

Theodore Sean Tavares

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U.S. Citizen

PROFESSIONAL INTERESTS

Fluid mechanics, thermodynamics, and other physical phenomena related to engineering application. Special interest in aerospace, propulsion, and energy applications. College level teaching in engineering and related technical subjects. Interests also include research into teaching and learning of STEM subjects and integration into curriculum.

ACADEMIC EXPERIENCE

University of New Hampshire Manchester Manchester, NH
Assistant Professor of Mechanical Engineering Technology, August 2014 – present

Resident Faculty in Mechanical Engineering Technology Program. Courses taught to date include ET 639 HVAC Engineering, ET 644 Concepts in Mechanical Engineering Design and Analysis, ET 674 Control Systems and Components, ET 696 Spec. Top. In MET, ET 751 MET Senior Capstone Project. Active in UNH STEM Education Learning Community.

University of Texas San Antonio (UTSA) San Antonio, TX
Adjoint Assistant Professor of Mechanical Engineering, Jan. 2012 – Present

Collaboration in development of curriculum for, and teaching of UTSA Course ME 6113, *Experimental Techniques in Engineering*. This is a required course in UTSA's recently added Ph.D. program in Mechanical Engineering. Course first delivered Spring of 2012, and taught again in Fall term of 2013. Faculty appointment is designated "Adjoint" as the course is under a collaboration agreement with Southwest Research Institute.

INDUSTRY AND RESEARCH EXPERIENCE

Southwest Research Institute San Antonio, TX
Principal Engineer, July 2008 – August 2014

Work included projects in the areas of performance testing of compressors and gas turbine engines; vibration and pulsation testing and troubleshooting of rotating machinery, piping and structures; Computational Fluid Dynamics (CFD); design and analysis of turbomachinery (compressors, fans, and pumps); root cause failure analysis; and engineering design audits. Regular presenter at short courses and training seminars in specialty areas. Projects involved travel to client sites in North and South America, Europe, Middle East, and Africa.

Rolls-Royce Energy Systems Inc. Mount Vernon, OH
Mechanical Engineer, Senior Specialist, Nov. 2000 – June 2008.

Responsible for developing and implementing improved techniques for aerodynamic and thermodynamic design and analysis of turbomachinery. This included application of CFD to centrifugal compressors. Other activity focused on implementing improved methodologies for mean-line analysis in the compressor design and development process. Also delivered technical training in engineering topics and new technology to coworkers, and other groups throughout the R-R Energy Business. Also responsible for securing Rolls-Royce Corporate funding for longer-time horizon Research and Technology Projects, and technical execution of same.

INDUSTRY AND RESEARCH EXPERIENCE (CONTINUED)

Northern Research and Engineering Corporation (NREC) Woburn, MA
Project Engineer, Dec. 1997 – Oct. 2000; Senior Engineer, Dec. 1993 - Dec. 1997.
Worked on aerodynamic and thermodynamic analysis, and the development of engineering software. Most applications involved design and analysis of turbomachinery for a variety of applications. Software development work focused primarily on NREC’s VISIUN, PREDIG, and PERFIG engineering software packages. Oversaw PREDIG and PERFIG technical development (1999-2000). Lectured on turbomachinery and CFD topics at NREC Technical Seminars and Workshops, delivered customer support and training, proposal writing, and support of sales efforts.

Flight Dynamics Directorate, U.S.A.F. Wright Lab. Wright-Patterson AFB, OH *June 1991 - June 1993.* National Research Council/Air Force Materiel Command Post-Doctoral Associate. Visiting Scientist in Computational Fluid Dynamics Research Section. Investigated high-angle-of-attack aerodynamics using state-of-the-art methods in computational fluid dynamics. Collaborated in developing methodologies for solving fluid flow equations on unstructured computational meshes.

M.I.T. Dept. of Aeronautics and Astronautics Cambridge, MA *June 1984 - Feb. 1986, and 1987-1990:* Research Assistant during Masters and Doctoral degree programs. *May 1983-May 1984:* Assisted in construction and testing of M.I.T. Monarch airplane, winner of the Third Kremer Prize for Human Powered Aircraft.

Woods Hole Oceanographic Institution Woods Hole, MA *Feb. Jan. - Oct. 1986, Summers 1980-83, and 1985.*
Worked on design, construction, calibration, and testing of instrumentation for marine geophysical research. Helped to organize and took part in a 30 day scientific cruise in the Pacific Ocean (1986).

EDUCATION

Massachusetts Institute of Technology Cambridge, MA
Ph.D. in Aerodynamics (June 1991)
Thesis research under Prof. J.E. McCune. Thesis title: “Aerodynamics of Maneuvering Slender Wings with Leading-Edge Separation.” Calculation and interpretation of the aerodynamic interaction between low-aspect ratio wings and their leading-edge vortex wakes at high angle-of-attack and in large amplitude maneuver. Minor in Earth and Planetary Sciences.

S.M. in Aeronautics and Astronautics (May 1986)
Thesis research under Profs. A.H. Epstein and J.L. Kerrebrock. Thesis title: “A Supersonic Fan Equipped Variable Cycle Engine for a Mach 2.7 Supersonic Transport.” System study of engine concept and design of cascades for a supersonic through flow fan stage. Analysis of fan cascades using computational fluid dynamics.

S.B. in Aeronautics and Astronautics (June 1984)
Curriculum in Aeronautics and Astronautics with emphasis on aerodynamics and aircraft propulsion. Humanities concentration in art and architecture history.

SELECTED PROFESSIONAL DEVELOPMENT

Turbulence Modeling for CFD, AIAA sponsored short course, April 1996.
Fundamentals of CFD, AIAA sponsored home study course, Nov. 1996 - March 1997.
Project Management for Engineers, ASME Short-Course, February 2002.
Customer-Centric Selling, Sales & Marketing course taken at SwRI, 2009.
UNH Writing Academy, 2015.
UNH Research & Engagement Academy, 2018.

HONORS AND AWARDS

Best Paper Award, Aircraft & Airfoil Test/Analysis Session, AIAA Dayton-Cincinnati Section 19th Annual Mini-Symposium, 1993.

Best Paper Award, Aircraft/Airfoil Aerodynamics Session, AIAA Dayton-Cincinnati Section 18th Annual Mini-Symposium, 1992.

National Research Council/Air Force Materiel Command Research Associate, 1991 & 1992.

Elected to Sigma Xi Scientific Research Society, Full Membership, 1989.

Received share of the Third Kremer Prize for Human Powered Aircraft as a Member of the M.I.T. Monarch Project, 1984.

ACTIVITIES

American Society of Mechanical Engineers; Treasurer of San Antonio Section, May-2011- Aug. 2014. Member ASME IGTI Oil & Gas App. Comm., Paper Reviewer

American Society for Engineering Education; Member and Paper Reviewer.

World War I Aeroplanes, Inc., (NY 501c3 non-profit aviation history organization); President of Board of Trustees (2009 – 2016), Vice President of Board of Trustees (2008-2009); Co-columnist aeromodeling column of quarterly Journal *World War I Aero* (2005-present).

Craft Center (extra-curricular arts program) at Kenyon College, Ohio. Assistant Instructor in Woodworking Program, Fall 2004 – Spring 2008.

Junior Warden, Harcourt Parish Episcopal Church, Gambier, Ohio. October 2005-June 2008.

American Institute of Aeronautics and Astronautics. Offices held in Columbus, Ohio Section; Chairman May 2003 - May 2004; Vice Chairman Jan. 2002 - May 2003. Holds FAA Private Pilot License.

PUBLICATIONS

1. Tavares, T.S., "A Supersonic Fan Equipped Variable Cycle Engine for a Mach 2.7 Supersonic Transport," NASA-CR-177141, 1986.

2. McCune, J.E., Tavares, T.S., Lee, N.K.W., and Weissbein, D., "Slender Wing Theory Including Regions of Embedded Total Pressure Loss," AIAA Paper 88-0320. Presented at the AIAA 26th Aerospace Sciences Meeting, Reno, NV, January 11-14, 1988.

3. McCune, J.E., and Tavares, T.S., "Unsteady 3-D Aerodynamics of Slender Wings in Severe Maneuver," AIAA Paper 88-3544. Presented at 1st National Fluid Dynamics Congress, Cincinnati, OH, July 25-28, 1988.

4. Tavares, T.S., and McCune J.E., "Aerodynamics of Maneuvering Slender Wings with Leading-Edge Separation," *AIAA Journal*, Vol. 31, No. 6, June 1993, pp. 977-986.

5. Tavares, T.S., "The Effect of Leading-Edge Cross-Sectional Geometry on Vortex Flow Aerodynamics, Synopsis of Research for *Computational Fluid Dynamics Research Branch Technical Briefs*, USAF Wright Laboratory Technical Report, WL- TR-93-3047, May 1993.

6. McCune, J.E., and Tavares, T.S., "Perspective: Unsteady Wing Theory - The Karman/Sears Legacy," Invited paper for Transactions of the ASME, *Journal of Fluids Engineering*, Volume 115, No. 4, December 1993, pp. 548-560.

**PUBLICATIONS
(CONTINUED)**

7. Aftosmis, M.J., Gaitonde, D.V., and Tavares, T.S., "On the Accuracy, Stability, and Monotonicity of Various Reconstruction Algorithms for Unstructured Meshes," AIAA Paper 94-0415. Presented at the AIAA 32nd Aerospace Sciences Conference, Reno, NV, January 10-13, 1994.
8. Aftosmis, M.J., Gaitonde, D.V., and Tavares, T.S., "The Behavior of Linear Reconstruction Techniques on Unstructured Meshes," USAF Wright Laboratory Technical Report WL-TR-94-3023, February 1994.
9. Aftosmis, M.J., Gaitonde, D.V., and Tavares, T.S., "Behavior of Linear Reconstruction Techniques on Unstructured Meshes," *AIAA Journal*, Vol. 33, No. 11, November 1995, pp. 2038-2049.
10. Broerman, E.L., Tavares, T.S., Iyengar, V., and Nored, M.G., "Investigation of High Efficiency Pulsation Filter Bottle Design," Presented at the 2009 GMRC Gas Machinery Conference, Atlanta, GA, October 5-7, 2009.
11. Garcia-Hernandez, A., Tavares, T.S., and Wilcox, M.A., "Dynamic Pipeline System Simulation of Multi-stage Compressor Trains," ASME Paper GT2012-70072. Presented at Turbo Expo 2012, Copenhagen, Denmark, June 11-15, 2012.
12. Tavares, T.S., Gatewood, J.T., and Sivadas, T.N., "Performance Assessment of Gas Turbine Driven Centrifugal Compressor Trains Derived from Field Testing," Proceedings of the 2nd Middle East Turbomachinery Symposium (METS II), Doha, Qatar, March 17-20, 2013.
13. Chirathadam, T., White, B., Broerman, E., Tavares, T.S., Esmael, J.A., and Meshram, S.K., ME, "Case Study: Design and Performance Verification Testing of a Screw Compressor Discharge Silencer," Paper presented at the 2015 GMRC Gas Machinery Conference, Austin TX, Oct. 4-7, 2015.
14. Halpin PA, Tavares S. and Sabin M. (2016). "An Interdisciplinary Approach Combines Physiology, Engineering, and Computer Science to Increase Awareness of STEM Professions among Middle School Students", *FASEB J* 30:553.6 (peer refereed abstract) Presented at: Experimental Biology Meeting, San Diego, CA, April 3, 2016.
15. LeBlanc, C., Forest, D., and Tavares, T.S., "Continuous Improvement of a 2+2 Engineering Technology Program: A Ten Year Study," Presented at the American Society of Engineering Education Conference for Industry and Education Collaboration, Jacksonville, FL, Feb. 6-10, 2017.
16. Tavares, T.S., "Performance Testing of Small Water Pumps: A Versatile and Economical Laboratory Exercise for Engineering Technology Students," Presented at the 2017 American Society of Engineering Education Annual Conference and Exposition, Columbus, OH, June 23-27, 2017.
17. Jin, K.H., Jonas, M., LeBlanc, C.D., and Tavares, T.S., "Modernizing Capstone Projects: Internal and External Approaches," Paper ID #23065, ASEE Annual Conference and Exposition, Salt Lake City, UT, June 24-27, 2018.
18. Tavares, T.S., Banker, S.C., LeBlanc, C.L., Ferguson, J., "Collaboration on Engineering Technology Capstone Projects with the UNH University Instrumentation Center", American Society of Engineering Educators Conference for Industry and Education Collaboration, New Orleans, LA, Jan. 30 – Feb. 1, 2019.

**PUBLICATIONS
(CONTINUED)**

19. Tavares, T.S., Tavares, T.S., “Study of Hydraulic Losses in Gravity-Driven Pipe Flow: An Exercise Combining Theory and Experiment for Engineering Technology Students,” Presented at the 2019 ASEE Annual Conference and Exhibition, Tampa, FL, June 15-19, 2019.

**SELECTED
PRESENTATIONS**

1. “A Supersonic Throughflow Turbofan for a Mach 2.7 SST,” Gas Turbine Laboratory Seminar, Department of Aeronautics and Astronautics, M.I.T., Cambridge, MA, April 30, 1987.
2. “Unsteady 3-D Aerodynamics of Slender Wings in Severe Maneuver,” Fluid Dynamics Seminar, Department of Aeronautics and Astronautics, M.I.T., Cambridge, MA, October 28, 1988.
3. “Calculation of Forces and Moments on Airfoils in Unsteady Flow Using Conservation of Kelvin Impulse,” Guest Lecture in Graduate Course 16.07: Aerodynamics of Wings and Bodies, Course Administered by Profs. J.E. McCune and S.E. Widnall, Department of Aeronautics and Astronautics, M.I.T., Cambridge, MA, February, 1989.
4. “Aerodynamics of Maneuvering Slender Wings with Leading-Edge Separation,” Applied and Computational Mathematics Seminar Series, Bolt, Beranek, & Newman Systems and Technologies Corporation, Cambridge, MA, July 11, 1990.
5. “On the Indicial and Gust Responses of Slender Wings with Leading-Edge Separation,” Presented at the 43rd Meeting of the Division of Fluid Dynamics, American Physical Society, Ithaca, NY, November 20, 1990.
6. “Separated Flow Aerodynamics of Maneuvering Low-Aspect-Ratio Wings,” Presentation to CFD Research Section, Wright Laboratory, Wright-Patterson A.F.B., Ohio, July 15, 1991.
7. “Aerodynamics of Maneuvering Slender Wings with Leading-Edge Separation,” Presented at the AIAA Dayton-Cincinnati Section 18th Annual Mini-Symposium, Dayton, OH, March 26, 1992. Winner of Best Paper Award in Aircraft/Airfoil Aerodynamics Session.
8. “The Effect of Leading-Edge Cross-Sectional Geometry on Vortex Flow Aerodynamics,” Presented at the AIAA Dayton-Cincinnati Section 19th Annual Mini-Symposium, Dayton, OH, March 25, 1993. Winner of Best Paper Award in Aircraft & Airfoil Test/Analysis Session.
9. “Gas Turbine and Centrifugal Compressor Performance Testing in the Field,” Tutorial presented at the 40th Eastern Gas Compression Roundtable, Moon Township, PA, May 7-9, 2012. (Co-presenters, Tavares, T.S., and Gatewood, J.T.)
10. “Testing Capabilities in Support of Modeling and Simulation,” Invited Presentation at Schlumberger World Technology Day, Sugarland, TX, June 14, 2012.
11. “Performance Assessment of Centrifugal and Reciprocating Compressor Units from Field Testing,” Tutorial presented at the 2012 GMRC Gas Machinery Conference, Austin, TX Sept. 30 – Oct. 3, 2012. (Co-presenters, Tavares, T.S., Wilcox, M.A., and Gatewood, J.T.)

**SELECTED
PRESENTATIONS
(CONTINUED)**

12. "Root Cause Failure Analysis for Machinery & Piping," 1-day short course presented at the 2nd Middle East Turbomachinery Symposium (METS II), Doha, Qatar, March 17-20, 2013. (Co-presenters, Iyengar, V., and Tavares, T.S.)

13. "Performance Assessment of Centrifugal and Reciprocating Compressor Units from Field Testing," Presented at the 41st Eastern Gas Compression Roundtable, Moon Township, PA, May 14-16, 2013. (Co-presenters, Tavares, T.S., and Brun, K.)

**OTHER
PRESENTATION
ACTIVITIES**

Technical Seminars given at Rolls-Royce included short preparation and delivery of talks on aerodynamics and thermodynamics of gas compressors. These were delivered to both R&D and design engineers, and to sales personnel. For the sales force sessions were given at 4 Rolls-Royce Energy Systems sites in 2007; Mt. Vernon, Ohio, Houston, Texas, Liverpool, UK, and at the Rolls-Royce Energy Division World Sales Conference, Ansty, UK.

Frequent presenter at SwRI of short courses and customer training sessions. Some examples include presentations on compressor and gas turbine performance testing at "IGTI Turbomachinery Training Week" courses held at SwRI in February 2010 and 2011, and lectures on performance and fluid dynamic characteristics of reciprocating compressors at SwRI Fluid Pulsation courses held in 2010, 2011, and 2013.