

Raymond Chow, Ph.D.

407 First Street, #1
Davis, CA 95616
(530) 848-0706
rchow@ucdavis.edu

Experience

- Nov. 2011 – Present **Postdoctoral Scholar**, *University of California, Davis* Davis, CA
Conducted computational fluid dynamic (CFD) based research on novel wind turbine rotors designs, active aerodynamic load control devices, control systems, as well as performing extensive wind tunnel experiments with mechanically actuated and pneumatic devices. Mentored and supervised the research of Ph.D. and MS students on aerodynamics, wind energy and numerical methods. Also managed the research facilities including the computational resources and wind tunnel.
- June 2011 – Present **Engineering Consultant**, *Senta Engineering, LLC* Davis, CA
Performed various advanced aerodynamic performance analysis, engineering design, cost analysis, and technology evaluation studies for various wind turbine manufacturers and design firms. Conducted detailed parametric study on utility scale, fan driven, air-cooled condensers (ACCs) to characterize and optimize plant layout configurations. Designed and deployed computational clusters, enabling large, scale in-house CFD simulations.
- June 2006 – Dec. 2006 **Intern**, *Eloret Corp* Ames Research Center, Moffett Field, CA
Contractor for the NASA Advanced Supercomputing (NAS) Division, generated state-of-the-art, multi-body overset grid systems using Chimera Grid Tools. Performed 3-D URANS CFD simulations using OVERFLOW-2 on the Columbia HPC. Worked with researchers on varying projects including: grid generation and computational simulations of shuttle rocket booster (SRB) breaches in the Vehicle Assembly Building (VAB) at Kennedy Space Center, developing the grid generation script for the flame trench of the KSC launch pad for shuttle/Ares launch simulations, and scripting of grid generation for a circulation control airfoil for DNS simulations.
- Mar. 2004 – June 2011 **Graduate Student Researcher**, *University of California, Davis* Davis, CA
Performed degree oriented and assorted research related tasks as a member of the Applied Aerodynamics Research Group advised by Prof. C.P. van Dam. Conducted complex aerodynamic 2-D/3-D URANS simulations on various wind energy and aerospace related projects using HPC resources; developed BEM codes and grid generation scripts for in-house and DOE use; deployed and maintained BEOWULF computational clusters, file servers and workstations; trained and mentored new students to the graduate group.
- Jul. 2003 – Feb. 2004 **Undergraduate Student Researcher**, *University of California, Davis* Davis, CA
Performed computational fluid and thermal analysis on surface skin friction and heating response in order to detect boundary layer transition on the airfoils of the (NASA Langley) Mars 'ARES' flyer under Martian atmospheric (high Mach, low Reynolds number) conditions.

Education

- June 2006 – **Ph.D.**, *University of California, Davis* Davis, CA
June 2011 Department of Mechanical and Aeronautical Engineering
Major: Thermo-Fluid Dynamics
Minor: Computational Engineering and Advanced Power Systems
Dissertation: “*Computational Investigations of Inboard Flow Separation and Mitigation Techniques on Multi-Megawatt Wind Turbines*”
- Mar 2004 – **M.S.**, *University of California, Davis* Davis, CA
June 2006 Department of Mechanical and Aeronautical Engineering
Thesis: “*Unsteady Computational Investigations of Deploying Load-Control Microtabs*”
Performed computational simulations of deploying active load-control devices on an airfoil using OVERFLOW-2. Examined the transient and long-term temporal behavior of the aerodynamic response due the change in the near body geometry. Generated novel and complex viscous grid topologies to model the geometry and deployment of the boundary-layer scale devices.
- Sept 2001 – **B.S.**, *University of California, Davis* Davis, CA
Mar 2004 Aeronautical Science and Engineering with Highest Honors
Mechanical Engineering with Highest Honors
Overall GPA: 3.90 / 4.0, Ranked 22 / 1129 in College of Engineering
- Sept 1998 – *City College of San Francisco* San Francisco, CA
June 2001 Overall GPA: 3.81 / 4.0

Distinctions

- 2009-2010 GEMA Fellowship
Dept. Mechanical and Aeronautical Engineering, UC Davis
- 2004-2007 National Defense Science and Engineering Graduate (NDSEG) Fellowship
Army Research Office and American Society of Engineering Education
- 2001-2004 College of Engineering Dean’s List (7 of 8 quarters), *UC Davis*
- 2001 *Stephen J. Cooper Memorial Scholarship, CCSF Engineering Dept.*

Journal Publications

- Blaylock, M., Chow, R., and van Dam, C.P., “Comparison of Pneumatic Jets and Tabs for Active Aerodynamic Load Control,” *Journal of Wind Energy*, vol. 17, no. 9, Sept. 2013, pp. 1365-1384. [doi: 10.1002/we.1638]
- Cooperman, A.M., Chow, R., and van Dam, C.P., “Active Load Control of a Wind Turbine Airfoil Using Microtabs,” *Journal of Aircraft*, vol. 50, no. 4, Jul. 2013, pp. 1150-1158. [doi: 10.2514/1.C032083]
- Chow, R., and van Dam, C.P., “Computational Investigations of Inboard Blunt Trailing Edge Modifications on the NREL 5-MW Rotor,” *Journal of Wind Energy*, vol. 16, no. 3, Apr. 2013, pp. 445-458. [doi: 10.1002/we.1505]

Chow, R., and van Dam, C.P., "Verification of Computational Simulations of the NREL 5-MW Rotor with a Focus on Inboard Flow Separation," *Journal of Wind Energy*, vol. 15, no. 8, Nov. 2012, pp. 967-981. [doi: 10.1002/we.529]

Chow, R., and van Dam, C.P., "On the Temporal Response of Active Load Control Devices," *Journal of Wind Energy*, vol.13, no. 2-3, Mar.-Apr. 2010, pp. 135-149. [doi:10.1002/we.370]

Chow, R., and van Dam, C.P., "Unsteady Computational Investigations of Deploying Load Control Microtabs," *Journal of Aircraft*, vol. 43, no. 5, Sept.-Oct. 2006, pp. 1458-1469. [doi:10.2514/1.22562]

Conference Papers

Langel, C.M., Chow, R., and van Dam, C.P., "Further Developments to a Local Correlation Based Roughness Model for Boundary Layer Transition Prediction," AIAA-2015-1232, 53rd AIAA Aerospace Sciences Meeting, Orlando, FL, Jan. 2015. [doi: 10.2514/6.2015-1232]

Langel, C.M., Chow, R., Hurley, O., van Dam, C.P., Maniaci, D.M., Erhmann, R.S., White., E.B., "Analysis of the Impact of Leading Edge Surface Degradation on Wind Turbine Performance," AIAA-2015-0489, 53rd AIAA Aerospace Sciences Meeting, Orlando, FL, Jan. 2015. [doi: 10.2514/6.2015-0489]

Anderson, E.W., Chow, R., and van Dam, C.P., "A Comparison of the NREL 5-MW Wake Characteristics Using Both SOWFA and OVERFLOW2," AIAA-2015-0726, 53rd AIAA Aerospace Sciences Meeting, Orlando, FL, Jan. 2015. [doi: 10.2514/6.2015-0726]

Langel, C.M., Chow, R., van Dam, C.P., Maniaci, D.M., Erhmann, R.S., White., E.B., "A Computational Approach to Simulating the Effects of Realistic Surface Roughness on Boundary Layer Transition," AIAA-2014-0234, 52nd AIAA Aerospace Sciences Meeting, Orlando, FL, Jan. 2014. [doi: 10.2514/6.2014-0234]

Erhmann, R.S., White., E.B., Maniaci, D.M., Chow, R., Langel, C.M., and van Dam, C.P., "Realistic Leading-Edge Roughness Effects on Airfoil Performance," AIAA-2013-2800, 31st AIAA Applied Aerodynamics Conference, San Diego, CA, Jun. 2013. [doi:10.2514/6.2013-2800]

Chow, R., and van Dam, C.P., "Inboard Stall and Separation Mitigation Techniques on Wind Turbine Rotors," AIAA-2011-152, 49th AIAA Aerospace Sciences Meeting, Orlando, FL, Jan. 2011.

Cooperman, A.M., Chow, R., Johnson, S.J., and van Dam, C.P., "Experimental and Computational Analysis of Wind Turbine Airfoil with Active Microtabs," AIAA-2011-347, 49th AIAA Aerospace Sciences Meeting, Orlando, FL, Jan. 2011.

Chow, R., and van Dam, C.P., "Analysis of Inboard Flow Separation on Wind Turbine Blades," Torque 2010, 3rd EAWE (European Academy of Wind Energy) Conference, Heraklion, Greece, Jul. 2010.

Blaylock, M., Chow, R., and van Dam, C.P., "Comparison of Microjets with Microtabs for Active Aerodynamic Load Control," AIAA-2010-4409, 5th AIAA Flow Control Conference, Chicago, IL, Jun. 2010.

Cooperman, A.M., McLennan, A.W., Chow, R., Baker, J.P., and van Dam, C.P., “Aerodynamic Performance of Thick Blunt Trailing Edge Airfoils,” AIAA-2010-4228, 28th AIAA Applied Aerodynamics Conference, Chicago, IL, Jun. 2010.

van Dam, C.P., Cooperman, A., McLennan, A., Chow, R., and Baker, J.P., “Thick Airfoils with Blunt Trailing Edge for Wind Turbine Blades,” Proc. of the ASME Turbo Expo 2010, Jun. 2010.

Yoo, S.Y., Chow, R., Mayda, E.A., and van Dam, C.P., “Integrated Method of CFD and Grid Generation for Automatic Generation of Airfoil Performance Tables,” AIAA-2008-1332, 46th AIAA Aerospace Sciences Meeting, Reno, NV, Jan. 2008.

Berg, D.E., Zayas, J.R., Lobitz, D.W., van Dam, C.P., Chow, R., Baker, J.P., “Active Aerodynamic Load Control of Wind Turbine Blades,” Proc. of the 5th Joint ASME/JSME Fluids Engineering Conference, FEDSM2007-37604, San Diego, CA, 2007.

van Dam, C.P., Chow, R., Zayas, J.R., and Berg, D.E., “Computational Investigations of Small Deploying Tabs and Flaps for Aerodynamic Load Control,” Paper 012027, *Journal of Physics: Conference Series*, vol. 75, 2007. [DOI:10.1088/1742-6596/75/1/012027]

van Dam, C.P., Chow, R., Zayas, J.R., and Lobitz, D.W., “Active Load Control of Wind Turbine Blades Using Small Tabs or Flaps,” AWEA (American Wind Energy Association) Windpower 2007, Los Angeles, CA, June 2007.

van Dam, C.P., Chow, R., Zayas, J.R., and Lobitz, D.W., “Active Aerodynamic Load Control of Blades Using Small Tabs or Flaps,” 2007 European Wind Energy Conference, Milan, Italy, May 2007.

Chow, R., and van Dam, C.P., “Unsteady Computational Investigations of Deploying Load Control Microtabs on a Wind Turbine Airfoil,” AIAA-2007-1018, Jan. 2007.

Zayas, J.R., van Dam, C.P., Chow, R., Baker, J.P., and Mayda, E.A., “Active Aerodynamic Load Control for Wind Turbine Blades,” 2006 European Wind Energy Conference, Athens, Greece, Feb. 2006.

Chow, R., and van Dam, C.P., “Unsteady Computational Investigations of Deploying Load Control Microtabs,” AIAA-2006-1063, 44th AIAA Aerospace Sciences Meeting, Reno, NV, Jan. 2006.

Chow, R., and van Dam, C.P., “Analysis of Airfoil Surface Temperature Distributions at High Altitude Conditions,” NASA Contractor Report, Dec. 2003.

Service

Peer Reviewer Aerospace Science and Technology (Elsevier), Journal of Aircraft (AIAA), Journal of Wind Energy (Wiley), Journal of Solar Energy Engineering (ASME), AIAA SciTech, ASME Wind Energy Symposium, ASME Turbo Expo

Pertinent Skills

| | |
|-----------------|--|
| Flow Solvers | OVERFLOW (1.8, 2.x), CFL3D, ARC2D, MSES/MSIS, XFOIL, WT_PERF |
| Grid Generation | Chimera Grid Tools, OVERGRID, scripting and automation |
| Post-Processing | Fieldview, TecPlot, PLOT3D, Photoshop |
| Programming | Fortran (77,90/95), MPI, Python, TCL/TK, Matlab, C, Perl, Shell, etc |
| Miscellaneous | Cluster/workstation/network/RAID hardware and software deployment, |

Linux/Unix administration, PBS management (TORQUE/SLURM) on HPC platforms

Academic and Professional Societies

Tau Beta Pi, CAA '03 – Engineering Honor Society

Phi Kappa Phi – Academic Honor Society

Golden Key – International Honor Society

UCD Rocket Club – Founding Member (2002-2005)

AIAA, American Institute of Astronautics and Aeronautics

ASME, American Society of Mechanical Engineers

SAE, Society of Automotive Engineers