
Dr. Kader Freni

Curriculum Vitae

Education:

- **Ph.D.** : Mechanical Engineering, Brown University, 1990.
 - **M.Sc.** : Applied Mathematics, Brown University, 1988.
 - **M.Sc.** : Mechanical Engineering, Brown University, 1986.
 - **B.Sc.** : Physics, University of Science and Technology Algiers, 1982.
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Honors:

- Recipient of an award for an outstanding Chairman job from the Mechanical and Aerospace Engineering faculty and staff, December 2010.
- Associate Editor, Journal of Propulsion and Power, Jan 2008 to present.
- Member of the board of directors for Habitat for Humanity of Madison County.
- Recipient of a Certificate of Recognition from NASA Stennis Space Center, July 2006.
- Recipient of the UAH Foundation Award for Research and Creative Achievement, March 2004.
- Fellow of ASME
- Associate Fellow of AIAA.
- Recipient of a Summer Faculty Fellowship from NASA Marshall Space Flight Center, 2000 and 2004.

- Recipient of several Certificate of Appreciation from NASA Langley Research Center for significant contributions to various programs (HSR, Hyper-X, AST).
 - Recipient of a graduate scholarship from the Algerian Government to attend Brown University from 1983 to 1989.
 - Recipient of a Presidential Award for an outstanding performance at the college entrance exam, 1979.
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Work Experience:

- **2011 to Present: Professor**, Mechanical and Aerospace Engineering Department, University of Alabama in Huntsville, Huntsville, AL.
 - **2007 to 2010: Professor and Department Chair**, Mechanical and Aerospace Engineering Department, University of Alabama in Huntsville, Huntsville, AL.
 - **2005 to 2007: Professor**, Mechanical and Aerospace Engineering Department, University of Alabama in Huntsville, Huntsville, AL.
 - **1999 to 2005: Associate Professor**, Mechanical and Aerospace Engineering Department, University of Alabama in Huntsville, Huntsville, AL.
 - **1990 to 1999: Research Scientist**, NASA Langley Research Center, Hampton, VA.
 - **1989 to 1990: Visiting Assistant Professor**, Mechanical Engineering Department, Northeastern University, Boston, MA.
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Research Funding:

- Subject Area: Fluid/Structure/Acoustic Interactions, Office of Naval Research, 2000-2004.
- Subject Area: Initiation and Suppression of Launch Vehicle Blast Waves, NASA Langley Research Center, 2000-2004.
- Subject Area: Noise Radiated by Engine Plumes, Phase I and Phase II SBIR with ASRI Inc. from NASA Marshall and NASA Stennis, 2001-2004.

- Subject Area: Combustion Instabilities in Rocket Engines, NASA Marshall Space Center, 2002-2009.
 - Subject Area: Vehicle Health Monitoring for Aviation Safety, NASA Langley Research Center, 2002-2003.
 - Subject Area: Accurate predictions of surface pressure fluctuations near the trailing edge of a swept-wing airfoil. NASA Langley Research Center, 2004-2007.
 - Subject Area: Wavelet Based Multiresolution Scheme for Aero-acoustic Computations. NASA Langley Research Center, 2003-2006.
 - Subject Area: Using CFD to understand and design Acoustic Igniters. Orion Propulsion Incorporated, 2009-2011.
 - Subject Area: Effect of Protuberances on Wall Pressure Fluctuations, The Boeing Company, 2009-2010.
 - SBIR Phase I: Development of High Order Schemes for Turbulence and Acoustic Applications, 2011.
 - SBIR Phase I: Extension of PANS Turbulence Model to Hypersonic Flows, 2011.
 - SBIR Phase II: Development of High Order Schemes for Turbulence and Acoustic Applications, 2011.
 - NASA Contract: Develop a semi-empirical model for a transfer function between in the inlet and exit of sensor port, 2013-2014.
 - STTR Phase I: Impact of Hypersonic Flight Environment on Electro-Optic/Infrared Sensors. Analysis and Applications Associates, Inc., 2015-2016.
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Publications:

Journal Publications:

- Olatoyinbo, S. F., Rani, S., Frendi, A. "Large-Eddy Simulation of Decaying Isotropic Turbulence using the Flowfield Dependent Variation Method, accepted for publication in **Numerical Methods for Heat & Fluid Flow**.
- Girgis, B., Rani, S., and Frendi, A., "Flowfield Dependent Variation: A Unified Scheme for the Solution of Incompressible and Compressible Flow Problems", accepted for publication in **Numerical Methods for Heat & Fluid Flow**.
- Brown, M.R., Frendi, A., "Flow Structures and Noise from a Supersonic Impinging Jet", accepted for publication in **Numerical Methods for Heat & Fluid Flow**.

- Man Zhang, and Frendi, A., "Effect of Airfoil Leading Edge Waviness on Flow Structures and Noise", accepted for publication in **Numerical Methods for Heat & Fluid Flow**.
- Hahn, V. P., Frendi, A., "Interaction of 3D Protuberances with a Supersonic Turbulent Boundary Layer", **AIAA Journal**, Vol. 51, No. 7, pp. 1657-1666, July 2013.
- Peugeot, W. J., Frendi, A., "Towards the Understanding of Flow Induced Vibration in a Rocket Engine Manifold", **Journal of Propulsion and Power**, Vol. 29, No. 6, pp. 1468-1477, September 2013.
- Fisher, A., Frendi, A., and Christopher, S.A., "Using Satellite Remote Sensing to Monitor Rocket Launch Induced Pollution", **International Journal of Remote Sensing**, Vol. 34, No. 1, January 2013, pp 60-72.
- Al Musleh, A., and Frendi, A., "On the Effect of a Flexible Structure on Boundary Layer Stability and Transition", **Journal of Fluids Engineering**, Vol. 133, No. 7, July 2011, pp. 071103-1 to 071103-6..
- Dunn, M.C., Shotorban, B., and Frendi, A., "Uncertainty Quantification of Turbulence Model Coefficients via Latin Hypercube Sampling Method", **Journal of Fluids Engineering**, Vol. 133, No. 4, April 2011, pp. 041402-1 to 041402-7.
- Frendi, A., Tosh, A., Girimaji, S." Flow Past a Backward Facing Step: Comparison of PANS, DES and URANS Results with Experiments", **International Journal of Computational Methods in Engineering Science and Mechanics**, Vol. 8, Issue 1, pp. 23-38, 2006.
- Canabal, F., Frendi, A., "Study of the Ignition Over-Pressure Suppression Technique by Water Addition", **Spacecraft and Rockets**, Vol. 43, No. 4, pp. 853-865, 2006.
- Abhijit, T., Frendi, A., "Effect of Decoupled Fluid Loading on Nonlinear Vibration of a Flat Plate", **Journal of Fluids & Structures**, Vol. 19, pp. 1117-1128, 2004.
- Buhler, W. and Frendi, A., "Effect of Fluid Wall Shear Stress on Nonlinear Beam Vibration", **Journal of Sound and Vibration**, Vol. 270 (4-5), pp. 793-811, 2004.
- Frendi, A., "On Flow Unsteadiness Induced by Structural Vibration", **Journal of Sound and Vibration**, Vol. 269, No. 1, pp. 327-343, Jan. 2004.

- Frendi, A., Dorland, W.D., Maung, T., Nesman, T. and Wang, T.-S, "A Jet Engine Noise Prediction/Measurement Tool", ***Journal of Acoustical Society of America***, Vol. 112, No. 5, Pt. 1, Nov. 2002.
- Frendi, A., "Accurate Surface Temperature Prediction at High Speeds", ***Numerical Heat Transfer Part A: Applications***, Vol. 41, No. 5, pp. 547-554, April 2002.
- Frendi, A., Nesman, T. and Wang, T.-S, "On the Effects of Time Scaling on the Noise Radiated by an Engine Plume", ***Journal of Sound and Vibration***, Vol. 256, No. 5, pp. 969-979, October 2002.
- Cockrell Jr., Engelund, W. Bittner, R., Dilley, R., Jentink, T. and Frendi, A., "Integrated Aero-Propulsive CFD Methodology for the Hyper-X Flight Experiment", ***Journal of Spacecraft and Rockets***, Vol. 38, No. 6, pp. 836-843, November-December 2001.
- Frendi, A., Nesman, T. and Wang, T.-S, "A Computational and Experimental Study of the Linear Aerospike Engine Noise", ***AIAA Journal***, Vol. 39, No. 8, pp. 1485-1492, August 2001.
- Frendi, A., "On the Effects of Wall Shear Stress on Structural Vibrations", ***AIAA Journal***, Vol. 39, No. 4, pp. 737-740, April 2001.
- Frendi, A., "On the Coupling Between a Supersonic Turbulent Boundary Layer and a Flexible Structure", ***AIAA Journal***, Vol. 35, No. 1, pp. 58-66, January 1997.
- Frendi, A. and Maestrello, L., "On the Combined Effect of Mean Flow and Acoustic Excitation on Structural Response and Radiation", ***Journal of Vibration and Acoustics***, Vol. 119, pp. 448-456, July 1997.
- Frendi, A., Maestrello, L., and Ting, L., "An Efficient Model for Coupling Structural Vibration with Acoustic Radiation", ***Journal of Sound and Vibration***, Vol. 182, No. 5, pp. 741-757, 1995.
- Frendi, A., Maestrello, L., and Bayliss, A., "Coupling Between Plate Vibration and Acoustic Radiation", ***Journal of Sound and Vibration***, Vol. 177, No. 2, pp. 207-226, 1994.
- Frendi, A., and Robinson, J., "On the Effect of Acoustic Coupling on Random and Harmonic Plate Vibrations", ***AIAA Journal***, Vol. 31, No. 11, pp. 1992-1997, 1993.
- Frendi, A., Maestrello, L., and Bayliss, A., "On the Coupling Between a Supersonic Boundary Layer and a Flexible Surface", ***AIAA Journal***, Vol. 31, No. 4, pp. 708-713, 1993.

- Maestrello, L., Frendi, A., and Brown, D.E., "Nonlinear Vibration and Radiation from a Panel Structure with Transition to Chaos Induced by Acoustic Waves", *AIAA Journal*, Vol. 30, No. 11, pp. 2632-2639, 1992.
 - Frendi, A., and Sibulkin, M., "Extinction of Methane-Air Mixtures by Nitrogen Dilution", *Combustion and Flame*, Vol. 86, pf. 185, 1991.
 - Chen, Y., Frendi, A., Tewari, S.S., and Sibulkin, M., "Combustion Properties of Pure and Fire Retarded Cellulose", *Combustion and Flame*, Vol. 84, pf. 120, 1991.
 - Frendi, A., and Sibulkin, M., "Dependence of Minimum Ignition Energy on the Ignition Parameters", *Combustion Science and Technology*, Vol. 73, pf. 395, 1990.
 - Sibulkin, M., and Frendi, A., "Prediction of a Lean Flammability Limit for a Premixed Gas in an Unconfined Medium", *Combustion and Flame*, Vol. 82, pf. 334, 1990.
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NASA / ICASE / Industry Publications:

- Frendi, A., Man Zhang and Wayne Thompson, "Testing and Analysis of Sensor Ports", NASA Contractor Report, December 2014.
- Frendi, A. and Girgis, B., "A High Order Accuracy Computational Tool for Unsteady Turbulent Flows and Acoustics", SBIR Phase I Final Report, September 2011.
- Girimaji, S., Frendi, A., "Computations of Separated High-Enthalpy Hypersonic Flows: Development of RANS and Variable-Resolution PANS Approaches", SBIR Phase I Final Report, September 2011.
- Frendi, A., Brown, M., "Computational Fluid Dynamics Analysis of Various Acoustic Igniter Geometries", Phase II SBIR Final Report, March 2011.
- Frendi, A. "Noise Source Identification for a Husqvarna Lawn Mower", Husqvarna Phase I Final Report, March 2011.
- Sheta, E., and Frendi, A., "High Order Wavelet-Based Multiresolution Technology for Airframe Noise Prediction ", SBIR Phase II Final Report/TM, December 2006.
- Frendi, A., "Prediction and Control of the Vibroacoustic Environment During a Launch Sequence" ", SBIR Phase I Final Report, July 2006.

- Frendi, A., "Control of Combustion Instability Through Various Passive Devices" ", NASA Contractor Report, 2005-213847.
- Essam Sheta, A. Frendi, "High Order Wavelet-Based Multiresolution Technology for Airframe Noise Prediction ", SBIR Phase I Final Report/TM , CFDRRC Report 8620/3.
- W. Dorland and A. Frendi, "Acoustic Prediction and Measurement Tool ", SBIR Phase I Final Report , 2001.
- Frendi, A., and Vu, B., "On the Propagation of Plane Acoustic Waves in a Duct with a Flexible and Impedance Walls ", NASA/TM , 2003-211185.
- Dorland, W., and Frendi, A., "Acoustic Prediction and Measurement Tool ", SBIR Phase II Final Report , 2003.
- Frendi, A., "Development of an Empirical Model for the X-33 Linear Aerospike Engine Noise ", NASA Contractor Report, 2001-210797.
- Frendi, A., "On the Effects of Sideslip on the Hyper-X Stability and Control", NASA Contractor Report, 2001.
- Frendi, A., "2D Viscous and 3D Inviscid Computations in Support of the Flush Air Data Sensor Experiments (FADS)", NASA/CDCR-10025, November 1999.
- Frendi, A., "Effects of Pressure Gradients on Plate Response and Radiation in a Supersonic Turbulent Boundary Layer", NASA-CR-201691, 1997.
- Frendi, A., "On the Coupling Between a Supersonic Turbulent Boundary Layer and a Flexible Structure", NASA-CR-201631, 1996.
- Frendi, A., and Robinson, J., "On the Effect of Acoustic Coupling on Random and Harmonic Plate Vibrations", NASA-TM-107740, 1993.
- Frendi, A., Maestrello, L., and Ting, L., "An Efficient Model for Coupling Structural Vibration with Acoustic Radiation", ICASE Report 93-18, April 1993.
- Frendi, A., Maestrello, L., and Bayliss, A., "Numerical Study of Flow/Structure Interaction Over a Flexible Plate", Computational Aeroacoustics, Eds. J.C. Hardin and M.Y. Hussaini, Springer-Verlag, New York, pp. 404-416, 1993.

- Frendi, A., Maestrello, L., and Bayliss, A., "On the Coupling Between a Supersonic Boundary Layer and a Flexible Surface", *ICASE Report 92-42*, Sept. 1992.
 - Frendi, A., Maestrello, L., and Bayliss, A., "Coupling Between Plate Vibration and Acoustic Radiation", *ICASE Report 92-67*, Dec. 1992.
 - Frendi, A., Maestrello, L., and Bayliss, A., "Outgoing Acoustic Waves in an Unstable Supersonic Laminar Boundary Layer Over a Flexible Surface", *Instability, Transition and Turbulence*, Eds. M.Y. Hussaini, A. Kumar and C.L. Streett, Springer-Verlag, New York, pp. 337-342, 1992.
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Conference Proceedings:

- Ewere, F., Wang, G., and Frendi, K. "Gallopig Piezoelectric Energy Harvester with Bio-inspired Square Bluff Body", presented at the Orlando Florida SciTech2015 Conference.
- Frendi, A., "Hybrid RANS-LES Methods Applied to Acoustic Problems", *Progress in Hybrid RANS-LES Modeling*, by Springer, Edited by Sharath Girimaji, Werner Haase, Shia-Hui Peng and Dieter Schwamborn, pp. 243-251, 2015
- Zhang, M., and Frendi, A., "Noise Generated by an Airfoil Located in the Wake of a Circular Cylinder", *Progress in Hybrid RANS-LES Modeling*, by Springer, Edited by Sharath Girimaji, Werner Haase, Shia-Hui Peng and Dieter Schwamborn, pp. 493-501, 2015.
- Frendi, A., and Hahn, P.V., "Pressure Fluctuations in the Vicinity of a Wall-Mounted Protuberance", *Fluid-Structure-Sound Interactions and Control, Proceedings of the 2nd Symposium of Fluid-Structure-Sound Interactions and Control*, Yu Zhou, Yang Liu, Lixi Huang and Dewy H. Hodges, Editors, Hong Kong-Macau, May 20-23, 2013, published by Springer, pp. 51-55.
- Cavender, D.P., Mireles, O.R., Broadway, J.W., and Frendi, A., "Design of Uranium-Dioxide Plasma Spheroidization System", submitted to the *Proceedings for Nuclear Technologies for Space*, Albuquerque, NM, February 2013.
- Peugeot, J.W., and Frendi, A., "Flow Induced Vibrations in Rocket Engine Manifold", AIAA-2012-2170.

- Hahn, P.V., and Frendi, A., "On the Interaction of 3D Protuberances with a Supersonic Turbulent Boundary Layer", AIAA-2012-2172.
- Brown, M.R., and Frendi, A., "Supersonic Jet Impingement on a Flat Plate", AIAA-2012-2261.
- Dunn, M.C., Shotorban, B., and Frendi, A., "Uncertainty Quantification of Turbulence Model Coefficients via Latin Hypercube Sampling Method", ASME paper FEDSM-ICNMM2010-30572.
- Owen, M. and Frendi, A. "A Semi-Empirical Noise Model Derived Using the Energy Spectrum ",AIAA-2009-3164.
- Frendi, A. and Sun, Y. "Noise Radiated from Two Cylinders in Tandem Arrangement Using High-Order Multidomain Spectral Difference Method ",AIAA-2009-3159.
- Hood, C. and Frendi, A. "A Two Dimensional Cartesian and Axisymmetric Study of Combustion-Acoustic Interaction ",AIAA-2006-5231.
- Frendi, A. and Zreik, M. "Application of the Partially-Averaged Navier-Stokes Method to the Tandem Cylinder Problem ",AIAA-2006-3204.
- Frendi, F. and Vu, B. "On the Propagation of Plane-Acoustic Waves in a Duct with Flexible and Impedance Walls ",AIAA-2006-2691.
- Burgess, B. and Frendi, A. "Nonlinear Vibration of Clamped 2024-T3 Aluminum Panels Subject to High Intensity Noise ",AIAA-2006-2661.
- Sheta, E., Tosh, A., and Frendi, A. "Multiresolution Methodology for Tandem Cylinder Noise ",AIAA-2006-3205.
- Hood, C. and Frendi, A. "On the Interaction of a Premixed Flame with an Acoustic Disturbance ",AIAA-2005-4304.
- Frendi, A., Nesman, T. and Canabal, F., "Control of Combustion Instabilities Through Various Passive Devices ",AIAA-2005-2832.
- Tosh, A., Frendi, A., Girimaji, S., "Partially Averaged Navier-Stokes: A New Turbulence Model for Unsteady Flows with Application to Acoustics ", AIAA-2005-2987.
- Sheta, E., Frendi, A., "Wavelet-Based Adaptive Multiresolution Methodology for Airframe Noise Prediction ", AIAA-2005-3056.
- Canabal, F., Frendi, A., "On the Suppression of Ignition OverPressure Generated by Launch Vehicles ", AIAA-2004-2833.

- Frendi, A., "Passive Control of Combustion Instabilities ", AIAA-2004-2930.
- Saxena, A., Frendi, A., "Effect of Equivalence Ratio on Combustion Instabilities ", AIAA-2004-2931.
- Tosh, A., Frendi, A., "Prediction of Noise Radiated by a Smooth-Square Cylinder ", AIAA-2004-2914.
- Limon-Duparmeur, F.M., Frendi, A., "Self and Shear Noise Model For An Axisymmetric Jet ", presented at the EUROMECH 449 Chamonix, France, December 2003.
- Frendi, A., Tosh, A. and Girimaji, S.S. "Comparison of DES, URANS and PANS Results for a Smooth Square Cylinder ", presented at the 54th APS Fluid Dynamics Meeting, East Rutherford, New Jersey, USA, November 2003.
- Canabal, F., Frendi, A., "On the Suppression of Ignition OverPressure Generated by Launch Vehicles ", AIAA-2003-3329.
- Canabal, F., Frendi, A., "A Finite Element Based Flux Correction Scheme for the Euler Equations ", AIAA-2003-3121.
- Frendi, A., "On the Role of Acoustic Coupling on Combustion Instabilities ", AIAA-2003-3181.
- Limon-Duparcmeur, F., Frendi, A., "Prediction of the Noise Radiated by an Engine Plume ", presented at the 2003 JANNAF 27th Exhaust Plume Technology Subcommittee NASA Stennis Space Center, Stennis, MS, May 2003.
- Al Musleh, A., Frendi, A., "On the Effects of Flexible Structures on Boundary Layer Stability ", AIAA-2003-3222.
- Canabal, F., Frendi, A., "A Computational Study of Ignition Over-Pressure For Launch Vehicles ", AIAA 2002-2541.
- Buhler, W., Frendi, A. "Effects of Fluid Wall Shear Stress on Nonlinear Vibration and Acoustic Radiation", AIAA 2002-2415.
- Frendi, A., Nesman, T. and Wang, T.-S, "On the Effect of Time Scaling on the Noise Radiated by an Engine Plume", AIAA paper 2001-1880
- Cockrell, Jr., Engelund, W., Bittner, R., Dilley, R., Jentink, T., and Frendi, A., "Integrated Aero-Propulsive CFD Methodology for the Hyper-X Flight Experiment", AIAA-paper 2000-4010.

- Frendi, A., "A Fully Coupled Flow-Heat Transfer Model for Accurate Prediction of Wall Temperature", AIAA paper 2000-3847.
- Frendi, A., "On the CFD Support for Hyper-X Aerodynamic Database", AIAA paper 1999-0885.
- Frendi, A., "Powered and Unpowered Sideslip CFD Results for the Mach 7 Hyper-X Vehicle", JANNAF Conference, Tucson, AZ, 1998.
- Frendi, A., "On the Coupling Between a Supersonic Turbulent Boundary Layer and a Flexible Structure", 34th AIAA Conference and Exhibit, Reno, Nevada, 1996.
- Frendi, A. and Maestrello, L., "On the Combined Effect of Mean Flow and Acoustic Excitation on Structural Response and Radiation", ASME Winter Annual Meeting, Chicago, IL, 1994.
- Frendi, A., Maestrello, L., Robinson, J., and Bayliss, A., "On Acoustic Radiation From a Vibrating Panel", AIAA paper 1993-4367.
- Frendi, A., Maestrello, L., and Bayliss, A., "Coupling Between Plate Vibration and Acoustic Radiation", AIAA paper 1993-0603.
- Frendi, A., Maestrello, L., and Bayliss, A., "On the Coupling Between a Supersonic Boundary Layer and a Flexible Surface", AIAA paper 1992-02-009.
- Maestrello, L., Frendi, A., and Brown, D.E., "Nonlinear Vibration and Radiation from a Panel Structure with Transition to Chaos Induced by Acoustic Waves", AIAA paper 1992-02-071.
- Frendi, A. and Sibulkin, M., "Lean Flammability Limit for Methane-Air Mixtures at Zero Gravity", Eastern Section of the Combustion Institute, RPI, New York, 1989.