James A. Turso, P.E., Ph.D.

EXPERIENCE

2018 – Present Advisory Electrical Engineer (E5), Newport News Shipbuilding, Washington, D.C.

- Shipboard power system troubleshooting and analysis
- Shipboard control system troubleshooting and analysis
- Modeling, simulation and analysis of shipboard systems
- Thermal system modeling and analysis

2013-2018 Senior Research Associate, Penn State Applied Research Laboratory and Department of Mechanical and Nuclear Engineering, University Park, PA

- Principle Investigator on the following projects:

  Analysis and Troubleshooting of CVN78 Generator Control System Issues, $40,000, Huntington-Ingalls Inc., Newport News Shipbuilding, 2015 (Principal Investigator – Penn State Applied Research Laboratory).

  Controllable Pitch Propeller (CPP) System Hammering Issue, Evaluation and Resolution, $60,000, Huntington-Ingalls Inc., Ingalls Shipbuilding, 2015 (Principal Investigator - Penn State Applied Research Laboratory)

  Digital Control and Safety System Modernization for the Penn State TRIGA Reactor, $1,083,773, Department of Energy, 2017 (Principal Investigator).

- USNRC-qualified Senior Reactor Operator. Stand watch and implement maintenance and performance procedures in support of PSU TRIGA reactor facility.
- Ph.D. Dissertation Committee member for two nuclear engineering graduate students and one mechanical engineering graduate student.
- Developed and tested LabView-based TRIGA reactor control rod reactivity computer.
- Lecturer, Penn State Departments of Mechanical and Nuclear Engineering and Electrical Engineering for the following courses.

  Nuclear Reactor Dynamics and Control (Graduate-Level Nuclear Engineering)

  Electric Machines and Drive Systems (Senior-Level Elective Electrical Engineering)

  Nuclear Reactor Physics Laboratory (Senior-Level Nuclear Engineering)

  Nuclear Engineering Senior Design Project. Mentored 2 groups to 1st and 3rd places in departmental design competition (19 4-person groups participated).

- Lead, linear actuator development – in partnership with a small business, prototyped actuator and associated controls for miniature control surface actuators used on UAV.
- Performed obsolescence upgrade of torpedo control surface actuators and motor drives.

2005-2013 **Fellow Engineer, Northrop Grumman Electronic Systems,** Sykesville, MD

Accomplishments:

- Systems Lead, CVN Machinery Control System – managed the development of aircraft carrier propulsion plant fluid/thermal system control algorithms and simulation models (for testing algorithms). Developed and implemented control algorithms in PLC (PAC) hardware for ship system and field device interfaces.
- Selected to participate in the Northrop Grumman Corporation's People Leadership Cohort program. This program combined management and non-management-grade personnel from each of the NGC four sectors to develop innovative business solutions. Participated in brain-storming sessions, organized and wrote the final report entitled ***Mission Capability Thinking:*** *How can NGC reshape the way we think about problems to focus on mission solutions as opposed to technology improvements.*
- Prototype control system test team member – led simulation-based verification (Hardware-in-the-Loop simulation testing) and controls algorithm development / implementation for off-site customer testing.
- Test lead for shipboard testing and analysis of machinery control and propulsion system performance for the USS Makin Island (the US Navy's first Hybrid Drive ship).
- Team lead in the development of electric plant and electric drive models for the USS Makin Island amphibious assault ship.
- Developed simulator-based (dSpace-based) shipboard control system test-bed. This required managing an Integrated Product Team of subcontractors, engineers, and craftspeople to successfully integrate simulator system into the shipboard environment with limited schedule and budget.

2003-2005 **Senior Research Engineer, QSS Group Inc., NASA Glenn Research Center**
Controls and Dynamics Technology Branch, Cleveland, OH

Accomplishments:

- Team lead: Space nuclear-electric propulsion system instrumentation and control system needs assessment. Wrote an internal report (and subsequent conference paper) which involved organizing a team from across NASA to provide a vision for space-nuclear control system functionality.
- Provided guidance to NASA program management on pertinent research areas critical to the success of several NASA programs. This included the development of:
- Reduced-order structural and thermal/hydraulic dynamic models of aircraft propulsion systems. Implemented models in the MATLAB/SIMULINK software environment. Combined aircraft propulsion system's structural models with thermal performance models in the MATLAB/SIMULINK, FORTRAN, and NPSS environments
- Robust control schemes to enhance the operability of jet engines
- Sensor fusion system using a wavelet-based signal processing algorithm to detect jet engine structural malfunctions e.g., foreign object damage (FOD), and Kalman Filter-based health parameter estimates to detect engine FOD events with high confidence.

1995-2002 **Senior Engineer, Bettis Atomic Power Laboratory, Bechtel Bettis, Inc.,** Pittsburgh, PA.

Accomplishments:

- Robust structural vibration control research.
- Power plant simulation development. Supported instrumentation and control system simulator/stimulator development (FORTRAN code development) for HIL testing of shipboard components and systems.
- Reactor protection analysis. Output data used for plant casualty response demonstrator crew training system.
- Reactor parameter estimation algorithm development. Developed novel technique for control rod reactivity estimation, used for shipboard physics tests.
- Lecturer at the Bettis Reactor Engineering School (BRES)

EDUCATION

2009	M.S.	Electrical Engineering (Specialty: Power Engineering, Power Electronics)	University of Idaho, Moscow, ID
1995	Ph.D.	Nuclear Engineering (Specialty: Plant Controls/Parameter Estimation)	Penn State, University Park, PA
1993	M.S.	Nuclear Engineering	Penn State, University Park, PA
1990	M.S.	Mechanical Engineering	Manhattan College, Bronx, NY
1984	B.S.	Marine Engineering	S.U.N.Y. Maritime College, Bronx, NY

PROFESSIONAL CERTIFICATIONS

- USNRC Senior Reactor Operator (inactive)
- Professional Engineer, Pennsylvania
- Six-Sigma Green Belt Certified
- U.S. Coast Guard Third Assistant Engineer, unlimited horsepower, steam and motor (active for continuity)
- Certified LabView Associate Developer

VOLUNTEER

2010-Present **Nuclear Ship Savannah Association (Nuclear Ship Savannah is an ASME National Historic Landmark). Baltimore, MD.**

- Nuclear Ship Savannah Association (Treasurer). Managed NSSA budget, maintained financial records for IRS tax reporting.
- Identified potential funders for the Savannah and planned development events to showcase the Savannah.
- Organized teams of Northrop Grumman volunteers to assist in public events and shipboard remediation activities.

AWARDS

- Newport News Shipbuilding Model of Excellence Award – 2022
- Northrop Grumman Electronic Systems Honor Roll of Inventors – 2010
- Best Paper Award, Northrop Grumman Technical Research Journal – 2008
- U.S. Navy Certificate of Appreciation: LHD8 Machinery Control System (SCADA) Development and Support – 2008
- NASA Tech Brief Award (new technology awards - 2): A Foreign Object Damage Event Detector Data Fusion System for Turbofan Engines, Airfoil Mounted Thin Film Flow Sensor Utilizing Time-Of - Flight to Determine Velocity Profile and Mass Flow (2005)
- Bechtel Bettis Inc, Engineering Achievement Award - 2001
- Bechtel Bettis Continuous Improvement Award (4) - 1997, 1998, 2000, 2001
- Bechtel Bettis Business Award – 1999

PUBLICATIONS

Reports to Sponsor

Edwards, R.M., H.E. Garcia, and J.A. Turso. October 1992. Test Data Package for Heater Number 2 Intelligent Control Demonstration at the Experimental Breeder Reactor (EBR II). Report to: Argonne National Laboratory.

Turso, J.A., R.M. Edwards, and S.J. Kenney. November 1997. Experimental Development of Power Reactor Intelligent Control; Task IV Hybrid Reactor/Simulation Capability. Report to: Electric Power Research Institute.

Turso, J., Lawrence, C., and Litt, J., “Reduced-Order Modeling and Wavelet Analysis of Turbofan Engine Structural Response due to Foreign Object Damage (FOD) Events,” NASA Technical Memorandum NASA/TM-2004-213118 (2004).

Turso, J.A., Garg, S., Shah, N., Chicatelli, A., Bajwa, A., "Instrumentation and Control Needs for Reliable Operation of Lunar Base Surface Nuclear Power Systems," NASA/TM—2005-213839 (2005).

Turso, J., Over 50 internal corporate reports and presentations.

Journal and Magazine Articles

Z.L. Kahn-Jetter, J.A. Turso, P.J. Pritchard, "Deformed Surface Curve Measurements Using Photogrammetric Techniques," *Experimental Techniques, The Society for Experimental Mechanics* (January/February 1992).

R.M. Edwards, J.A. Turso, H.E. Garcia, Asok Ray, "The Penn State Intelligent Distributed Controls Research Laboratory,: *IEEE Transactions on Energy Conversion*, 7:478-482 (September 1992).

J.A. Turso, R.M. Edwards, J. March-Leuba, "Hybrid Simulation of Boiling Water Reactor Dynamics Using a University Research Reactor," *Nuclear Technology* (April 1995).

J.A. Turso, J. March-Leuba, R.M. Edwards, "A Modal-Based Reduced-Order Model of BWR Out-of Phase Instabilities," *Annals of Nuclear Energy, Vol. 24, No. 12* (1997).

Turso, J. A., and R. M. Edwards. "Kalman Filter-Based Maximum A Posteriori Probability Detection of Boiling Water Reactor Stability," *IEEE Transactions on Control System Technology,* Vol. 12, No. 5, September 2004.

Turso, J.A., Litt, J.S., "A Foreign Object Damage Event Detector Data Fusion System for Turbofan Engines," *AIAA Journal of Aerospace Computing, Information, and Communication,* Vol. 2, No. 7, July 2005.

Turso, J. A., R. M. Edwards, B.E. Turso, "Accommodating Power Plant Anomalies via Artificial Neural Network-Based Reconfigurable Control," *Journal of Intelligent Systems*, January 2007.

Turso, J., Lawrence, C., and Litt, J., "Reduced-Order Modeling and Wavelet Analysis of Turbofan Engine Structural Response due to Foreign Object Damage (FOD) Events," *ASME Journal of Engineering for Gas Turbines and Power,* July 2007.

Turso, J.A., Logan, K., Brick, D.C., "Shipboard Applications of Advanced Model-based Sensor Diagnostics," *Northrop Grumman Technical Review Journal*, August, 2007. (Winner, 2008 Best Paper Award).

Turso, J.A., Litt, J.S., "Toward an Intelligent, Deterioration Accommodating Controller for Aging Turbofan Engines," *The Aeronautical Journal*, October 2008.

Nuernberger, S., and J. Turso, "Toward the Use of Wavelet Scalograms in the Diagnostic Analysis of Rotating Machine Transient Data," *Noise and Vibration Worldwide,* Sage Publishing, Vol. 49(3), 2018.

Turso, J., "Penn State University TRIGA Reactor Digital Reactivity Computer: Development and Testing," *Annals of Nuclear Energy,* 114 (2018) 561-568.

Turso, J., Carvajal, J., "Toward the Implementation of Self-Powered, Wireless, Real-Time Reactor Power Sensing," *Annals of Nuclear Energy,* December, 2019.

J.A. Turso and M.R. Patel, "Electrical Power Online Education Program with USMMA," *Marine Technology,* Society of Naval Architects and Marine Engineers, January 2021.

Renz, E.C.; Turso, J. "Toward the Application of Pulse Width Modulated (PWM) Inverter Drive-Based Electric Propulsion to Ice Capable Ships," *Energies* **2022**, 15, 8217. https://doi.org/10.3390/en15218217

Conference Proceedings

J.A. Turso, R.M. Edwards, D. Hughes, Mac Bryan, H.E. Garcia, "Experience with Developing A Real-World Advanced Control and Diagnostic Testbed Using a University Research Reactor," *Proceedings of the American Nuclear Society, A/91: Frontiers in Innovative Computing for the Nuclear Industry*, Jackson, Wyoming (Sept. 15-18,

Edwards, R.M., J.A. Turso, H.E. Garcia, M.H. Ghie, S. Dharap, and S. Lee, "Real-time Distributed Simulation Using the Modular Modeling System Interfaced to a Bailey NETWORK 90 System," *EPRI 1991 International Conference on Power Plant and Power System Training, Simulators, and Modeling*. Miami Beach, FL (1991).

Edwards, R.M., J.A. Turso, K.Y. Lee, H.E. Garcia, and A. Ray, "The Penn State Intelligent Distributed Control Research Laboratory," *Proceedings of the 1992 IEEE Power Engineering Society Winter Meeting*. New York, NY (1992).

Turso, J.A., R.M. Edwards, and D.E. Hughes, "Hybrid Reactor/Simulation Development for Commercial Power Plant Controller Testing," *Proceedings of The 16th Biennial ANS Topical Meeting on Reactor Operations Experience: Present & Future Technologies - Applying Lessons Learned*. Long Island, NY (1993).

R.M. Edwards, J.A. Turso, H.E. Garcia, "Fault Accommodating Feedwater Control Simulation and Validation for In-Plant Test, *" Proceedings of the American Nuclear Society Topical Meeting on Nuclear Plant Instrumentation, Control and Man-Machine Interface Technologies,* Oak Ridge, TN (April 18-21 1993).

Turso, J.A., J. March-Leuba, and R.M. Edwards," A Modal Based Reduced Order Model of BWR Out-of-Phase Instabilities," *Trans. of the Amer. Nucl. Soc*. (1995).

Turso, J.A., R.M. Edwards, and T. Highlands, "Boiling Water Reactor Stability Analysis Via Kalman Filter-Based State Estimation and Maximum A Posteriori Detection," *Proceedings of The 1996 American Nuclear Society International Topical Meeting on Nuclear Plant Instrumentation, Control and Human Machine Interface Technologies,* NPIC&HMIT'96, University Park, PA, (1996).

Turso, J. A., and J.T. Roth, "Smart Materials-Based Structural Vibration Isolation using H_∞ - Based optimal control," *Proceedings of the ASME Int. Mechanical Engineering Congress and Exposition,* November 2002.

Turso, J.A., A. Khalilolahi, "Dynamical State Space Modeling of Composite Springboards," *Proceedings of the Tenth Annual ICCE,* New Orleans, LA, July 2003.

Turso, J.A., Litt, J.S., "A Foreign Object Damage Event Detector Data Fusion System for Turbofan Engines," AIAA-2004-4047, *AIAA Joint Propulsion Conference*, Ft. Lauderdale, FL , July 2004. (NASA-TM-2004-213192).

Turso, J.A., Litt, J.S., "Intelligent, Robust Control of Deteriorated Turbofan Engines via Linear Parameter Varying Quadratic Lyapunov Function (LPVQLF)-Based Design," AIAA-2004-6363, *AIAA Intelligent Systems Conference,* Chicago, IL, September 2004. (NASA-TM-2004-213375)

Turso, J.A., Ainsworth, W, Dusang, L., Smith, L, "*U.S.S. Makin Island:* Simulation-Based Analysis and its Role in Electric-Plant Control System Design," *Electric Ship Technology Symposium,* Alexandria, VA, 2007.

Turso, J., T. Dalton, S. McCullough , C. Bottorff, W. Ainsworth, C. Mako, S. Foster, R. Peden, D. Johnson, "*U.S.S. Makin Island Auxiliary Propulsion System:* Identification and Accommodation of System-Level Interactions," Electric Machinery Technology Symposium (EMTS), American Society of Naval Engineers, 2010.

Turso, J., Simon, D., Boughner, A., Buonamici, G., Johnson, D., and Rucker, H., "*Propulsion Simulator/Stimulator Development for US NAVY'S Newest Gas Turbine-Powered Ship, LHD 8 USS Makin Island,"* Proceedings of ASME Turbo Expo 2010: Power for Land, Sea and Air GT2010, Glasgow, UK, 2010.

Lawson, M., Turso, J., "Development and Hardware-In-The-Loop Analysis of Commercial Marine-Nuclear Propulsion Plant Programmable Logic Controller-Based Control," *Proceedings of the American Nuclear Society NPIC&HMIT 2012*, San Diego, CA 2012.

Corak, Gokhan and J. Turso, "Penn State Breazeale Reactor Control System Replacement: System Development and Hardware-In-The-Loop Testing," *American Nuclear Society Student Conference, Pittsburgh, PA, April 2017* (Winner – Best Paper in Session).

Humes, Emily and J. Turso, "Characterization of Penn State TRIGA Reactor External Irradiation Fixtures," *American Nuclear Society Student Conference, Pittsburgh, PA, April 2017.*

Yao, W., Turso, J., Ray, A., and Watson, J., "Non-redundant Temperature Sensor Calibration Using Autoregressive Support Vector Machine in PWR Nuclear Power Plants," *American Nuclear Society NPIC&HMIT 2017*, San Francisco, CA 2017, June 2017.

James Turso and Kenan Ünlü, "Digital Control and Safety System Modernization for the Penn State TRIGA Reactor," *Transactions of the American Nuclear Society, 2018 Summer Meeting,* Philadelphia, PA (Invited Paper).