

Dudley Stephen Nichols, III

Education

PhD, Engineering (Emphasis on Aerospace Engineering), Mississippi State University, August 2002
MS, Aerospace Engineering (Minor, Mechanical Engineering), Mississippi State University, May 1998
BS, Aerospace Engineering (Emphasis on Astrodynamics), United States Naval Academy, May 1992

Employment History

Computational Scientist, Center for Computational Sciences, Oak Ridge National Laboratory, November 2019-Present
Assistant Professor, Department of Aerospace Engineering, Auburn University, August 2016-October 2019
Associate Research Professor, Department of Aerospace Engineering, Auburn University, August 2015-August 2016
Associate Research Professor, SimCenter, University of Tennessee at Chattanooga, July 2008-August 2015
Assistant Research Professor, SimCenter, University of Tennessee at Chattanooga, Aug 2002- June 2008
Research Associate, SimCenter, Engineering Research Center, Mississippi State University, Sept 1999-Aug 2002
Aerospace Engineer, Naval Surface Warfare Center Dahlgren Division (NSWCDD), Feb 1999-Aug 1999
Project Engineer, USMC Lightweight Laser Rangefinder Designator Program, NSWCDD, Sept 1998- Jan 1999
Graduate Research Assistant, MSU-NSF Engineering Research Center, Mississippi State University, May 1994-Sept 1998
Naval Officer, Ensign, United States Navy, May 1992-April 1994

Leadership Roles

ECP L4 Manager and Principal Investigator

Project Title: ECP Frontier Application Integration

Budget: \$14,000,000 (2nd half of overall project budget)

Duration: 2021-Present (2nd half of project duration)

Assumed managerial/PI role in FY2021 Q2 and responsible for the \$14M budget that deeply engages 14 separate ECP AD applications and supports numerous ECP ST projects and HPE and AMD activities to ensure application readiness for the new OLCF Frontier system. Specific accomplishments to date include:

- Managed the completion of 21 project milestones with 3 in-progress and 5 planned milestones
- Managed the project budget to maintain desired CPI and SPI
- Exercised 5 contract options for Frontier Center of Excellence activities and ensured their timely enactment
- Worked with the ECP project office to budget for a two-quarter extension for Frontier Application Integration
- Working with the ECP project office to plan the milestones for the extension
- Curated 24 monthly reports with updates for 14 ECP AD projects
- Completed and submitted 8 detailed quarterly reports
- Attended monthly meetings of the Frontier Center of Excellence Management Council
- Helped organize the Application Integration Sessions for 3 ECP Annual Meetings

Technical Discipline Chair (TDC) for the Meshing, Visualization, and Computational Environments (MVCE) Technical Sessions of the 2023 AIAA SciTech Conference, February 2022 to January 2023.

- Attended bi-weekly status meetings with AIAA conference planners
- Created and submitted the MVCE Call-For-Papers
- Recruited and assigned reviewers for the submitted extended abstracts
- Accepted or rejected the submitted abstracts according to the reviews
- Created and populated the MVCE technical sessions
- Managed the session changes to accommodate virtual or in-person preferences and paper withdrawals
- Recruited and assigned session chairs for the MVCE technical sessions
- Updated the MVCE Technical Committee members at the quarterly meetings

Deputy Technical Discipline Chair (DTDC) for the MVCE Technical Sessions of the 2023 AIAA SciTech Conference, February 2022 to January 2023.

- Shadowed the TDC to learn the process and to assist when necessary
- Attended bi-weekly status meetings with AIAA conference planners
- Coordinated the transfer of papers to/from MVCE sessions with TDCs and DTDCs of other technical committees
- Reviewed multiple submitted abstracts to ensure a sufficient number of reviews
- Chaired a technical session

Member of the AIAA MVCE Technical Committee, June 2019 to Present

- Attended the quarterly MVCE TC meetings and contributed to the discussions

Chair of the MVCE Computational Environments (CE) Subcommittee, August 2022 to Present

- Leading the discussions to give new direction and purpose to the “CE” part of “MVCE”
- Created a draft document that attempts to provide a modern definition for “Computational Environment”
- Briefed the MVCE TC on subcommittee activities and progress at the quarterly TC meetings

Mentored 3 Junior Staff Members in the Advanced Computing for Life Sciences and Engineering Group (2020 to Present)

Faculty Advisor for the AIAA Student Chapter at Auburn University (2016 to 2019)

Managed research for 37 funded projects as PI or Co-PI (2004 to Present)

Research Expertise in Computational Fluid Dynamics

Parallel Unstructured and Structured Flow Solvers

Unsteady Free-Surface Flows

Turbulence Modeling

Multi-Phase and Multi-Species Modeling

Meshless Smoothed Particle Hydrodynamics

Preconditioned Equations

Surface-Ship Hydrodynamics and Maneuvering

Flood Control and Disaster Mitigation

Source Term Utilization

Grid Generation

Scientific Supercomputing Experience

3.25 years as a Computational Scientist in the Scientific Computing and the Life Sciences and Engineering Groups at NCCS

- L4 Manager and PI of ECP Frontier Application Integration
- Engaged with 9 INCITE projects, the CAAR GESTS project, and the ECP ExaAM project
- Performed initial testing for the CAAR GESTS project on OLCF Frontier system with the largest known 3D Direct Numerical Simulation to date: 32768^3 problem size with over 35 trillion grid points.
- Created 15 gitlab repos either to reproduce problems or for demonstration and tutorial purposes on OLCF systems
- Refactored Fortran/C/C++ codes for better utilization of current and emerging GPU-accelerated OLCF systems

17 years of professional experience as a Code Developer (C/C++) for *Tenasi*, the highly scalable, parallel, general multi-element, unstructured flow solver developed at the SimCenter: National Center for Computational Engineering

- Developed and Implemented an Incompressible Multi-Species model with Total Energy Conservation
- Improved and validated 2 preconditioned mathematical models for multi-phase and multi-species flows
- Implemented 7 turbulence models and improved the sub-grid scale modeling of the 7 models
- Developed 2 atmospheric models that support full atmospheric stratification and gravitational potential

3 years of professional experience as a Code Developer (C/C++/Fortran) for U^2 NCLE, the highly scalable, parallel, general multi-element, unstructured flow solver developed at the Mississippi State University SimCenter

- Implemented and Improved a Multi-Phase Surface Capturing model to study Surface-Ship and Underwater-Vehicle Hydrodynamics and Maneuvering

General Software Development

24 years of professional experience with

- High Performance Scientific Supercomputing
- Mathematical Modeling and High-Resolution Computational Algorithm Development
- C, C++, and Fortran Programming in Unix/Linux Environments
- MPI, OpenMP for CPUs and GPUs, CUDA, OpenACC, HIP, ROCm
- Shell and Python scripting in Unix/Linux environments
- Version Control using SVN and GIT
- Build/CI Testing

Professional Memberships

Senior Member of American Institute of Aeronautics and Astronautics (AIAA)

AIAA Meshing, Visualization, and Computational Environments (MVCE) Technical Committee

Member of Association for Computing Machinery (ACM)

Reviewer

Journal of Ship Research

Computers & Fluids

Journal of Fluids Engineering

AIAA Journal

Book Chapters

1. Adhikari, N. and Nichols, D.S., "Grid Generation About High Lift Wing Configurations", *Numerical Simulation of the Aerodynamics of High-Lift Configurations*, ISBN:978-3-319-62135-7, Springer, May 2018.
2. Adhikari, N. and Nichols, D.S., "Incompressible Solutions About High Lift Wing Configurations", *Numerical Simulation of the Aerodynamics of High-Lift Configurations*, ISBN:978-3-319-62135-7, Springer, May 2018

Presentations

1. DeWitt, S., Newman, C., Nichols, S., Fattebert, J.L., Radhakrishnan, B., Coleman, J., Knapp, G., Belak, J., and Turner, J., "Testing Analytic Models and Heuristics for Microstructure Evolution with 3D, Dendrite-Resolved Phase-Field Simulations of Entire Spot Melts", to be presented, 2023 TMS Annual Meeting and Exhibition, March 21, 2023.
2. Yeung, P.K, Ravikumar, K., Nichols, S., and Uma-Vaideswaran, R., "Turbulence at the Exascale: Particle Tracking and Asynchronous GPU Algorithm for Low-Diffusivity Turbulent Mixing", to be presented, American Physical Society March Meeting, March 7, 2023.
3. Yeung, P.K, Ravikumar, K., Nichols, S., "Turbulence Simulations on the Verge of Exascale: GPU Algorithms and an Alternative to Long Simulations at High Resolutions", American Physical Society, 75th Annual Meeting of the Division of Fluid Dynamics, November 21, 2022.
4. Nichols, S., "Turbulence Simulations on the Verge of Exascale", 2022 OLCF User Meeting, October 18, 2022.
5. DeWitt, S., Newman, C., Nichols, S., Fattebert, J.L., Radhakrishnan, B., Belak, J., and Turner, J., "Simulating Spot Melts in 3D with Dendrite-Scale Resolution", TMS Additive Manufacturing Benchmarks 2022, August 16, 2022.
6. Nichols, S., Radhakrishnan, B., and Yeung, P.K, "Performance and Portability with Fortran OpenMP Offload for ECP ExaAM and CAAR GESTS", P3HPC BoF, ECP Community BoF Days, May 11, 2022.
7. Yeung, P.K, Ravikumar, K., Nichols, S., and Uma-Vaideswaran, R., "Simulation of Extreme-Scale Homogeneous Turbulence on a New Leadership Exascale GPU Platform", APS March Meeting, March 16, 2022.

Papers

1. Budardjia, R., Eisenbach, M., Jansen, G., Joubert, W., Nichols, S., Berril, M., Tharrington, A., Rogers, D., and Messer, B., "Ready for the Frontier: Preparing Applications for the World's First Exascale System", Submitted to ISC High Performance 2023, to be held May 21-25, Hamburg, Germany, *Accepted*.
2. Ravikumar, K., Hernandez, O., Levesque, J. Nichols, S., Yeung, P.K., "Achieving Portability for a Highly Optimized GPU Code for 3D Fourier Transforms at Extreme Problem Sizes", P3HPC Forum 2020.
3. Siemon, M. and Nichols, D.S., "CFD Analysis of Heterogeneous and Homogeneous Multi-Truck Platoon Aerodynamic Drag Reduction", AIAA Paper 2018-3862, AIAA Fluid Dynamics Conference, Atlanta, GA, June 2018
4. Siemon, M., Smith, P., Nichols, D.S., Bevly, D., and Helm, S., "An Integrated CFD and Truck Simulation for 4 Vehicle Platoons," WCX Paper 2018-01-0797, WCX: SAE World Congress Experience, Detroit, MI, April 2018.
5. Siemon, M. and Nichols, D.S., "A Numerical Investigation of Vortex Dynamics about a Streamlined Cylinder at Various Aspect Ratios", AIAA Paper 2017-3307, 47th AIAA Fluid Dynamics Conference, Denver, CO, June 2017.
6. Hereth, E.A., Sreenivas, K., Taylor, L.K., and Nichols, D.S., "Automatic Parallel Octree Grid Generation Software with an Extensible Solver Framework and a Focus on Urban Environments", AIAA Paper 2017-0587, 55th AIAA Aerospace Sciences Meeting, Grapevine, TX, January 2017.
7. Mittal, A., Taylor, L, Sreenivas, K, Nichols, D.S, and Briley, W.R., "Extension of a Parabolic Method without Pressure Approximations for Wind Turbines in ABL Flows", AIAA Paper 2015-3391, 33rd AIAA Applied Aerodynamics Conference, Dallas, TX, June 2015.
8. Nichols, III, D. S., "Accounting for Shocks in Turbulence Modeling," 41st AIAA Fluid Dynamics Conference, Honolulu, Hawaii, June 2011.
9. Hyams, D.G., Sreenivas, K., Pankajakshan, R., Nichols, III, D.S., Briley, W.R., and Whitfield, D.L., "Computational simulation of model and full-scale Class 8 trucks with drag reduction devices," *Computers & Fluids*, Volume 41, Issue 1, February 2011, Pages 27-40.
10. M. Hajjawi, L. Taylor, and S. Nichols, "Assessment and Modification for Reynolds Stress Transport Turbulence Model Flow Prediction," AIAA-2008-568, 46th AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, Jan. 7-10, 2008.
11. M. Hajjawi, L. Taylor, and S. Nichols, "Assessment of Filtered-Based RANS Turbulence Model For Unsteady Separated Flow Prediction," AIAA-2008-670, 46th AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, Jan. 7-10, 2008.
12. S. Nichols, K. Sreenivas, S. Karman and B. Mitchell, "Turbulence Modeling for Highly Separated Flows," AIAA-2007-1407, 45th AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, Jan. 8-11, 2007.
13. K. Sreenivas, B. Mitchell, S. Sawyer, S. Karman, S. Nichols, and D. Hyams, "Computational Prediction of Forces and Moments for Transport Aircraft," AIAA-2007-1088, 45th AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, Jan. 8-11, 2007.

14. K. Sreenivas, S. Nichols, D. Hyams, B. Mitchell, S. Sawyer, and D. Whitfield, "Computational Simulation of Heavy Trucks," AIAA-2007-1087, 45th AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, Jan. 8-11, 2007.
15. A. Arabshahi, K. Sreenivas, S. Nichols, B. Mitchell, L. Taylor and D. Whitfield, "Computational Analysis of Turbulent Internal Flow in Ballistic Rocket Motors," AIAA-2007-1449, 45th AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, Jan. 8-11, 2007.
16. Wilson, R.V., Nichols, D.S., Mitchell, B., Karman, S.L., Hyams, D.G., Sreenivas, K., Taylor, L.K., Briley, W.R., and Whitfield, D.L., "Application of an Unstructured Free Surface Flow Solver for High Speed Transom Stern Ships," 26th Symposium on Naval Hydrodynamics, Rome Italy, September. 17-22, 2006.
17. S. Nichols, B. Mitchell, K. Sreenivas, L. Taylor, D. Whitfield and R. Briley, "Aerosol Propagation in an Urban Environment," AIAA 2006-3726, June 2006.
18. S. Nichols, D. Hyams, K. Sreenivas, B. Mitchell, L. Taylor, D. Whitfield, "An Unstructured Incompressible Multi-Phase Solution Algorithm", AIAA-2006-1290, 44th AIAA Aerospace Sciences Meeting and Exhibit, January 2006.
19. K. Sreenivas, R. Pankajakshan, S. Nichols B. Mitchell, L. Taylor, D. Whitfield, "Aerodynamic Simulation of Heavy Trucks with Rotating Wheels", AIAA-2006-1394, 44th AIAA Aerospace Sciences Meeting and Exhibit, January 2006.
20. Sreenivas, K., Hyams, D., Nichols, S., Mitchell, B., Taylor, L., Briley, R., Whitfield, D., *Development of an Unstructured Parallel Flow Solver for Arbitrary Mach Numbers*, 43rd AIAA Aerospace Sciences Meeting and Exhibit, AIAA 2005-0325, January 2005
21. Nichols, D. S. III, *Development of a Free Surface Method Utilizing an Incompressible Multi-Phase Algorithm to Study the flow about Surface Ships and Underwater Vehicles*, Doctoral Thesis, Mississippi State University, August 2002
22. Hyams, D.G., Sreenivas, K., Sheng, C., Nichols, S., Taylor, L.K., Briley, W.R., and Whitfield, D.L., *An Unstructured Multielement Solution Algorithm for Complex Geometry Hydrodynamic Simulations*, 23rd Symposium on Naval Hydrodynamics, Val de Reuil, France, September 2000.
23. Beddhu, M., Nichols, S., Jiang, M.Y., Sheng, C., Whitfield, D.L., and Taylor, L.K., *Comparison of EFD and CFD Results of the Free Surface Flow Field about the Series 60 $C_B = 0.6$ Ship*, 25th American Towing Conference, Iowa City, IA, Sept. 1998
24. Nichols, D. S. III, *Calculation of Free Surface Wave Forms and Flow Field about the Series 60 $C_B=0.6$ Ship*, Masters Thesis, Mississippi State University, May 1998

HPC Awards

Source: INCITE 2022

Title: Interplay Between Cell/Dendrite and Grain Length Scales as Spot Melts Solidify
 Node Hours: 370,000 Node Hours
 Role: Co-Investigator

Funded Projects (37 Total: 19 Extramural and 18 University Intramural)

Source: DOE/ACM

Title: Fuel Efficient Platooning in Mixed Traffic Highway Environments
 Amount: \$393,646 and \$274,284 Auburn Cost Share
 Duration: 2018-2019
 Role: Co-Principal Investigator
 Effort: Performed High-Fidelity CFD Simulations of Truck Platoons in Multiple Configurations

Source: Integrated Solutions for Systems (IS4S)/Army

Title: Fuel Efficiency for Tactical Wheel Vehicles and Convoys
 Amount: \$200,000
 Duration: 2018-2019
 Role: Co-Principal Investigator
 Effort: Performed High-Fidelity CFD Simulations of Truck Platoons in Multiple Configurations

Source: Bush Hog, Inc

Title: Simulations of Bush Hog, Inc Mowing Decks
 Amount: \$5,500
 Duration: 2019
 Role: Principal Investigator
 Effort: Performed Numerical Simulations of Flow Patterns Under Multiple Three-Bladed Mowing Decks

Source: CHI, Engineering
Title: Risk Mitigation for Commercial Point (Extended)
Amount: \$44,000
Duration: 2017-2018
Role: Principal Investigator
Effort: Performed Numerical Simulations to Evaluate Multiple Spill Mitigation Designs

Source: Integrated Solutions For Systems (IS4S)/Army
Title: Fuel Efficiency for Tactical Wheel Vehicles and Convoys
Amount: \$30,000
Duration: 2017
Role: Co-Investigator
Effort: High-Fidelity CFD Simulations of Truck Platoons in Multiple Configurations

Source: Federal Highway Administration
Title: Heavy Truck Cooperative Adaptive Cruise Control: Evaluation, Testing, and Stakeholder Engagement for Near Term Development
Amount: \$1,419,420 and \$449,214 Auburn Cost Share
Duration: 2017-2019 (overall project 2013-2019)
Role: Co-Principal Investigator
Effort: Performed High-Fidelity CFD Simulations of Truck Platoons in Multiple Configurations

Source: CHI, Engineering
Title: Risk Mitigation for Commercial Point
Amount: \$22,000
Duration: 2017
Role: Principal Investigator
Effort: Performed Numerical Simulations to Evaluate Multiple Spill Mitigation Designs

Source: Auburn University Intramural Grant Program
Title: An Experimental and Numerical Study of the Environmental and Combustion Characteristics of Wildland Fuels
Amount: \$40,000
Duration: 2017-2019
Role: Co-Investigator
Effort: Investigated Reduced-Order Computational Tool for Quick Prediction of Wildland Fires and Performed High-Fidelity CFD Simulations of Typical Wildland Fuels

Source: CHI, Engineering
Title: National Grid Risk Mitigation
Amount: \$63,000
Duration: 2015-2017
Role: Principal Investigator
Effort: Performed Numerical Simulations to Evaluate Multiple Spill Mitigation Designs

Source: CHI, Engineering
Title: Physics-Based Simulation of Potential LNG Spillage
Amount: \$184,760
Duration: 2014-2015
Role: Principal Investigator
Effort: Performed Numerical Simulations to Evaluate Multiple Spill Mitigation Designs

Source: Office of Naval Research
Title: Hydrodynamic Drag Reduction
Amount: \$220,000
Duration: 2013-2014
Role: Co-Investigator
Effort: Performed Free-Surface and Advanced Turbulence Modeling for Unstructured Topologies Undergoing 6-DOF Simulations

Source: CoE Appl. Comp. Sci. Engr.
Title: Incompressible Multi-Species Flow Regime with Total Energy Conservation
Amount: \$30,000
Duration: 2013-2014
Role: Principal Investigator
Effort: Developed and Implemented a New Flow Regime in the Tenasi Code

Source: CoE Appl. Comp. Sci. Engr.
Title: Transition Modeling for Improved Heat Transfer Computations for Turbomachinery
Amount: \$20,000
Duration: 2013-2014
Role: Principal Investigator
Effort: Implemented a Turbulence Transition Model with Specific Modifications for Turbomachinery

Source: CoE Appl. Comp. Sci. Engr.
Title: Design of a Coronary Stent for Reduced Failure Rate
Amount: \$10,000
Duration: 2013-2014
Role: Principal Investigator
Effort: Performed Numerical Study of Coronary Stent

Source: SimCenter Enterprises, Inc.
Title: Simplified Modeling of Buoyant, Precipitant, and Explosive Events with the Scalar Transport Model
Amount: \$15,000
Duration: 2013-2014
Role: Principal Investigator
Effort: Performed Numerical Simulations of Buoyant, Precipitant, and Explosive Events

Source: SimCenter Enterprises, Inc.
Title: The Washington, DC Project
Amount: \$99,000
Duration: 2012-2013
Role: Co-Investigator
Effort: Performed Time-Dependent Atmospheric Computations with Buoyancy and Advanced Turbulence Modeling

Source: National Science Foundation US Ignite Program Grant
Title: Disaster Mitigation System
Amount: \$224,658
Duration: 2012-2013
Role: Co-Investigator
Effort: Performed Time-Dependent Atmospheric Computations with Buoyancy and Advanced Turbulence Modeling

Source: SimCenter Enterprises, Inc.
Title: Coupling of the Weather Research & Forecast Model (WRF) and Tenasi for Atmospheric Simulations
Amount: \$56,886
Duration: 2012-2013
Role: Principal Investigator
Effort: Implemented an algorithm to Assimilate WRF Solutions into the Tenasi Solution Process

Source: SimCenter Enterprises, Inc.
Title: Reducing Large Urban Environment Simulations for Time-Critical Predictions
Amount: \$43,273
Duration: 2012-2013
Role: Principal Investigator
Effort: Optimized the Tenasi Solution Algorithm to Reduce Runtime

Source: SimCenter Enterprises, Inc.
Title: Temperature Generated Turbulence in Buoyant Flow Fields
Amount: \$29,958
Duration: 2012-2013
Role: Principal Investigator
Effort: Evaluated Multiple Models to Include Temperature Generated Turbulence

Source: SimCenter Enterprises, Inc.
Title: Turbulence Modeling for High Energy Flows
Amount: \$26,614
Duration: 2011-2012
Role: Principal Investigator
Effort: Modified Turbulence Models for High Energy Flows

Source: SimCenter Enterprises, Inc.
Title: Buoyant Atmospheric Simulations
Amount: \$55,606
Duration: 2011-2012
Role: Principal Investigator
Effort: Performed Buoyant Atmospheric Simulations

Source: CoE. Appl. Comp. Sci. Engr.
Title: Applications of SimCenter Hybrid RANS/LES Code
Amount: \$80,615
Duration: 2011-2012
Role: Principal Investigator
Effort: Implemented and Validated a Hybrid RANS/LES Model

Source: SimCenter Enterprises, Inc.
Title: Buoyant Multi-Species Flows
Amount: \$91,755
Duration: 2010-2011
Role: Principal Investigator
Effort: Perform Simulations for Buoyant Multi-Species Flows

Source: CoE Appl. Comp. Sci. Engr
Title: Modeling Turbulence Kinetic Energy for High Energy Flows
Amount: \$31,345
Duration: 2010-2011
Role: Principal Investigator
Effort: Improved Modeling of Turbulence Kinetic Energy for High Energy Flows in Tenasi Solver

Source: CoE Appl. Comp. Sci. Engr.
Title: Simulations With Gravity On Multi-Element Unstructured Topologies
Amount: \$89,720
Duration: 2009-2010
Role: Principal Investigator
Effort: Perform Simulations With Gravity On Unstructured Topologies

Source: CoE Appl. Comp. Sci. Engr.
Title: Atmospheric Wind Modeling for Regional Simulations
Amount: \$42,125
Duration: 2008-2009
Role: Principal Investigator
Effort: Implemented and Evaluated Atmospheric Wind Models for Regional Simulations

Source: CoE Appl. Comp. Sci. Engr.
Title: Turbulence Modeling for Multi-Speed Flows
Amount: \$77,000
Duration: 2007-2009
Role: Principal Investigator
Effort: Modified and Evaluated Turbulence Models for Multi-Speed Flows

Source: Jackson & Tull/Air Force Research Lab
Title: Turbomachinery CFD Analysis
Amount: \$120,000
Duration: 2007
Role: Co-Investigator
Effort: Implemented Improved Boundary Conditions and Advanced Turbulence Modeling Techniques

Source: Office of Naval Research
Title: Unstructured Viscous Free Surface Solver for Predicting Hydrodynamic Performance of High Speed Ships
Amount: \$1,056,000
Duration: 2006-2009
Role: Co-Investigator
Effort: Free-Surface and Advanced Turbulence Modeling for Unstructured Topologies

Source: Department of Energy
Title: Atmospheric Dispersion at Spatial Resolutions Below Mesoscale
Amount: \$579,000
Duration: 2005-2008
Role: Co-Investigator
Effort: Atmospheric Modeling, Source Term Utilization, and Advanced Turbulence Modeling for Unstructured Topologies

Source: CoE Appl. Comp. Sci. Engr.
Title: Advanced Turbulence Modeling for Unstructured Topologies
Amount: \$166,000
Duration: 2005-2007
Role: Principal Investigator
Effort: Developed and Validated Advanced Turbulence Modeling Techniques for Unstructured Topologies

Source: Barber-Nichols, Inc.
Title: CFD Tool Validation for Upper Stage, Turbo-Pump, Design
Amount: \$178,000
Duration: 2005
Role: Co-Investigator
Effort: Optimized Turbulence Modeling for Pump Design

Source: ITT Industries, Inc.
Title: Post-Engagement Ground Effects Model (PEGEM) Independent Validation & Verification
Amount: \$100,000
Duration: 2005
Role: Co-Investigator
Effort: Unsteady Atmospheric Simulations for Aerosol Contaminant Transport

Source: Department of Energy
Title: Global Climate Change
Amount: \$725,000
Duration: 2004-2007
Role: Co-Investigator
Effort: Atmospheric Modeling, Advanced Turbulence Modeling, Source Term Utilization

Source: Office of Naval Research (DARPA)

Title: Simulation and Analysis of Proposed Underwater Vehicles
Amount: \$150,000
Duration: 2004
Role: Co-Investigator
Effort: 6-DOF Dynamic Motion and Advanced Turbulence Modeling

Source: ATA/AEDC

Title: Engine Inlet Distortion Simulations
Amount: \$40,000
Duration: 2004
Role: Co-Investigator
Effort: Boundary Conditions and Advanced Turbulence Modeling

Academic Teaching Experience

Undergraduate Teaching Experience: ENGR 1040 Vector Statics (UT Chattanooga)
ENGR 3050 Thermo-Fluids (UT Chattanooga)
AERO 3110 Aerodynamics I (Auburn University)
AERO 4140 Aerodynamics III (Auburn University)
AERO 4970 Intro to CFD (Auburn University)

Graduate Teaching Experience: ENCM 5210 Introduction to Parallel Programming (UT Chattanooga)
ENCM 7210 Parallel Scientific Supercomputing (UT Chattanooga)
AERO 7970 Special Topics: Intro to CFD (Auburn University)
AERO 7140 Advanced CFD (Auburn University)
AERO 7970 Scientific Supercomputing (Auburn University)
AERO 7970 Theory of Computations (Auburn University)

Graduate Student Advising and Mentoring

Served as the major professor of 5 Master's Students at Auburn University
Served as a committee member on 5 Master's Students at Auburn University
Served as the major professor of 5 Doctoral Students at Auburn University
Served as a committee member on 6 Doctoral Students at Auburn University
Mentored 22 Master's and Doctoral students at UT Chattanooga

Awards

Awarded Excellent Performance rating by ORNL for FY22
Awarded Excellent Performance rating by ORNL for FY21
2015-2016 Aerospace Professor of the Year, awarded by Auburn University's AIAA student chapter
Awarded the highest performance rating by UT Chattanooga for the 2014-2015 academic year, included a \$1,500 bonus.