Bryan W. Weber

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Education

Case Western Reserve University, Cleveland, OH
>   Bachelor of Science, Aerospace Engineering
>   Graduated *cum laude*, May 2009
>   Cumulative GPA: 3.73

University of Connecticut, Storrs, CT
>   Master of Science, Mechanical Engineering
>   Planned Graduation: May 2010

Professional Experience

Master's Thesis (Planned Completion: May 2010)
Combustion Laboratory, University of Connecticut, Storrs, CT
>   Autoignition of Butanol Isomers at Elevated Pressure
>   **Objective**: To determine the ignition characteristics and kinetics of the 4 butanol
>   isomers using a rapid compression machine

- Developed LabView instrument to control data sampling from the rapid compression machine
- Designed and constructed an electrical circuit and mechanical system to control diaphragm puncture timing on a sampling apparatus for the rapid compression machine
- Operating the rapid compression machine to measure the autoignition delay associated with the four isomers of butanol
- Operating the gas chromatograph, mass spectrometer, and flame ionization detector to determine the kinetic pathways of butanol ignition
- Simulating ignition delay and kinetic results of experiments using CHEMKIN software

Senior Project, Summer 2008-Spring 2009

Combustion Diagnostics Laboratory, Case Western Reserve University, Cleveland, OH

<u>Analysis of Heavy Hydrocarbon Fuels using Gas Chromatography with Mass Spectrometry</u>

> Characterized the composition of unburned conventional and synthetic jet fuels (Jet-A, JP-8, and S-8)

Mechanical Engineering Laboratory 2, Spring 2008

Combustion Diagnostics Laboratory, Case Western Reserve University, Cleveland, OH

<u>An Investigation of Hydrocarbon Flames using Probe Sampling and Gas Chromatography with Mass Spectrometry</u>

- Constructed gas sampling probe and control system
- Tested sampling probe on flat, premixed methane flames

Internship, Summer 2007

Combustion Diagnostics Laboratory, Case Western Reserve University, Cleveland, OH

<u>Catalytic Hydrogen Ignition Project</u>

- Designed, constructed, and calibrated a flow control system for hydrogen, nitrogen, and oxygen
- Designed and constructed a customized translation stage for hydrogen-air burner
- Constructed a customized exhaust hood for hydrogen-air burner

Awards

- The Fred H. Vose Prize, awarded to the senior in Mechanical and Aerospace Engineering at Case Western Reserve University showing the most promise for future leadership, 2009
- The Summer Undergraduate Research in Energy Sciences grant for $3,500 from Case Western Reserve University, 2008
- The Case Alumni Association Junior/Senior Scholarship for $2,100 per year, 2008-2009
- The Provost's Scholarship for $14,400 per year for 4 years to attend Case Western Reserve University, 2005-2009

Presentations

- Hands-on demonstration of the rapid compression machine to senior faculty in the Mechanical Engineering Department at the University of Connecticut, senior engineers at Pratt & Whitney, and senior research fellows at United Technologies Research Center; October 2009
- <u>An Investigation of Hydrocarbon Flames using Probe Sampling and Gas Chromatography/Mass Spectrometry</u>; 2009 Symposium and Poster Session, sponsored by the Support of Undergraduate Research and Creative Endeavors Office at Case Western Reserve University; April 2009
- <u>Analysis of Hydrocarbon Fuels using Gas Chromatography/Mass Spectrometry</u>; 2008 Summer Undergraduate Research in Energy Sciences program, sponsored by the Dominion Energy East Ohio Branch; August 2008

Leadership Experience

Ultimate Frisbee Club, Case Western Reserve University, Cleveland, OH
President, 2008; *Treasurer,* 2007-2008; *Secretary and Webmaster*, 2006-2007; *Member*, 2005-2009
- Managed team budget with more than $10,000 in annual revenue and expenses
- Assisted in organizing and conducting North Coast Ultimate Frisbee tournaments for 22 teams from MI, PA, NY, and OH; 2006-2008
- Coordinated club activities with the Case Western Reserve University Athletic Department and Facilities Department
- Won Sports Club of the Year, 2007
- Coordinated week-long team trip to Jekyll Island, GA for High Tide Tournament, 2009

Combustion Diagnostics Lab, Case Western Reserve University, Cleveland, OH
Mentored an undergraduate student in the Summer Research in Energy Studies program, 2009

Computer Skills

Windows XP, SolidWorks, Microsoft Word, Excel, and PowerPoint, MatLab, LabView, CHEMKIN 4.1.1 (Chemical Kinetic Modeling Software)

Additional Related Coursework

Aerospace Design: Semester-long course to design an atmospheric miner for Neptune. Mission profile called for mining mission in the atmosphere of Neptune followed by launch to orbit, transfer of payload to another craft, and re-entry into the atmosphere for more mining missions. Design included nuclear-thermal propulsion system, cryogenic cooling and storage system, aerodynamics of the craft, and entry heating analysis. Participated as the lead propulsion system designer on a team of 3 people.

Combustion: Graduate Level. Chemical kinetics, thermodynamics, and governing conservation equations of chemically reacting flows. Laminar premixed and diffusion flames, ignition, extinction, flame stabilization, detonation, and droplet and particle combustion were covered.

Advanced Heat and Mass Transfer: Graduate Level. Review of the thermophysical properties of matter including nanoscale effects. Exact and computational solutions of heat conduction equations and dimensionless conduction rate approach for steady-state and transient conduction. Species diffusion equations with emphasis on stationary media and partitioning effects. Navier-Stokes equations and exact solutions for special cases.

Radiation Heat Transfer: Graduate Level. Fundamentals of radiative emission (black body behavior and Planck's law), surface properties (emissivity, absorptivity, reflectivity, and transmissivity), electromagnetic theory for prediction of radiative properties, development of solution methods for radiant energy interchange between surfaces and in enclosures with and without absorbing, emitting, and scattering media present.

Advanced Fluid Dynamics 1 and 2: Graduate Level. General equations for conservation of mass, momentum, and energy; and solutions for incompressible Newtonian viscous fluids were presented and analyzed. Kinematics and dynamics of inviscid and incompressible flow including free streamline theory were studied using vector, complex variable, and numerical techniques. Low and high Reynolds number approximations and boundary layer theory. Matching techniques and similarity solutions. Elements of gas dynamics including quasi-one-dimensional flow, shock waves, supersonic expansion, and linearized theory. Non-Newtonian fluids.

Flight and Orbital Mechanics: Aircraft performance, range and endurance, stability and control, take-off and landing, and simple maneuvers. Also included elements of celestial mechanics, orbit transfer, orbit decay due to drag, and lift-off and entry.

Aerophysics: Graduate Level. Physical and chemical topics in modern fluid mechanics, plasma dynamics, and combustion sciences, including quantum mechanical analysis of atomic and molecular structure, statistical thermodynamic calculations, chemical and physical equilibrium, reaction kinetics, and adiabatic flame temperature of complex reacting systems and transport phenomena.

Propulsion: Performance criteria of engines and air-breathing engine cycle analysis. Rocket flight performance and staging. Introduction to thermochemistry and combustion.

Aero and Gas Dynamics: Review of conservation equations and potential flow. Subsonic and supersonic airfoil theory, finite wings, isentropic one-dimensional flow, normal and oblique shock waves, and Prandtl-Meyer expansion waves.

Aerostructures: Mechanics of thin-walled aerospace structures including load analysis and shear flow due to shear and twisting loads in open and closed cross-sections. Introduction to structural vibrations and finite element methods. Included application of ALGOR FEA software to various related structures. As part of a team of 5, constructed and successfully test-flew a micro-air vehicle constructed from molded carbon fiber.

Mechanical Manufacturing: Focus on graphics and manufacturing processes. Included manual and computer-aided drafting and design, primary and secondary engineering processes, engineering materials, and a hands-on lab applying knowledge obtained in lectures.

Design of Fluid and Thermal Elements: Project-based class presenting practical design problems integrating fluid mechanics, thermodynamics, and heat transfer. A series of 6 projects were completed in teams of 3 over the semester.

Engineering Design: Semester-long project to design and build a small-scale hover craft in teams of 5.

Fluid and Thermal Engineering 2: Heat engines and refrigeration, chemical equilibrium, developing flow, boundary layer theory, hydrodynamic lubrication, heat transfer, and heat exchangers.