
Faculty Advisor, UW AIAA Student Section 2002-2003, 2007-2008, 2016-2018
Member, High-speed Air-breathing Propulsion Technical Committee 2016-present
Member, Air-breathing Propulsion Technical Committee 1994-1997
Council Member, Pacific Northwest Section (elected) 2009-2012
Invited Panelist, Pacific Northwest Section Technical Symposium November 2010
- American Society of Mechanical Engineers (Fellow) 1984-present
Fellow 2000
Faculty Advisor, WPI ASME Student Section 1995-1998
- The Combustion Institute (Member) 1988-present
- Member, Western States Section Executive Committee 2003-present
- American Physical Society (Member) 1996-present
Guest Editor, *Physics of Fluids* 2005
- Christian Engineering Society (Member) 2019-present

17. Service Activities

17.1 Service Activities at the UW

- Associate Director, Washington Space Grant Program 2021-2022
- Faculty Advisor, UW Society for Aerospace Rocket Propulsion (SARP) 2019-2022

Service Activities (continued)

- A&A Teaching Faculty Search Committee Chair 2019-present
2019-2021
- A&A Undergraduate Committee 2021-present
- A&A International Programs Committee Chair 2016-2019
2019-present
- ABET Program Coordinator, Department of Aeronautics & Astronautics 2019-2021
- A&A Graduate Committee Chair 2002-2010, 2015-2021
2003-2006
- A&A Safety Committee Chair 2002-2003, 2017-2020
2004-2010
- A&A Diversity Committee Chair 2015-2018
2017-2018
- UW Royalty Research Fund Review Committee 2016-2018
- ME Faculty Search Committee (Member) 2007-2008
- Guggenheim Building Renovation Committee 2004-2007
- Session Chair, *35th Annual Meeting of the American Society for Gravitational and Space Research*, Denver, CO, November 2019.
- Local Arrangements Chair, Western States Section of the Combustion Institute 2016 Technical Meeting (jointly with J. Kramlich and P. Malte, UW ME Department). This highly successful meeting resulted in much praise and excellent exposure for the UW in the national combustion community. 2015-2016
- AIAA High-Speed Airbreathing Technical Committee (Member) 2016-present
- Session Co-Chair, 56th Aerospace Sciences Meeting/SciTech 2018, Kissimmee, FL, January 2018.
- Session Chair, American Physical Society, Division of Fluid Dynamics 67th Annual Meeting, San Francisco, CA, November 2014.
- Session Chair, American Physical Society, Division of Fluid Dynamics 63rd Annual Meeting, Long Beach, CA, November 2010.
- Session Chair, 20th International Symposium on Transport Phenomena, Victoria, BC, July 2009.
- Session Chair, 5th US Combustion Meeting of the Combustion Institute, San Diego CA, 2007.
- Session Chair, 31st Symposium (International) on Combustion, Heidelberg, Germany, 2006.
- Session Chair, 30th Symposium (International) on Combustion, Chicago, IL. 2004.

Service Activities (continued)

- American Physical Society, Division of Fluid Dynamics 57th Annual Mtg. 2004-2005
Program Review Committee Member
Organizer of Mini-Symposium on Compressible Flow
Session Chair
Coordinator, 22nd Annual Gallery of Fluid Motion. The *Gallery* (68 poster and video entries) contributed significantly to this very successful meeting, providing excellent exposure for the UW in the national and international fluid dynamics community.
- Faculty Advisor, AIAA Student Section 2002-2003, 2009-2010, 2016-2018
- A&A Strategic Planning Committee (Chair) 2002-2014
- Master of Ceremonies and Co-coordinator, A&A Awards Banquet 2006

17.2 Service Activities at WPI

- Played major role in coordinating local arrangements for the *Eastern States Meeting of the Combustion Institute*, Oct. 13-15, 1995. Was primarily responsible for registration, finances, the abstract books, and helping Professor V. Motevalli with other local arrangements as needed. Organized and oversaw local team consisting of Mrs. P. Boucher, Professors R. Zalosh and N. Dembsey, and Mr. K. Checca. This highly successful meeting resulted in much praise and excellent exposure for WPI in the national combustion community.
- Session organizer and chair, *AIAA 33th Aerospace Sciences Meeting*, January 1995.
- Session organizer and chair, *31st AIAA/ASME/SAE/ASEE Joint Propulsion Conference*, July 1995.
- Session organizer and chair, *AIAA 34th Aerospace Sciences Meeting*, January 1996.
- Session organizer and chair, *32nd AIAA/ASME/SAE/ASEE Joint Propulsion Conference*, July 1996.
- Technical Program Chair for Air-Breathing Propulsion, *35th AIAA Aerospace Sciences Meeting*, January 1997. This conference is the major annual AIAA meeting, and is a leading international conference in the aerospace field.
- Session organizer and chair, *AIAA 36th Aerospace Sciences Meeting*, January 1998.
- Associate Editor of the *AIAA Journal*, 1998-2002. The Journal is the flagship publication of the American Institute of Aeronautics and Astronautics, and is widely considered a prestigious, high-quality journal.
- Chair of Department Faculty Search Committee, 2001.
- Department Faculty Search Committee Member (2 positions), 1999-2000.
- Graduate Committee (elected), 1996-2000.
- Undergraduate Awards and MQP Day Committee.
- Faculty and Graduate Students Awards Committee.
- Student helper coordinator for Higgins Lab Dedication, 1997.
- WPI Campus Hearing Board (elected), 2000.

Service Activities (continued)

- New Student Orientation Faculty Consultant, 1997, 1998, 1999, 2000.
- ASME Student Section Advisor 1995-1998.

18. Editorial and Referee Services

18.1 Editorial Services

- Associate Editor, *AIAA Journal*, 1998-2003. Number of papers edited: 60

18.2 Referee Services

- Program Advisory Sub-Committee member, The Combustion Institute, 1990, 1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006. Total papers reviewed: 27

Reviewed papers for:

- Flow Measurement and Instrumentation (2)
- International Journal of Energy Research (4)
- Journal of Fluid Mechanics (8)
- Journal of Propulsion and Power (3)
- AIAA Journal (11)
- International Gas Turbine Institute (2)
- AIAA Aerospace Sciences Meetings (6)
- AIAA/ASME/SAE/ASEE Joint Propulsion Conferences (5)
- AIAA SciTech Forum (17)
- AIAA Propulsion and Energy Forum (6)
- Physics of Fluids (16)
- Experiments in Fluids (4)
- Combustion and Flame
- Combustion Science and Technology (7)
- ASME Journal of Fluids Engineering
- ASME Early Career Technical Journal
- Cryogenics

Proposal reviews:

- National Science Foundation (5)
- The Petroleum Research Institute
- The University of Washington Royalty Research Fund

National review panels:

- National Science Foundation/Sandia Program, June 1999.
- National Science Foundation/CAREER Program, November 1999.
- NASA Microgravity Combustion Program, NRA 99-HEDS-04, June 2000.
- DOE review of Sandia National Laboratories Combustion Research Facility, March 2004.

National review panels (continued)

- NASA Microgravity Fluid Physics Program, Multiphase Flow and Heat Transfer, HST 2004, January 2005.
- National Science Foundation/Thermal Transport Processes (TTP) Phase Change Panel, May 2008.

19. Dissertation and Thesis Committees

19.1 at the UW

- A. Jansen, Ph.D. Supervisory Committee Chair, current.
- P. Trefftz-Posada, Ph.D. Supervisory Committee Member, current (A. Ferrante, Chair).
- B. Diamond, Ph.D. Supervisory Committee Member, current (U. Shumlak, Chair).
- F. Spencer, Ph.D. Supervisory Committee Member, current (R. Breidenthal, Chair).
- D. Crews, Ph.D., Supervisory Committee Member, 2022 (U. Shumlak, Chair).
- D. Foight, Ph.D., Supervisory Committee Member, 2021 (M. Mesbahi, Chair)
- R. Osuna-Orozco, Ph.D., Supervisory Committee Member, 2021 (A. Aliseda, Chair)
- A. Shepherd, Ph.D. Supervisory Committee Member, 2021 (U. Shumlak, Chair).
- T. Reynolds, Ph.D., Supervisory Committee Member, 2020 (M. Mesbahi, Chair).
- E. Forbes, Ph.D. Supervisory Committee Member, 2017 (U. Shumlak, Chair).
- M. Dodd, Ph.D. Qualifying Committee Member, 2017 (A Ferrante, Chair).
- S. Miller, Ph.D. Supervisor Committee Member, 2016 (U. Shumlak, Chair).
- J.C. Gonzalez, Ph.D. Supervisory Committee Member, 2015 (Chair).
- I. Johnson, Ph.D. Supervisor Committee Member, 2015 (R. Winglee, Chair).
- B. Wade, Ph.D. Supervisory Committee Member, 2014 (P. Feraboli, Chair).
- Y.-H. Liao, Ph.D. Supervisory Committee Chair, 2013.
- W.-H. Tien, Ph.D. Supervisory Committee Member, 2013 (D. Dabiri, Chair).
- E. Meyer, Ph.D. Supervisory Committee Member, 2011 (U. Shumlak, Chair).
- Y.-J. Kim, Ph.D. Supervisory Committee Chair, 2011.
- J.T. Kimball, Ph.D. Supervisory Committee Chair, 2010.
- M. Fregeau, Ph.D. Supervisory Committee Chair, 2007.
- U. Bae, Doctoral Supervisory Committee Member, 2007 (Electrical Engineering, Yongmin Kim, Chair).
- M. Judy, Ph.D. Supervisory Committee Member, 2006 (K. Morgansen, Chair).
- W. I-Song, Ph.D. Supervisory Committee Member, 2005 (U. Shumlak, Chair).
- A. Rahmani, Ph.D. Supervisory Committee Member, 2005 (M. Mesbahi, Chair).

Dissertation Committees (continued)

- M.K.M. Phariss, Doctoral Supervisory Committee Member, 2005 (GSR Representative, B.D. Flinn, Department of Materials Science and Engineering, Chair).
- K. Lee, Doctoral Supervisory Committee Member, 2005 (GSR representative, C.D. Chamber, Department of Computer Science and Engineering, Chair).
- R.A. Nugent, Doctoral Supervisory Committee Member, 2006 (GSR representative, W. Stuetzle, Statistics, Chair).
- R.J. Harrod, Doctoral Supervisory Committee Member, 2003 (C.B. Halpern, Forest Resources, Chair).

19.2 at WPI

- H. Fang, M.S. Thesis, "An Experimental Study of the Structure and Trajectory of Vortex Rings Horizontally Moving in Stratified Media," Professor H. Johari, Major Advisor (completed 5/4/95).
- J. G. Buzby, M.S. Thesis, "Effluent Assessment and Direct Simulation Monte-Carlo Modeling of Plume Backflow," Professor N. Gatsonis, Major Advisor (defended 4/11/96).
- K. B. Cordio, M.S. Thesis, "Determination of the Mechanical Properties of Skin Using Quasi-Static Bi-axial Testing," Professor A. Hoffman, Major Advisor (defended 4/23/96).
- D. Wilson, M.S. Thesis, "Fermentor Impeller Study: Flat Blade Turbine and Gas Dispersing Axial Impellers for Biopharmaceutical Production," Professor B.J. Savilonis, Major Advisor (defended 4/25/96).
- L. Meng, M.S. Thesis, "Flow Visualization of Vortex Shedding From a Vibrating Flexible Cable," Professor D. Olinger, Major Advisor (completed 8/12/96).
- G. Marr, M.S. Thesis, "Development of a Methodology for Creating Families of Parts," Professor H. Ault, Major Advisor (completed 8/16/96).
- M. Gruslin, M.S. Thesis, "Contributions to the Design of High-speed Progressive Die Systems and their Industrial Applications," Professor R. Damian, Major Advisor (completed 8/28/96).
- M. Cyr, Ph.D. Thesis, "Thermo-fluid Dynamics of a Condensing Incompressible Fluid," Professor A. Alexandrou, Major Advisor (defended 12/12/96).
- C. Shakeri, Ph.D. Dissertation Committee, Professor M.N. Noori, Major Advisor (Candidacy Examination, 3/8/96).
- C. Bruno, M.S. Thesis, "Development of a Mathematical Model to Investigate the Static and Dynamic Stability of a Wheelchair System," Professor A. Hoffman, Major Advisor (defended 4/28/97).
- J. Sambrook, M.S. Thesis, "Efficiency of a Commercially Available Filtration System in Removing Radon from Home Drinking Water," Professor L. Bobek, Major Advisor (defended 4/28/97).
- K. Tsuda, M.S. Thesis, "Development of a Three-dimensional Finite Volume Navier-Stokes Solver with Extensions to Magnetohydrodynamics," N. Gatsonis, Major Advisor (defended 7/2/97).
- Q. Zhang, Ph.D. Dissertation, "Measurements of Passive Scalar Concentration Field in Accelerating Turbulent Jets," Prof. H. Johari, Major Advisor (defended 8/18/97).

Thesis Committees (continued)

- K. Desabrais, M.S. Thesis, “Direct Measurement of Wing Tip Vortex Circulation Using Ultrasound,” Prof. H. Johari, Major Advisor (defended 8/19/97).
- L. Duval-Rebolledo, M.S. Thesis, “An Extension of Direct Stochastic Linearization Technique for MDOF Systems with General Hysteresis,” Prof. M. Noori, Major Advisor (defended 8/25/97).
- G. Aviza, M.S. Thesis, “An Experimental Investigation of Torque Balancing to Reduce the Torsional Vibration of Camshafts,” Prof. R. Norton, Major Advisor (defended 12/16/97).
- M. Fratantonio, M.S. Thesis, “Exact Solutions to Boundary Integrals for the Two-dimensional Laplacian Problem,” Prof. J. Rencis, Major Advisor (defended 5/98).
- J. Yuan, Ph.D. Dissertation Committee, Professor D.J. Olinger, Major Advisor (Candidacy Examination, 6/2/98).
- G. Balasubramanian, M.S. Thesis, “Control of Three Dimensional Cylinder Wake Structures Using Coupled Map Lattices,” Prof. D. Olinger, Major Advisor (defended 9/10/98).
- D. Thurston, M.S. Thesis, “Design of a Shape Memory Alloy Activated Gripper Device,” Prof. R. Hagglund, Major Advisor (defended 12/98).
- G. Burgos, Ph.D. Thesis, “Rheology of Semisolid Metal Suspensions,” Prof. A. Alexandrou, Major Advisor (defended 1/18/99).
- L. Wang, Ph.D. Thesis, “Kinetic Theory of Monosized Particles and Binary Mixtures Thermalized by Vibrating Sieves,” Prof. M. Richman, Major Advisor (defended 1/19/99).
- R. Eckman, M.S. Thesis, “Langmuir Probe Measurements in the Plume of a Pulsed Plasma Thruster,” Prof. N. Gatsonis, Major Advisor (defended 1/21/99).
- C. Furlong, Ph.D. Dissertation, “Hybrid, Experimental and Computational Approach for the Study and Optimization of Mechanical and Electro-Mechanical Components,” Professor R. Pryputniewicz, Major Advisor (defended 5/29/99).
- J. Powell, M.S. Thesis, “Machine Autopsy,” Professor R. Sisson, Major Advisor (defended 5/27/99).
- A. Linn, M.S. Thesis, “Determination of Average Lift of a Rapidly Pitching Airfoil,” Prof. W. Durgin, Major Advisor (defended 10/22/99).
- M. Gagne, M.S. Thesis, “Experimental and Numerical Investigation of Pulsed Plasma Thruster Plumes,” Prof. N. Gatsonis Major Advisor (defended 2/25/00).
- M. Seta, M.S. Thesis, “ACES Approach to the Development of Self-assembling MEMS,” Prof. R. Pryputniewicz, Major Advisor (defended 5/10/00).
- K. Kovalev, M.S. Thesis, “Development of a 2-D/3-D Constrained Adaptive Grid Generator for Direct Simulation Monte Carlo Computation,” Prof. N. Gatsonis, Advisor (defended 7/13/00).
- G. Balasubramanian, Ph.D. Dissertation Committee, Professor D.J. Olinger, Major Advisor (Candidacy Examination, 2/26/01).
- C. Heath, Ph.D. Dissertation, “Binary Condensation in a Supersonic Nozzle-,” Prof. B. Wyslouzil, Major Advisor (Chemical Engineering Department) (defended 4/20/01).
- M. Davis, M.S. Thesis, “Low-Order Modeling of Freely Vibrating Flexible Cables,” Prof. D. Olinger, Major Advisor (defended 5/8/01).

Thesis Committees (continued)

- U. Benz, M.S. Thesis, “Coupling Two-dimensional and Axisymmetric Boundary Element Zones for Transient Heat Transfer Applications,” Prof. J. Rencis, Major Advisor (defended 5/25/01).
- D.P. Bond, M.S. Thesis, “Near-Field Development of Buoyancy Driven Flows,” Prof. H. Johari Major Advisor (defended 12/10/01).
- M.A. Shear, M.S. Thesis, “Ultrasonic Measurement of Thin Condensing Fluid Films,” Co-Advisor, Major Advisor P.C. Pederson (defended 4/18/02).

20. Significant Civic, Cultural, Religious, Outreach, and Similar Contributions

- Presentations at Corvallis High School and Grants Pass High School as part of the German American Fulbright Commission’s “Meet-a-German” Initiative, October 6, 2020.
- Presentations at Kamiak High School as part of the German American Fulbright Commission’s “Meet-a-German” Initiative, October 3 (Germany Unity Day), 2019.
- Presentations at Snohomish High School as part of the German American Fulbright Commission’s “Meet-a-German” Initiative, October 3 (Germany Unity Day), 2018.
- Presentation as part of Washington State Academic RedShirt (*STARS*) program (for low-income and first-generation college students), February 2014.
- Washington Aerospace Scholars, Second Residency Session, Seattle, WA, featured presenter, June 2008, June 2010, June 2012, July 2013, July 2018 (Subject: rockets and careers in engineering careers).
- Expert Witness and Panelist, United States Senate Aviation Operations, Safety and Security Subcommittee Hearing on “The Aviation Workforce: Training Needs and Challenges,” October, 2011.
- MSL (Math + Science + Leadership) Program presentation, Seattle, WA, June 2011 (Subject: Rockets and engineering).
- MSL (Math + Science + Leadership) Program presentation, Seattle, WA, July 2010 (Subject: Rockets and engineering).
- MSL (Math + Science + Leadership) Program presentation, Seattle, WA, July 2009 (Subject: Rockets and engineering).
- Margaret Mead Elementary School, Sammamish, WA, Science Night featured presenter, May 2009 (Subject: Airplanes).
- Represented WPI and the engineering profession in talks given during Career Night at St. John’s High School, Shrewsbury, MA, 1995, 1997, 1999, 2000.
- Gave presentation to 3rd Grade Class K-3, Paxton Center School, 12/98. Subject: Japan.
- Worship Leader, Trinity Covenant Church, Manchester, CT 6/93-6/94.
- Sunday School Instructor (Senior High), Trinity Covenant Church, Manchester, CT, 9/92-6/93.
- Sunday School Instructor (Junior High), First Congregational Church, Paxton, MA, 9/98-present.
- Senior Choir member, First Congregational Church, Paxton, MA, 4/97-6/99.
- Church Board Member, Shoreline Covenant Church, Shoreline, WA, 2009-2011.

V. OTHER EXPERIENCE

21. Other Professional Jobs and Experience

Research Scientist

7/88-3/95

United Technologies Research Center, East Hartford, CT

Responsible for conducting basic and applied research primarily in areas relevant to aircraft propulsion and energy conversion applications. Successful experimental and analytical research programs conducted include:

- Turbulent mixing downstream of lobed mixers in compressible flow (NASA Langley support). Visiting Ph.D. student (MIT) supervised. This research established the relative importance of streamwise vorticity generation for two-stream mixing for application to engines for the High Speed Civil Transport.
- Investigation of the heat transfer and thermal stability characteristics of high-purity methane and natural gas fuels for high-speed aircraft applications (Japanese (NEDO) support). This work led to the detailed fuel specification required for the Japanese Supersonic Transport.
- Experimental investigation of jet fuel two-phase flow characteristics (Pratt & Whitney support). This work demonstrated a two-fold decrease in fuel line purging time, an enabling technology for the International Aero Engine V2500 gas turbine combustor.
- Characterization by schlieren visualization and detailed pressure measurements the flow field in a model supersonic combustor (Pratt & Whitney support). The results of this study led to a 50% improvement in the fuel/air mixing rate in a Pratt & Whitney scramjet combustor.
- Experimental study of the mixing and stability characteristics of compressible vortex rings impacted by normal shock waves (jointly with the University of Connecticut; UConn Research Foundation support).
- Experimental studies of the stability and pollutant emissions characteristics of laminar and turbulent premixed flames using gaseous fuels with varying hydrogen content (IR&D support). This program led to the first demonstration of active combustion control and noise reduction at UTRC.
- Experimental studies of jet fuel thermal stability and autoignition/detonation (Pratt & Whitney support). The results of this effort were used to define successful operating regimes for the IAE V2500 gas turbine engine.
- Planar laser induced fluorescence and Mie scattering imaging studies of turbulent structure and mixing in compressible shear layers and jets (IR&D support).
- Examination of the penetration and disruption characteristics of superheated liquid jets in compressible flow (UTC internal (IR&D) support). Visiting Ph.D. student supervised.
- Analytical studies of the effects of preferential thermal and mass transport on the structure of laminar diffusion flames (IR&D support).

These programs involved the design, fabrication, installation, and successful check-out of a co-annular combustion apparatus, including instrumentation for emissions measurement, a laser-diagnostic system for planar Mie/Rayleigh scattering, two high-speed flow facilities, and a jet fuel two-phase flow test rig.

Other Professional Jobs and Experience (continued)

Developed programs for external funding in the areas of superheated liquid droplet injection, diagnostics development for measuring pressure and temperature in compressible boundary layers, active control and mixing enhancement of supersonic shear flows (jointly with the University of Connecticut), compressible mixing and noise generation of lobed mixer geometries (jointly with Massachusetts Institute of Technology), advanced design procedures for forced mixing devices (also jointly with MIT), and hot hydrogen testing of materials for nuclear rocket applications (jointly with Pratt & Whitney).

Senior Engineer

2/86-7/88

University of Washington Applied Physics Laboratory, Seattle, WA

Conducted basic and applied research in marine propulsion and hydrodynamics. Principal investigator for analytical study of propulsor-hull interaction on axisymmetric bodies, funded by Office of Naval Research (ONR). Project engineer for study of flow induced vibration and failure of surface ship sonar dome rubber window, sponsored by the Naval Sea Systems Command (NAVSEA). Supervised one Ph.D. student through the U.W. Department of Aeronautics and Astronautics.

Research Fellow

7/85-12/85

Universität Göttingen, Göttingen, Germany

Collaborated on experimental research on particulate emissions in flames, both in a non-oxidizing environment at one atmosphere pressure and in a benzene-air flame at elevated pressure. Utilized laser diagnostics for soot particle size and loading characterization. Performed a feasibility study of the use of laser photon-correlation techniques for soot particle size measurement. Obtained funding for the research from the Deutscher Akademischer Austauschdienst (DAAD).

Research Assistant

6/80-6/85

California Institute of Technology, Pasadena, CA

Conducted experimental research on the effects of high heat release in a turbulent mixing layer. Modified an existing combustion facility for high temperatures, including the development of new optical and electronic diagnostics. Performed feasibility study and preliminary design of a supersonic reacting shear layer facility. Supervised technical and graduate assistants.

Engineer

7/77-7/79

Boeing Aerospace Company, Seattle, WA

Performed computer flight performance prediction for the air-launched cruise missile and for a ground launched anti-armor missile. Worked on solid propellant rocket motor performance prediction and evaluation for the space shuttle inertial upper stage, including developing a computer model for motor design optimization. Developed successful model for predicting the slag retention of spin-stabilized solid rocket motors.

Member of Computing Staff

6/75-5/77

University of Washington Aeronautical Laboratory (UWAL), Seattle, WA

Worked with other undergraduates in computer reduction of wind tunnel data, preparation of test reports and coordination with customer company technical representatives. Promoted to Assistant Chief of Computing in October 1976; to Chief in April 1977.