Curriculum Vitae

Charles A. Radovich

radovich@usc.edu

EDUCATION

- **Ph.D., Aerospace Engineering**, University of Southern California, Los Angeles, CA, 2010
  DISSERTATION: *Experiments on Spray from a Rolling Tire*
- **M.S., Aerospace Engineering**, University of Southern California, 2004
- **B.S., Aerospace Engineering**, University of Southern California, 2002

ACADEMIC EXPERIENCE

University of Southern California **Los Angeles, CA** **2010 – present**
Department of Aerospace & Mechanical Engineering

2018-present ***Associate Professor of Practice****, Aerospace and Mechanical Engineering*
2017-present ***Director*** *of Aerospace and Mechanical Instructional Laboratories*
2015-18 ***Senior Lecturer***
2010-15 ***Lecturer***

- Courses taught: Mechoptronics Laboratory (AME-341 a&b), Senior Projects Laboratory (AME-441a), Dynamics of Fluids (AME-309), Basic Flight Mechanics (AME-261), Statics (AME-201), Undergraduate Design Projects II (AME-491), Directed Research (AME-490)

Faculty Advisor

- 2010-now USC Aero Design Team, competes in the annual AIAA Design/Build/Fly competition
  - 1st Place 2020, 2017 and 2014, 2nd Place 2011
- 2018-now USC Advanced Spacecraft Propulsion and Energy Laboratory (ASPEN)
- 2016-20 American Society of Mechanical Engineering (ASME) Student Chapter
- 2015-17 Hyperloop at USC Design Team
  - Team selected to attend the first ever Competition Weekend in Hawthorne, CA summer 2016
- 2014-15 ASME Human Powered Vehicle Challenge (HPVC) Design Team
  - West region: 2015 3rd Place Endurance, 5th Place Overall

Research Assistant*, Department of Aerospace & Mechanical Engineering* 2004 – 2010
USC Splash and Spray Tire Lab

- Performed experiments on water spray formation and disintegration from a rolling tire
- Determined the mechanics of tire spray, droplet size distribution and velocity distribution as a function of droplet size
- Designed full-scale apparatus to produce tire spray in a laboratory setting
- Developed techniques for droplet detection and sizing through digital imaging
- Measured droplet velocity field using correlation image velocimetry (CIV)

Instructional Lab Manager*, Department of Aerospace & Mechanical Engineering* Fall 2008

Teaching Assistant*, Department of Aerospace & Mechanical Engineering* 2002 – 2004

Professional Memberships: American Institute of Aeronautics and Astronautics (AIAA), Sigma Gamma Tau (aerospace engineering national honor society), American Society for Engineering Education (ASEE)

External Examiner: Univ. of Pretoria: Aeronautics MLV 420 (Fall '13), Aerodynamics MLD 780 (Fall '14)

Awards: 2018 Orange County Engineering Council Outstanding Educator Award
2017 Northrop Grumman Excellence in Teaching Award

Manuscript Reviewer: *AIAA Journal of Aircraft*

PROFESSIONAL EXPERIENCE

Virgin Orbit **Long Beach, CA** **Dec. 2016 – Oct. 2019**
Aerodynamics Engineer Consultant

- Developed unsteady aerodynamic forcing functions for the LauncherOne vehicle platform based on wind tunnel test data at high angles of attack
  - Buffet predictions provided for the baseline outer mold line (OML) and protuberances
- Constructed the steady-state aerodynamics uncertainty database used by Guidance Navigation and Control (GNC) for ascent trajectory and performance simulations

Thor Trucks **North Hollywood, CA** **May-Dec. 2016**
Technical Advisor

- Advised this startup company on using computational fluid dynamics (CFD) to predict vehicle performance and estimate aerodynamic drag for an array of configurations; suggested CFD cases for them to run and methods for analyzing the data

Space Exploration Technologies (SpaceX) **Hawthorne, CA** **July 2009 – May 2016**
Aerodynamics Engineer

- Developed compartment venting methodology currently used by SpaceX to estimate the internal pressure and venting rate for all unpressurized structures during ascent and reentry
  - Used for vehicle all Falcon 9 launches, including Dragon missions
  - Responsible for sizing passive vent sizing and location(s) for the entire vehicle
  - Provided internal pressure predictions to Structures for sizing in-flight design loads; venting rates used by satellite customers and for internal compartments
  - Brought transparency to the dependency on internal pressure (vent size) and venting rate, which led to a venting design criteria used by all affected departments (Structures, Propulsion, Business Development, Aerodynamics)
  - Helped write and implement a Matlab utility to bypass Sinda/Fluint and automate venting predictions
- Wind tunnel testing of the Falcon 9 first stage reentry, Falcon Heavy ascent, Dragon capsule reentry, and Dragon launch abort configurations
  - Responsible for tunnel selection, model sizing and configuration, coordinating model fabrication, test and data requirements, sensor selection and placement, and data analysis
  - Results used to create aerodynamic databases for GNC (ascent and reentry), validate and modify predictive models, and drive design decisions (con-ops and vehicle geometry)
- Unsteady aerodynamics forcing functions for use with Coupled Loads Analysis
  - Provided predictions for the entire vehicle outer mold line (tip-to-tail) as well as all external protuberances (*e.g.*, antenna covers)
  - Responsible for documenting the SpaceX unsteady aerodynamics methodology for customer review (*e.g.*, the USAF and Aerospace Corp.) and training new team members
- On-orbit plume impingement analysis; results used by GNC to determine spacecraft control authority when thruster plumes are obstructed

Triumph Aerospace Systems Trisonic Wind Tunnel (TWT) **El Segundo, CA** **2002-2008**
Researcher and Test Engineer

- Analyzed steady state and dynamic data for various missiles and aircraft
- Prepared preliminary and final test reports for customers
- Quantified tunnel performance including flow quality, acoustic noise and repeatability
- Tested and implemented new high-speed data acquisition system

- Rewrote legacy force balance reduction routine for the high-speed data system using Matlab
- Created an electronic test log using MS-Excel and Visual Basic
- Performed force balance calibrations (primary and auxiliary balances, *e.g.*, fins)
- Assisted in the design and implementation of a wide-angle shadowgraph imaging setup
- Company formerly known as North American Aviation and Allied Aerospace

Boeing Satellite Systems **El Segundo, CA** **2001-2002**
Solar Array Division, Junior Design and Test Engineer

- Created qualification test plans and procedures for solar array hardware
- Analyzed and communicated solar cell life cycle test results to the design group
- Created conceptual electrical layout for a new solar panel stow and deploy design
- Developed 131 volume technical reference library

SOFTWARE AND UTILITIES

Skilled with MATLAB, LabVIEW, Sinda/Fluint, digital signal processing, FORTRAN, Visual Basic, digital imaging, MultiSIM, HTML, Photoshop, MS Office, SVN, Missile DATCOM; capable with Python, NX, SolidWorks, I-DEAS, AutoCAD; limited experience with Illustrator, OpenGL, C++, MySQL

RESEARCH INTERESTS

Experimental fluid mechanics, aerodynamics, flight mechanics, digital image acquisition and analysis

RESEARCH EXPERIENCE

- Water spray formation and disintegration from a rolling tire, USC, 2004-10
- Fuel Savings by Means of Flaps Attached to the Base of a Trailer: Field Tests, USC, 2004
- Centerline Acoustic Noise Calibration of the Allied Aerospace North American 7x7 foot Trisonic Wind Tunnel, 2003
- Fuel Saving Achieved in the Field Test of Two Tandem Trucks, USC, 2003
- Wind Tunnel Test of Cab Extender Incidence on Heavy Truck Aerodynamics, USC Dryden Wind Tunnel, 2002 and 2005
- Flow Field Determination for the USC Moving Ground Plane Wind Tunnel, 2001

PUBLICATIONS

- Browand, F., D. Plocher and C. Radovich. *Spray from a rolling tire: the mechanics of droplet formation*. University of Southern California Department of Aerospace & Mechanical Engineering Report USCAME 200, 2010.
- Radovich, C. and D. Plocher. *Experiments on Spray from a Rolling Tire*, Engineering Conferences International (ECI), Aerodynamics of Heavy Vehicles II: Trucks, Buses and Trains, Lake Tahoe, August 2007. ISBN: 3540850694, Springer.
- Radovich, C. *Wind Tunnel Test of Cab Extender Incidence on Heavy Truck Aerodynamics*, SAE Commercial Vehicle Engineering Congress, paper number 2005-01-3527 (05CV-249), November 2005.
- Browand, F., C. Radovich and M. Boivin. *Fuel Savings by Means of Flaps Attached to the Base of a Trailer: Field Test Results*, SAE 2005 World Congress & Exhibition, paper 2005-01-1016, April 2005.

- Medved, B. and C. Radovich. *Fluctuating Static Pressure Measurements in the Allied Aerospace North American 7 x 7 Foot Trisonic Wind Tunnel*, 24th International Congress of the Aeronautical Sciences, August 2004.
- Browand, F., J. McArthur and C. Radovich. *Fuel Savings Achieved in the Field Test of Two Tandem Trucks*, California PATH Research Report, report number UCB-ITS-PRR-2004-20, June 2004.
- Medved, B. and C. Radovich. *Notes on Test Section Optimum Porosity and Flow Quality in the Allied Aerospace North American 7 x 7 Foot Trisonic Wind Tunnel*, Supersonic Tunnel Association International, May 2004.
- Radovich, C. and J. McArthur. *Hotwire Anemometry*, pilot volume for the USC Viterbi School of Engineering Video Lecture Series, July 2004.

STUDENT DEVELOPMENT

Served as a Ph.D. committee member for the following students

- Saakar Byahut, AME (aircraft design), qualifying exam Feb. 2019. Primary advisor: Alejandra Uranga
- Orlando Delpino, AME (cavitation and crack propagation), qualifying exam Oct. 2014. Primary advisor: Veronica Eliasson
- Roe Burrell, AME (combustion), qualifying exam Sept. 2013. Primary advisor: Fokion Egolfopoulos
- Shanling Yang, AME (aerodynamics), defended Sept. 2013. Primary advisor: Geoffrey Spedding

AIAA Region VI Student Conference – Senior Projects that I advised

- 2019 2nd place, Joshua Kalani A. Ancheta, Sierra L. Dean, Luke E. Stevens, and Darian J. Wood. *Surface-Water-Air Propulsion (SWAP) System*
- 2018 1st place, James Blakely, Johann Freeberg, and Jacob Hogge. *Spray Cone Formation from Pintle-Type Injector Systems in Liquid Rocket Engines*
- 2015 2nd place, Min Maung, Kevin Sakumoto, Cody Sato, Brandon Uchimura. *Improved Surface Marker Buoy for Scuba Divers*
- 2014 2nd place, Daniel Buecker, Montgomerie Steele, Jordan Thayer & Katie Will. *Object Tracking Using Multiple Pan-Tilt Cameras*
- 2014 3rd place, Christoph Efstathiou, Brendan Plecque & Awadi Rathugamage. *Hydrophilic Coatings as a Means of Marine Drag Reduction*
- 2013: 1st place, Aditya Vaidyanathan, David Kingman & Theresa Kurth. *When do Endplates Work?*
- 2011: 1st place, Michael Jacobs, Mathew Dung & Alec Winetrobe. *Analysis and Design of a Mobile, Actively-Balanced Ballbot for Integration into Human Environments*

Undergraduate Directed Research Advisor (student / project)

- 2018 Hugo Villafana / DragonFly: Flapping macro air vehicle design
- 2018 Andrew Cecola / SANISOLV: Evaluation of a small scale two-stage anaerobic digester
- 2015 Justin Field / Fairing optimization for multiple riders of a human powered vehicle
- 2015 Stephen Rolfe / Composite fuel strand burner
- 2015 Jason Silverman / Propulsive landing of a solid rocket vehicle
- 2014 Bradley Hartwig / Offsetting the angle of tandem propellers as a means for noise reduction
- 2012 Benjamin Title / CNC hotwire cutter for tapered and swept wings
- 2011 Matthew Cowen / Genetic algorithm based MDO tool for UAV design
- 2011 Justin Brooks / Visual Effects – Use of ultrasonic misters and LED's to emulate fire

Additional Student Design Project Involvement

- 2018-now USC Recumbent Vehicle Design Team (RVDT): invited design reviewer
- 2016-18 USC Liquid Propulsion Lab (LPL): advised students on pintle injector design, manufacturing, and test methods
- 2016-17 Rocket Propulsion Lab (RPL): invited design reviewer
- 2014-now SC Racing Formula SAE Design Team: invited design reviewer
- 2013-15 USC Autonomous Underwater Vehicle (AUV) Design Team: invited design reviewer
- 2015 Senior Design Expo, Best Design Team award: Stefano Bauk, Rayed Khan, Derek Nielsen, and Chase Totoris / Closed loop control of a leading-edge flap

Other Involvement and Outreach Activities

- Explore USC Scholarship Presidential and Trustee Scholarship Interviewer, 2015-now
- Commencement and Admittance Ceremonies
    - Announcer of Degree Candidates (VSOE 2017, '18, '19); Faculty Marshal for USC Main and Viterbi Ceremonies; New Student Convocation; VSOE New Student Welcome (repeated)
- USC Architecture Graduate Thesis collaboration for composites manufacturing, 2019, '20
- ASME USC Chapter: Evening with Faculty, invited guest speaker, August 2020
- Girls in Aerospace and Mechanical Engineering (GAME) outreach event hosted on campus for local high school students, May 2019
- AME Faculty Spotlight 2019
- AIAA USC Chapter: Evening with Faculty, invited guest speaker, September 2019, October '16
- SHPE USC Chapter: Member Appreciation Banquet '19; Alumni Panel '18, Evening with Faculty '15
- NSBE USC Chapter: Evening with Faculty 2015, '16, '17, '19
- Judge at the SpaceX Hyperloop Design Weekend at Texas A&M University, January 2016
- Peaks and Professors, student hike of Switzer Falls, November 2015
- Viterbi Student Alumni Mentoring Program (VSAMP), one-on-one interaction with a current USC engineering student, 2014-19
- Sigma Gamma Tau Dinner with Faculty, invited speaker, March 2013

CONFERENCES, PRESENTATIONS AND PROFESSIONAL DEVELOPMENT

- Process Oriented Guided Inquiry learning (POGIL) workshop for educators, 2019
- Viterbi Workshop for Teaching Track Faculty Mentors, September 2019
- Viterbi Workshop for Teaching Track Faculty, August 2019
- Aero Club of Southern California (ACSC) Scholarship Awards, Keynote Speaker, September 2018
- Capstone Design Conference in Columbus, OH, workshop participant, June 2016
- Division of Engineering Education (DEE) Retreat, attendee (4 events since 2013)
- *Experiments on Tire Spray: Breakup Mechanisms and a Determination of the Spray Field*, invited speaker for a seminar at Lawrence Livermore National Laboratory, February. 4th, 2011
- *Experiments on Spray from a Rolling Tire*, 63rd Annual Meeting of the American Physical Society (APS) Division of Fluid Dynamics (DFD), November 21st - 23rd, 2010, presenter
- *Experiments on Spray from a Rolling Tire*, Engineering Conferences International (ECI), Aerodynamics of Heavy Vehicles II: Trucks, Buses and Trains, Lake Tahoe, August 2007, presenter
- *Wind Tunnel Test of Cab Extender Incidence on Heavy Truck Aerodynamics*, SAE Commercial Vehicle Engineering Congress, November 2005, presenter

MEDIA AND NEWS ARTICLES

- Viterbi Voices Podcast, *Teaching Mechoptronics Lab Remotely with Prof. Radovich*, Aug 2020 (link)
- Viterbi News, *As the World Goes Remote, USC Researchers, Entrepreneurs Work to Fill Gap in Healthcare Supply Chain*, April 2020 (link)
- Viterbi News, *Up, Up and Away! – L.A. Youth Gain Hands-On Engineering Experience at Three-Day Camp Hosted by the USC Viterbi Department of Aerospace and Mechanical Engineering*, August 2019 (link)
- Viterbi News, *Local High School Students Gain Practical Experience and Inspiration at AME Outreach Event*, May 2019 (link)
- Viterbi News, *USC Viterbi's AeroDesign Team: A winning history*, February 2018 (link)
- USC News, *Adviser's faith in USC AeroDesign Team pays off with impressive win*, May 2017 (link)
- Viterbi News, *The AeroDesign Team Turns a Crash into a Victory*, May 2017 (link)
- USC News, *Engineering alum helps USC aeronautics team reach new heights*, January 2017 (link)
- Viterbi News, *"Aviate, Navigate, Communicate": The Rules of Flying*, December 2016 (link)
- USC News, *Student engineers shoot to No. 1 in airplane design-and-fly contest*, May 2014 (link)
- USC News, *It's always sunny in the Coliseum*, February 2013 (link)