

TIMOTHY L. BROWER

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Director, Engineering Partnership Program with Colorado Mesa University
Mechanical Engineering Department
College of Engineering and Applied Science
University of Colorado Boulder

Professional Preparation

Colorado State University	PhD in Civil Engineering/Space Related Fluid Mechanics
Montana State University	MS in Mechanical Engineering
Idaho State University	BS in General Engineering

Academic Appointments

2009 – present **Director**, University of Colorado Boulder/Colorado Mesa University Engineering Partnership Programs
2004 – 2009 **Founding Director**, Project Lead The Way for Oregon
2008 – 2009 **Professor**, Mechanical & Manufacturing Engineering & Technology, Oregon Institute of Technology
2008 – 2009 **Director**, American Society of Engineering Education, Engineering Technology Council
2005 – 2007 **Associate Director**, Oregon Space Grant
2003 – 2008 **Associate Professor**, Mechanical & Manufacturing Engineering & Technology, Oregon Institute of Technology
2002 – 2008 **Department Chair**, Manufacturing & Mechanical Engineering & Technology, Oregon Institute of Technology
1998 – 2003 **Assistant Professor**, Mechanical & Manufacturing Engineering, Oregon Institute of Technology

Educational Background

Ph.D. in Space Fluid Mechanics, Civil Engineering Department, Colorado State University. Dissertation entitled “Flow about a Droplet in Reduced Gravity,” performed under the direction of the late Dr. Willy Sadeh (1932-1997), Professor of Space Engineering and Fluid Mechanics. An interdisciplinary approach to low gravity fluids that included aspects of the aerospace, mechanical and civil curricula. An appointment as a NASA Research Fellow from 1992-1995 allowed for a purely theoretical research topic concerning the motion of a droplet under the combined influence of gravity and a thermally induced surface tension gradient. Course emphasis included turbulence, hydrodynamics, theoretical mechanics, experimental methods, and finite elements.

MS in Mechanical Engineering, Montana State University. Thesis entitled “Transition to Turbulence in Non-Equilibrium Mixing Layers,” performed under the tutelage of Dr. Anthony Demetriades, Professor of Mechanical Engineering. An experimental investigation of the fundamental mixing characteristics of two supersonic streams. Studies included steady-state and fluctuating pressure measurements as well as turbulence detection using hot film and hot wire anemometry.

BS in General Engineering, Idaho State University. Graduated with high honors, GPA 3.81/4.00. Program of study provided a broad background in fluid mechanics, heat transfer, physical modeling, structures, materials, and electronics. A minor in mathematics was granted.

Academic Experience

Oregon Institute of Technology, Klamath Falls, OR, Professor (11 yrs). Tenure received 2003. 6 years as Department Chair. Teaching duties include undergraduate courses in Biomedical Engineering, Fluid Mechanics, Thermodynamics, Renewable Energy, Gas Dynamics, Fluid Power Systems, Vibrations, Statics, Strength of Materials, Fuel Cells, Vacuum Technology, and Senior Projects. Trained ABET Program Evaluator.

Colorado State University, Fort Collins, CO, Assistant Professor/ Research Scientist (2 yrs). Responsibilities included approximately 2/3 research and 1/3 teaching. Research consisted of a \$110k per year contract with the Lockheed Martin Corporation to consult and perform analyses on problems of mutual interest relating to the Titan, Atlas, EELV and LMLV programs. Effort to develop an externally funded research program in fluid mechanics and aerodynamics was ongoing. Work to integrate the technical aspects of wind tunnel modeling and aerospace vehicle design for the company. Normal teaching duties included undergraduate courses in Mechanics of Materials (lecture and laboratory) and Engineering Mechanics. Guest lecturer in several graduate level courses with subjects on perturbation methods and computational fluid mechanics applied to droplet motion.

NASA Graduate Researchers Program. Competitive research proposal submitted to the NASA Office of Space Science and Applications resulted in a three year funded fellowship to conduct theoretical investigations of immiscible fluid separation in low gravity environments.

AIMS Community College, Greeley, CO, Visiting Professor part-time. Instructor for courses in calculus based physics, algebra based physics, physics laboratory, calculus and meteorology.

Embry-Riddle Aeronautical University, Warren AFB Resident Center, Adjunct Faculty. Professor in the graduate Space Studies Specialization and the Master of Science in Technical Management options.

Industrial Experience

Lockheed Martin Corporation, Denver, CO, Aerodynamics/Aerophysics/ Systems Engineer (12 yrs, last 6 concurrent with Ph.D. studies). Lead aero-engineer for the analysis and design of launch vehicles encompassing all steady and dynamic subsonic and supersonic flight regimes.

- Research projects included state-of-the-art 3-body aerodynamic and high angle-of-attack aerodynamic studies.
- Technical management of multi-million dollar projects related to the design of launch vehicles. Coordination of technical interchange between Lockheed Martin management, the Air Force Space Command, the Aerospace Corp., and sub-contractors McDonnell Douglas Corp., Hercules (Alliant Technologies), Hughes Corporation, TRW and Boeing.
- Lead engineer for several experimental wind tunnel investigations conducted at the Arnold Engineering and Development Center. Various on-site experimental studies concerning air flow contamination and honeycomb venting. Conducted three experimental investigations off-site at McDonnell Douglas, Huntington Beach addressing the flow of air through various venting configurations.

AVCO Systems Division, Wilmington, MA, Staff Mechanical Engineer (2 yrs).

Responsibilities included heat transfer and pressure analyses and designs of wind tunnel models, full-scale high-speed reentry vehicles and lab test articles.

Bonneville Power Administration, Portland, OR, Mechanical Engineer (3 yrs, last 2 concurrent with MS studies). Responsibilities included computer modeling of residential and

business buildings and energy systems. Programs used to forecast energy consumption throughout the Pacific Northwest Region for the next decade. Computer models developed were later used as a basis for future energy modeling software.

Selected Publications

1. Brower, T., "Unique Collaboration between Engineering and Engineering Technology Programs," AC 2014-9065, *Proceedings*, American Society of Engineering Education Annual Conference & Exposition, Indianapolis, Indiana, June 2014.
2. Brower, T., "Innovative Partnership Collaborations in Engineering Education," ETD 425, *Proceedings*, 2007 ASEE Conference for Industry and Education Collaboration, Savannah, GA, February 2014.
3. Brower, T., "Using a Systems Engineering Approach for Students to Design & Build Laboratory Equipment," AC 2012-3136, *Proceedings*, American Society of Engineering Education Annual Conference & Exposition, San Antonio, Texas, June 2012.
4. Brower, T., "Going With the Flow in a Service Learning Project," AC 2011-751, *Proceedings*, American Society of Engineering Education Annual Conference & Exposition, Vancouver, B.C., June 2011.
5. Brower, T., "Systems Engineering in Undergraduate Education: An Activities, Project, Problem-Based Learning Approach," AC 2009-261, *Proceedings*, American Society of Engineering Education Annual Conference & Exposition, June 2009, Austin, TX., June, 2009.
6. Brower, T., "Linking High School Pre-Engineering with University E and ET Programs," *Proceedings*, ASEE Conference for Industry and Education Collaboration, Orlando, FL, Feb. 2009.
7. Brower, T. and Gummer, E. invited presentations: "Evaluation Model of PLTW" and "Teacher Professional Development Model," US Dept. of Ed. Mathematics and Science Regional Conference, San Francisco, CA, Feb. 14, 15, 2008.
8. Brower, T., Grimsley, R., and Newberry, P., "STEM is Not Just a Four Individually Lettered Word," AC 2007-884, ASEE Annual Conference & Exposition, Honolulu, Hawaii, June, 2007.
9. Fitzsimmons, V. and Brower, T., "An Evaluation Model for Senior Project Collaborations," Session ETD 426, 2007 ASEE Conference for Industry and Education Collaboration, Palm Springs, CA, Feb. 2007.
10. Brower, T., "Can Engineering and Engineering Technology Programs Reside within the Same Academic Department?," 2006 ASEE Annual Conference & Exposition, Chicago, IL, June 2006.
11. Brower, T., "Titan Launch Vehicle: A Ground Test History," AIAA Journal of Spacecraft and Rockets, Vol. 43, No. 1, September, Jan.-Feb. 2006, pp 147-160.
12. Brower, T., "Titan Launch Vehicle: A Ground Test History," AIAA 2004-2488, 24th AIAA Aerodynamic Measurement Technology and Ground Testing Conference, Portland, Oregon, 28 June – 1 July, 2004.
13. Brower, T. and Cornachione, H., "Women in Engineering Technology: Where Are They?" Session 3249, 2001 ASEE Annual Conference & Exposition, Albuquerque, N.M., June 2001.
14. Brower, T. and Hefty, M., "A Mechanical Engineering Technology Senior Project Aboard NASA's Weightless Wonder," ASEE 2001 CIEC Conference for Industry and Education Collaboration, San Diego CA, Jan 30 - Feb 2, 2001.
15. Brower, T. and Sadeh, W., "Thermocapillary Drift of a Droplet in Reduced Gravity," IAF-97-J.1.03, 48th International Astronautical Congress, Turin, Italy, October 6-10, 1997.
16. Brower, T., "Droplet Flow in Reduced Gravity," Ph.D. Dissertation, Colorado State University, Fort Collins, CO, May, 1997.
17. Brower, T., "Immiscible Fluid Separation in Low-Gravity Environments," Annual presentation for the NASA Graduate Student Researchers Program, Washington D.C., 1993, 1994 and 1995.

18. Brower, T. and Sadeh, W., "Bond Number in Low-Gravity Environments," ASME Paper AMD-174/FED-Vol. 175, Fluid Mechanics Phenomena in Microgravity, Winter Annual Meeting, New Orleans, LA, 1993.
19. Brower, T. and Demetriades, A., "Experiments on the Free Shear Layer Between Two Supersonic Streams," AIAA Paper No. 90-0710, 28th Aerospace Sciences Meeting, Reno, NV, 1990.

Industrial Publications

Dr. Brower authored more than 300 technical reports while tenured at the Lockheed Martin Corporation. These reports cover a broad cross-section of subjects including wind tunnel tests, data analysis, theoretical development of new analysis methodologies and computational fluid dynamic studies. Titles of these reports are available upon request.

Recent Grants

Principal Investigator –

University of Colorado Seed Grant to study and develop a Particle Imaging Velocimetry (PIV) and Computational Fluid Dynamics (CFD) teaching modules. Conducted Summer 2012.

"Research Experiences for Undergraduates" NSF program announcement 07-569 (\$12,800 for 1-year). Conducted 2009-12.

Oregon Department of Education Mathematics & Science Partnership (\$935K over 3-years). Conducted 2005-08.

Engineering & Technology Industry Council (\$373K over 2-years). Conducted 2005-7. Intel (\$30K). Conducted 2004-05.

Professional Affiliations and Service

American Institute of Aeronautics and Astronautics (AIAA), senior member

American Society of Engineering Educators (ASEE), member

Program Chair, 2006 Conference for Industry and Education Collaboration, San Antonio, Texas.

Assistant Vice Chair for Programs for the 2007 ASEE Annual Conference in Honolulu, Hawaii.

Program Chair, 2008 ASEE Annual Conference in Pittsburg, PA.

American Society of Mechanical Engineers (ASME), member

Committee on Engineering Technology Accreditation, 2012-present, Chair 2017-present

ABET Engineering Technology Accreditation Commissioner, 2014-present

ASME ABET Program Evaluator, 2004 – present.

Mechanical Engineering Technology Department Heads Committee, Secretary (05-06), Vice Chair (06-07), Chair (07-08).

Honors and Awards

ASEE Recognition of Service as Program Chair, 2008 Annual Conference, Engineering Technology Division.

ASEE Recognition of Service as Program Chair, 2006 CIEC.

ASME International, Student Section Advisor Award (1999).

OIT Outstanding Club Advisor Award (1999/2000).

OIT Faculty Achievement Award (**teacher of the year**), (2000).

OIT Certificate of Recognition for summer activities (2000/01).

OIT Student Affairs Most Valuable Partner Award (2001).

ASEE Engineering Technology Division Best Presenter Award for CIEC Conference (2001).

Summer Assignments

Reduced Gravity Student Flight Opportunities Program, Houston, Texas (2000, 2001, 2002, 2005), Technology Space Camp Coordinator (2001, 2002), PLTW Director, Affiliate PLTW Professor for POE and EDD (2006, 2007, 2008), 2006 Chautauqua Short Course “Atmospheric Science Utilizing High-Altitude Balloon Experiments.”