

## Abdollah (Abi) Arabshahi, Ph.D.

### Personal Data

**Citizenship:** United States  
**Address:** 701 East M.L. King Boulevard, Chattanooga, TN 37403  
**Office Phone:** 423-425-5485  
**E-Mail:** [Abi-Arabshahi@utc.edu](mailto:Abi-Arabshahi@utc.edu)

### Education

Ph.D., Aerospace Engineering, Mississippi State University, May 1989  
M.S., Aerospace Engineering, Mississippi State University, May 1985  
B.S., Civil Engineering, Mississippi State University, May 1982

### Employment

**Research Professor**, Graduate School of Computational Engineering / SimCenter: National Center for Computational Engineering, The University of Tennessee at Chattanooga, 2005 - Present  
**Associate Research Professor**, Graduate School of Computational Engineering / SimCenter: National Center for Computational Engineering, The University of Tennessee at Chattanooga, 2002 - 2005  
**Senior Research Associate**, Applied Research Laboratory, The Pennsylvania State University, 1998 - 2002  
**Research Engineer II**, Computational Fluid Dynamics Laboratory, NSF/ERC for Computational Field Simulation, Mississippi State University, 1996 - 1998  
**Research Engineer I**, Computational Fluid Dynamics Laboratory, NSF/ERC for Computational Field Simulation, Mississippi State University, 1991 - 1996  
**Post-Doctoral Fellow**, Computational Fluid Dynamics Laboratory, NSF/ERC for Computational Field Simulation, Mississippi State University, 1989 - 1991

### Academic Activities

Mentoring and advising students involved in research associated with the UT SimCenter, monitoring student progress, as well as instruction regarding the use and implementation of UT SimCenter research codes  
Committee member for five Master's degree students and one Doctoral candidate  
Advised students involved in sponsored research conducted at the CFD Laboratory, provided instruction regarding use and implementation of research codes, monitored student progress  
Assisted in teaching graduate level course, CFD II (ASE 8423)  
Supervised Master's degree candidate at the Air Force Institute of Technology  
Supervised project efforts of two high school students from the Mississippi School for Math and Science (MSMS) in the Super Quest competition sponsored by the National Science Foundation (NSF)

### Professional Activities

Tau Beta Pi (Engineering Honor society), Member  
Phi Theta Kappa (Honor Society), Member  
American Institute of Aeronautics and Astronautics, Member  
The American Society of Mechanical Engineers, Member

## Reviewer

AIAA Journal  
Computers and Fluids Journal  
International Journal for Numerical Methods in Fluids  
Mathematical and Computer Modeling Journal  
Journal of Naval Architecture and Marine Engineering

## Book

Whitfield, D. L., Taylor, L. K., Beddhu, M., and Arabshahi, A., "Discretized Newton- Relaxation Solution of the Three-Dimensional Unsteady Incompressible Navier-Stokes Equations," *Frontiers of Computational Fluid Dynamics*, Chapter 28, pp. 575-594, D. A. Caughey and M. M. Hafez, Editors, ISBN 0-471-95334-2, John Wiley & Sons, Ltd., New York, 1994.

## Publications and Presentations

1. Arabshahi, A., Taylor, L., and Whitfield, D. L., "Computation of Dynamic Stability and Control Derivative," AIAA 2011-3348, 29th AIAA Applied Aerodynamics Conference 27-30 June 2011, Hawaii, Hawaii.
2. Arabshahi, A., Webster, R. S., Sreenivas, K., Hyams, D. G., and Whitfield, D. L., "Numerical Simulation of Reacting and Non-reacting Nozzle Flows," AIAA-2009-4858, the 45th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit, Denver, CO, August, 2009.
3. Arabshahi, A., Sreenivas, K., Nichols, D.S., Mitchell, B. C. J., Taylor, L. K., and Whitfield, D. L., "Computational Analysis of Turbulent Internal Flow in Ballistic Solid Rocket Motors," AIAA-2007-1449, the 45th AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January 8-11, 2007.
4. Arabshahi, A., Webster, R. S., Briley, W. R., and Whitfield, D. L., "Numerical Analysis of Solid Propellant Rocket Motor Internal Flows," AIAA-2006-5114, the 42nd AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, Sacramento, CA, July 9-12, 2006.
5. Arabshahi, A., Janus, J. M., "A Multiblock Compressible Navier-Stokes Flow Solver Applied to Complex Launch Vehicles," *AIAA Journal of Spacecraft and Rockets*, Vol. 41, No. 3, pp. 469-472, May-June 2004.
6. Arabshahi, A., Gibeling H. J., "Computational Hydrodynamics for an Autonomous Underwater Vehicle with Moving Control Surfaces," FEDSM2002-31428, ASME 2002 Fluids Engineering Division Summer Meeting, Montreal, Canada, July 2002.
7. Arabshahi, A., Tangirala, S., Dzielski, J. E., Gibeling H. J., "CFD Based Prediction of Stability and Control Derivatives for Autonomous Underwater Vehicles," the 8th International Conference on Numerical Grid Generation in Computational Field Simulations, Honolulu, Hawaii, June 2002.
8. Arabshahi, A., Boger, D. A., Lindau, J. L., Zajaczkowski, F. J. , " CFD Validation and Development for CCAT Design Analysis," the CCAT board, ONR PMS 415, Applied Research Laboratory, State College, PA, February 2002.
9. Arabshahi, A., Gibeling H. J., "Numerical Simulation of Viscous Flows about Underwater Vehicles," OCEANS 2000 MTS/IEEE Conference & Exhibition, Providence, RI, September 2000.
10. Arabshahi, A., Janus, J. M., "A Multiblock Compressible Navier-Stokes Flow Solver Applied to Complex Launch Vehicles," AIAA-99-3378, the 14th Computational Fluid Dynamics Conference, Norfolk, VA, June 28-July 1 1999.
11. Arabshahi, A., Gibeling H. J., "Computational Hydrodynamics for Autonomous Underwater Vehicles," the 4th Mississippi State Conference on Differential Equations & Computational Simulations, May 1999.
12. Arabshahi, A., et. al., "A Perspective on Naval Hydrodynamic Flow Simulations," The 22nd Naval Hydrodynamics Program, August 1998.
13. Beddhu, M., Jiang, M. Y., Whitfield, D. L., Taylor, L. K., and Arabshahi, A., "CFD Validation of the Free Surface Flow Around DTMB Model 5415 Using Reynolds Averaged Navier-Stokes Equations," The 3rd Osaka Colloquium on Advanced CFD Applications to Ship Flow and Hull Form Design (OC'98), May 1998.
14. Beddhu, M., Jiang, M. Y., Whitfield, D. L., Taylor, L. K., and Arabshahi, A., "An Algorithm for Calculating Unsteady Free Surface Flows Around Complex Geometries Using Reynolds Average Navier-Stokes Equations." Submitted for publication in *Journal of Computational Physics*, April 1998.
15. Razzaghi, M., Arabshahi, A., and Lin, S. D., "Analysis of Linear Distributed Parameter Systems via Double Fourier Series," *Applied Mathematics and Computation*, Vol. 87, No. 2-3, pp. 205-215, 1997.
16. Beddhu, M., Jiang, M. Y., Whitfield, D. L., Taylor, L. K., and Arabshahi, A., "Computational Physical

- Oceanography - A Comprehensive Approach Based on Generalized CFD/Grid Techniques for Planetary Scale Simulations of Oceanic Flows," MSSU-EIRS-ERC-97-5, March 1997.
17. Arabshahi, A., Whitfield, D. L., "Multiblock Euler Computation of Transonic Flow About A Generic Aircraft Configuration," *International Journal of Computational Fluid Dynamics*, Vol. 4, No. 3-4, pp. 307-321, 1995.
  18. Arabshahi, A., Taylor, L. K., and Whitfield, D. L., "UNCLE - Toward A Comprehensive Time-Accurate Incompressible Navier-Stokes Flow Solver," AIAA-95-0050, 33rd AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January 9-12, 1995.
  19. Taylor, L. K., Arabshahi, A., and Whitfield, D. L., "Unsteady Three-Dimensional Incompressible Navier-Stokes Computations for a Prolate Spheroid Undergoing Time-Dependent Maneuvers," AIAA-95-0313, 33rd AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January 9-12, 1995.
  20. Razzaghi, M., Arabshahi, A., and Lin, S. D., "Identification of Nonlinear Differential Equations Via Fourier Series Operational Matrix for Repeated Integration," *Applied Mathematics and Computation*, Vol. 68, pp. 189-198, 1995.
  21. Taylor, L. K., Busby, J. A., Jiang, M. Y., Arabshahi, A., Sreenivas, K., and Whitfield, D. L., "Time Accurate Incompressible Navier-Stokes Simulation of the Flapping Foil Experiment," Presented at the Sixth International Conference on Numerical Ship Hydrodynamics, Iowa City, Iowa, August 1993.
  22. Cox, C. F., Cinnella, P., and Arabshahi, A., "Multi-Block Calculation for Flows in Local Chemical Equilibrium," AIAA-93-2999, 24th AIAA Fluid Dynamics Conference, Orlando, FL, July 1993.
  23. Pankajakshan, R., Arabshahi, A., and Whitfield, D. L., "Turbofan Flowfield Simulation Using Euler Equations With Body Forces," AIAA-98-1978, AIAA 29th Joint Propulsion Conference, Monterey, CA, June 1993.
  24. Hammersley, J. R., Olson, D. E., Reddy, R. N., Arabshahi, A., and Gatlin, B., "Computational Modeling of Airflows in the Smaller Airways," *American Review of Respiratory Diseases*, Vol. 145, p. A32, April 1993.
  25. Soni, B. K., Huddleston, D. H., Arabshahi, A., and Vu, B., "A Study of CFD Algorithms Applied to Complete Aircraft Configurations," AIAA-93-0784, the 31st AIA Aerospace Sciences Meeting, Reno, NV, January 1993.
  26. Hammersley, J. R., Reddy, R. N., and Arabshahi, A., "Computational Simulation of Airflow within Human Lungs," Arkansas Computer Science Conference, Little Rock, AR, October 1992.
  27. Hammersley, J. R., Olson, D. E., Reddy, R. N., Arabshahi, A., and Gatlin, B., "Computational Modeling of Airflows in the Smaller Airways," American Lung Association Conference, Miami Beach, FL, May 1992.
  28. Arabshahi, A. and Whitfield, D. L., "Numerical Simulation of Supersonic Unsteady Flow for Multibody Configuration," AIAA-91-0023, AIAA 29th Aerospace Sciences Meeting and Exhibit, Reno, NV, January 1991.
  29. Razzaghi, M. and Arabshahi, A., "Solutions of Convolution Integral and Fredholm Integral Equation Via Double Fourier Series," *Applied Mathematics and Computation*, Vol. 40, No. 3, pp. 215-224, 1991.
  30. Arabshahi, A. and Whitfield, D. L., "A Multiblock Approach to Solving the Three-Dimensional Unsteady Euler Equations About A Wing-Pylon-Store Configuration," AIAA-89-3401, AIAA Atmospheric Flight Mechanics Conference, Boston, MA, August 14-16, 1989.
  31. Whitfield, D. L., Janus, M. J., and Arabshahi, A., "Unsteady Euler Solutions on Dynamic Grids for Complex Configurations," *AGARD-CP-464*, Loen, Norway, May 1989.
  32. Arabshahi, A., "A Dynamic Multiblock Approach to Solving the Unsteady Euler Equations about Complex Configurations," *Ph.D. Dissertation*, May 1989.
  33. Razzaghi, M. and Arabshahi, A., "Solutions of Linear Two-Point Boundary Value Problems Via Polynomial Series," *International Journal of Systems Science*, Vol. 20, No. 3, pp. 375-384, 1989.
  34. Razzaghi, M., Tahai, A., and Arabshahi, A., "Solutions of Two-Point Boundary Value Problems via Fourier Series and Application to Optimal Control of Linear Systems," *Journal of Franklin Institute*, Vol. 326, No. 4, pp. 523-533, 1989.
  35. Razzaghi, M. and Arabshahi, A., "Optimal Control of Linear Distributed Parameter Systems via Polynomial Series," *International Journal of System Science*, Vol. 20, No. 7, pp. 1141-1148, 1989.
  36. Razzaghi, M. and Arabshahi, A., "Analysis of Linear Time-Varying Systems and Bilinear Systems Via Fourier Series," *International Journal of Control*, Vol. 50, No. 3, pp. 889-898, 1989.
  37. Arabshahi, A., "Correlations for the Drag Coefficient of Blunt Circular Cylinders in Transonic Axial Flow," *Master's Thesis*, May 1984.

## Grants and Contracts

1. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "Numerical simulation of respiratory flow patterns within human lung," PI, \$53,852.00, July 2011-July 2012.
2. SimCenter Enterprises Inc., "Environmental wind and water codes," PI, \$53,532.86, July 2011-July 2012.
3. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "Direct Numerical Simulation (DNS) for a priori Large-Eddy Simulation (LES) Sub-grid Model Evaluation," CO-PI, \$69,877.00, July 2011-July 2012.
4. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "LES of Chemically Reacting Flows," CO-PI, \$69,877.00, July 2011- July 2012; continuing funded contract.
5. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "Investigation of Boundary Conditions for Optimal Domain Size," PI, \$50,652.00, July 2010 -July 2011.
6. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "LES of Chemically Reacting Flows," CO-PI, \$69,877.00, July 2010- July 2011.
7. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "Direct Numerical Simulation (DNS) for a priori Large-Eddy Simulation (LES) Sub-grid Model Evaluation," CO-PI, \$69,877.00, July 2010- July 2011.
8. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "Large Eddy Simulation of Internal Turbulent Flows," PI, \$78,464.00, July 2009- July 2010.
9. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "Implementation of the hydrodynamic and control system design technology into the tenasi unstructured flow solver," PI, \$38,897.00, July 2009- July 2010
10. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "Implementation of finite-rate chemistry in the Tenasi family of flow solvers," Co- PI, July 2007- July 2008; Not Funded.
11. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "Implementation of an arbitrary equation of state into the Tenasi family of flow solver," Co- PI, July 2007- July 2008; Not Funded.
12. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "Advancement and Verification of the Navier-Stokes Flow Solver for Rocket Motor Internal Flows," PI, \$100,000.00, July 2006- July 2007.
13. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "Computation of Dynamic Stability and Control Derivatives," PI, \$168,250.00, July 2005- July 2007.
14. Tennessee Higher Education Commission Center of Excellence in Applied Computational Science and Engineering, "Advancement and Verification of the Navier-Stokes Flow Solver for Rocket Motor Internal Flows," PI, \$100,780.00, July 2005- July 2006.
15. Riverbend Technology Institute to support an industrial application for eSpin Technologies, Inc., "Computational Analysis Assessment of an Air Exchange System," PI, \$15,000.00, May 2006.
16. Riverbend Technology Institute, "Computational Analysis Assessment of an Air Exchange System," PI, \$1,000, March 2005.
17. SPARATA, INC. "Computational Analysis and Advancement of Solid Rocket Motor (SRM) Modeling and Simulation Tools," work under the direction of Dr. David L. Whitfield, PI, \$150,000, January 2005- 2006.
18. Office of Naval Research (ONR), Research, Contract No: N00014-04-1-0289 "Simulation and Analysis of Proposed Underwater Vehicles," worked under the direction of Dr. David L. Whitfield, PI, \$150,000, March-November 2004.
19. Office of Naval Research (ONR), BAA\_03-009 Undersea Weaponry Science and Technology Program "Design Optimization for Undersea Weapon Hydrodynamics and Maneuvering," PI, \$990,000, July 2003; Not Funded
20. ARL/Keyport, "Estimated Hydrodynamic Loads on the Adapter Housing and Array for a Revised USBA Configuration," PI, \$45,000, February 2001; Funded.
21. NASA LaRC, "Advanced Control Methods for Futuristic Aerospace Vehicles using Smart Actuators," PI,

\$270,000, March 2000; Not Funded.

22. DRPA, "RANS Models for Polymer Turbulent Drag Reduction," Co-PI, \$710,837, October 2000; Not Funded.
23. BAE SYSTEMS Flight Systems Inc., "CFD Studies of the MQM-107E and MQM-107E+Streaker (Subscale Aerial Target)," PI, \$1,100,641, June 2000; Not Funded.
24. ARL/Keyport, "Ultra Short Baseline Array Packaging," Co-PI, \$198,756, September 1999.
25. Lockheed Martin, "Enhancement of CFD Capabilities at Lockheed Martin," Co-PI, \$395,419, May 1997 - May 1998.
26. Lockheed Martin, "Enhancement of CFD Capabilities at Lockheed Martin," Co-PI, \$197,000, May 1996 - May 1997.
27. ARL/Pennsylvania State University, "Free Surface Fluid Dynamics Produced by a Near Surface Vehicle," Co-PI, \$25,000, August 1995.
28. Office of Naval Research (ONR), "Computational Propulsor Hydrodynamics," worked under the direction of Dr. David L. Whitfield, PI, \$315,000, October 1991 - October 1994.
29. ARL/Pennsylvania State University, "Flow About Maneuvering Appended Bodies," worked under the direction of Dr. David L. Whitfield, PI, \$266,000, April 1993 - April 1995.
30. Department of Energy, "Computational Oceanography," worked under the direction of Dr. David L. Whitfield, PI, \$240,000, April 1993 - April 1995.
31. NASA Langley Research Center, "Propulsion/Airframe Interaction," worked under the direction of Dr. David L. Whitfield, PI, \$25,000, August 1993.
32. NASA Langley Research Center, "Viscous-Inviscid Interaction using Euler and Inverse Boundary-Layer Equations," worked under the direction of Dr. David L. Whitfield, PI, \$115,000, January 1990.
33. AFWL/Eglin AFB, "Computation of Hypersonic Interference Flow Fields," worked under the direction of Dr. David L. Whitfield, PI, \$439,398, May 1988 - May 1991.

## Technical Reports

1. Arabshahi, A., "Mesh Refinement and Order Accuracy Study for Stepped Nozzles Using the UTC Tenasi Flow Solver," SRN Modeling, Chattanooga, TN, October 16, 2007.
2. Arabshahi, A. and Whitfield, D. L., "Computational of Dynamic Stability and Control Derivatives," THEC Final Report, January 2005-July 2007.
3. Arabshahi, A., Webster, R. S., Briley, W. R., and Whitfield, D. L., "Advancement and Verification of the Navier-Stokes Flow Solver for Rocket Motor Internal Flows," THEC Final Report, July 2005 ? June 2007.
4. Arabshahi, A., Sreenivas, K., Nichols, D.S., Mitchell, B. C. J., Taylor, L. K., and Whitfield, D. L., "Computational Analysis of Turbulent Internal Flow in Ballistic Solid Rocket Motors," AIAA-2007-1449, the 45th AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January 8-11, 2007.
5. Arabshahi, A., Webster, R.S., Briley, W., and Whitfield, D. L. " Computational Analysis and Advancement of Solid Rocket Motor (SRM) Modeling and Simulation Tools," Final report for period January 2005–July 2006, SPARTA, INC. 25531 Commercentre Drive, Suite 120 Lake Forest, CA 92630. August 2006.
6. Briley, W., Arabshahi, A., Webster, R.S., and Whitfield, D. L. " Computational Analysis and Advancement of Solid Rocket Motor (SRM) Modeling and Simulation Tools," Monthly Technical Report for period February 2005-July 2006, SPARTA, INC. 25531 Commercentre Drive, Suite 120 Lake Forest, CA 92630. July 2006.
7. Arabshahi, A., Mitchell, B., Nichols, S., Taylor, L., and Whitfield, D. L. "Simulation and Analysis of Proposed Underwater Vehicles," Final report for period March-November 2004, Office of Naval Research, Contract No: N00014-04-1-0289, November 2004.
8. Arabshahi, A., "Estimated Hydrodynamic Loads on the Adapter Housing and Array for a Revised USBA Configuration," Final report for period February-July 2001, Naval Undersea Warfare Center, Keyport Division, Keyport, WA, October 2001.
9. Arabshahi, A., Brockett, T., Kerstetter, D., Koudela, K., and Montgomery, T., "Initial Design and Validation of the Keyport Ultra Short Baseline Array," Technical Note, File No. 00-159, Applied Research Laboratory, State college, PA, September 28, 2000.
10. Arabshahi, A., Webster, R., Janus, J. M., and Whitfield, D. L., "Enhancement of Computational Fluid Dynamic Capabilities at Lockheed Martin," Final report for period May 1997 - May 1998, Lockheed Martin, June 1998
11. Arabshahi, A., Janus, J. M., and Whitfield, D. L., "Enhancement of Computational Fluid Dynamic Capabilities at Lockheed Martin," Final report for period May 1996 - May 1997, Lockheed Martin, June 1997
12. Zierke, W. C., et. al., "A Physics-Based Means of Computing the Flow Around a Maneuvering Underwater Vehicle," Technical Report No. TR 97-002, Applied Research Laboratory, State college, PA, January 1997.
13. Arabshahi, A. and Pankajakshan, R., "Propulsion/Airframe Interference for Ducted Propfan Engines with Ground Effect," Final report for NASA Grant NAG-1-226, November 1994.
14. Janus, J. M., Arabshahi, A., and Whitfield, D. L., "Numerical Solution and Algorithm Analysis for the Unsteady Navier-Stokes Equations on Dynamic Multiblock Grids," WL-TR-92-7044, Vol. I, Final report for period June 1989 - June 1992, Wright Laboratory, Armament Directorate, Eglin AFB, October 1992.
15. Janus, J. M., Cox, C. F., Arabshahi, A., Cinnella, P., and Whitfield, D. L., "Numerical Solution and Algorithm Analysis for the Unsteady Navier-Stokes Equations on Dynamic Multiblock Grids Including Chemical Equilibrium," WL-TR-92-7044, Vol. II, Final report for period June 1989 - June 1992, Wright Laboratory, Armament Directorate, Eglin AFB, October 1992.