

Jaton N. Wince, Ph.D.

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Forensic engineer and continuum mechanics expert with more than 25 years of experience across aerospace, defense, computational science, and forensic engineering. Practice areas include mechanical and materials failure analysis, gas and explosion investigation, blast–structure interaction, biomechanics of traumatic injury, and standards-based forensic evaluation. Develops and applies first principles physics-multiphysics material modeling and digital-twin simulation methods in support of causation assessment, system reliability evaluation, and litigation.

Career spans government laboratories, defense contractors, and commercial engineering practice, including national security programs formerly requiring Top Secret / SCI eligibility. Provides objective, reproducible, and defensible technical analysis for attorneys, insurers, and institutional clients where accuracy and admissibility are required.

EXPERT WITNESS TESTIMONY

Trial Testimony (Expert): None

Sworn Testimony

- Depositions and examination under oath provided in connection with accident-related matters. Testimony includes expert-retention matters and sworn proceedings in a personal context. Expert witness engagements are identified separately in the case list.

FORENSIC ENGINEERING & LITIGATION CONSULTING EXPERIENCE

(Non-testifying, consulting, and pre-retention engagements)

- Forensic engineering investigations involving gas explosions, pressure-driven failures, structural damage, and mechanical system failures in residential, commercial, and industrial contexts.
- Engineering inspections, failure reconstruction, and causation analysis for litigation support, insurance disputes, and pre-trial technical evaluation.
- Development of inspection protocols, testing plans, and standards-based engineering analyses for counsel in advance of expert designation.
- Biomechanical and injury-mechanics analyses supporting litigation strategy, settlement evaluation, and insurance claim resolution.
- Confidential advisory roles for defense counsel and government contractors involving mechanical, structural, thermal, and materials failure assessment.
- Authored a comprehensive motor-vehicle-collision injury-causation biomechanical analysis — including collision reconstruction and occupant kinematics, three-point-restraint belt-load reconstruction, and tissue-level threshold comparison for cervical (whiplash), lumbar, shoulder (SLAP lesion and long-head biceps tendon), and knee (meniscus) injuries — correlated to medical findings and peer-reviewed failure thresholds.

These engagements involved engineering analysis and consulting services and did not include sworn testimony unless separately listed above.

ENGINEERING INVESTIGATIONS & TECHNICAL REPORTING (NON-TESTIFYING)

- Biomechanical injury-causation investigations, including motor-vehicle-collision reconstruction, occupant kinematics, and spine, shoulder, and knee injury-mechanism analysis correlating collision forces to documented injuries.
- Gas explosion investigations and blast-effects analysis, including ignition-sequence reconstruction, pressure-driven failure sequencing, and evaluation of leak and accumulation plausibility.
- Heavy-equipment and industrial-machinery failure analysis involving metallurgical evaluation and fracture-surface (fractographic) examination of failed structural components on construction and excavation equipment.
- Tempered-glass and suspended-glass failure reconstruction, including top-hung sliding shower-door detachment and fracture-origin (mirror, mist, and hackle) analysis to determine the governing failure mechanism.
- Structural and building-science evaluations addressing code compliance, remediation scope, and post-loss reconstruction requirements.
- Mechanical systems inspections and failure assessments for pressure vessels, rotating machinery, consumer products, and safety-critical equipment.
- Preparation of formal engineering reports, technical addenda, and standards-based analyses used in litigation, insurance, and regulatory contexts.

TECHNICAL EXPERTISE

- Mechanical Failure Analysis (Gas, Blast, Structural)
- Biomechanics of Traumatic Injury (Brain, Bone, Composite Tissue)
- Blast-Structure Interaction & Overpressure Effects
- Crashworthiness & Damage Tolerance
- Equation-of-State and Constitutive Modeling
- Forensic Simulation & Digital Twin Reconstruction
- Thermo-Mechanical Response of Complex Systems
- Multiphasic Composite Mechanics (Ceramic, Polymeric, Biological, Geomaterial)
- Damage Mechanics, Viscoelasticity, Viscoplasticity, and Anisotropic Redistribution

Software & Analysis Tools: WiSM, PHYNEX, ANSYS, LS-DYNA, ABAQUS, UGX, CATIA, MATLAB, Python.

BIOMECHANICS & AFRL-BASED RESEARCH

- Dissertation research developed the foundational continuum mechanics framework underlying the Wince Internal State Model (WiSM), addressing multiphase composite systems — including brain tissue, cortical bone, ceramics, polymers, and geomaterials — for materials subjected to high-strain-rate, temperature, and pressure conditions.
- Developed the Wince Internal State Model (WiSM), an ISV constitutive framework coupling a five-mechanism multiplicative kinematic decomposition, Lie-derivative-based objective rates, a

Helmholtz free-energy hierarchy with full ISV evolution, and thermodynamically consistent history-dependent damage evolution under the Clausius-Duhem inequality. WiSM is one of the constitutive technologies within the PHYNEX platform, which is the subject of a filed U.S. provisional patent application (see Patents & Intellectual Property).

- Integrated AFRL biomechanics experience under the Unitary Warhead and Lethality/Vulnerability Program, modeling lethality response of fixed, mobile, and soft targets.
- Supported advanced constitutive model validation in high-assurance national defense and biomedical applications.

PROFESSIONAL EXPERIENCE

SCIENALYSIS, INC. — President

The Woodlands, TX | April 2011 – Present

- Direct the firm's forensic engineering and computational mechanics practice, including failure investigations, biomechanical injury analysis, and litigation support for counsel, insurers, and institutional clients.
- Lead forensic investigations in complex, high-liability engineering matters, including biomechanical injury and explosive and gas-failure events, translating multiphysics analysis into technical conclusions for legal proceedings.
- Developed a proprietary GPU-accelerated micro-continuum mechanics digital twin enabling end-to-end, multiscale simulation for internal research and development applications.
- Conduct computational materials research and development, including precision modeling and automated analysis-pipeline development.
- Authored advanced technical volumes for SBIR and commercial solicitations in aerospace and defense-adjacent sectors.
- Directed spacecraft systems assurance projects, including development of Product Assurance Plans and Radiation Hardness Assurance methodologies for missions in extreme radiation, thermal, and structural environments.
- Authored and delivered finite element analysis (FEA) lecture series and tutorials on dynamic environments, structural mechanics, and test-assessment workflows.
- Maintain academic and industry collaborations supporting structural diagnostics, litigation support, and mission-critical aerospace analysis.

Parsons — Lead Systems Engineer

Huntsville, AL | November 2020 – October 2022

- Served as lead systems architect and engineering advisor for national defense programs under the Missile Defense Agency (MDA), spanning ground-based intercept and thermal-battery platforms.
- Implemented a system-wide assessment framework for missile defense capabilities.
- Led mission assurance initiatives for Ground-Based Interceptor (GBI) and Advanced Thermal Battery systems.
- Directed integration of C5ISR technologies across defense communications and control architectures; provided technical briefings to government stakeholders.

- Advised Integrated Product Teams (IPTs) and chaired the Specialty Engineering Working Group, setting technical standards and alignment across subsystems.
- Authored cyber-resilient planning and integration strategy for future MDA missions, addressing secure system interconnectivity with evolving communication-link infrastructure.
- Performed targeted diagnostics across materials, propulsion, and structural systems to identify and mitigate failure modes.

a.i. Solutions Inc. — Consulting Systems Engineer / Principal Investigator

Huntsville, AL | October 2010 – October 2020

- Served as Principal Investigator on multiple government contracts, leading technical volume development, mission-aligned solution design, and field validation strategies.
- Directed end-to-end production assurance and sustainment for a large-scale missile defense system, addressing operational readiness and system availability.
- Led field test planning, airborne sensor mission coordination, and system reliability evaluation, supporting platform transition to production.
- Identified and mitigated manufacturing design risks across production systems.
- Chaired multi-site Failure Review Boards and resolved system-level ballistic missile design issues.

Additional Experience

Jacobs Technology Inc. — Senior Engineer II

Huntsville, AL | February 2009 – October 2010

- Performed advanced predictive modeling for NASA propulsion and materials systems using ANSYS and LS-DYNA, supporting aerospace innovation and material certification.

General Electric (Aviation) — Lead Engineer / Technologist

Cincinnati, OH | March 2007 – February 2009

- Directed mechanical design and simulation (UGX, CATIA, ANSYS, ABAQUS) of advanced aircraft engine components; improved the inertia welding process through system-level redesign.

U.S. Air Force Research Laboratory — Mechanical Engineer & Systems Safety Engineer

Eglin AFB, FL | August 2002 – March 2007

- Conducted advanced penetration mechanics and systems safety analysis for defense systems; developed safety protocols across directorate-level programs.

Mississippi State University Engineering Research Center — Associate Research Engineer

Starkville, MS | January 2001 – August 2002

- Conducted computational mechanics research using DYNA3D to advance structural analysis and materials modeling for federal infrastructure and defense applications.

EDUCATION

Ph.D., Engineering

Liberty University, Lynchburg, VA | Conferred May 2025

Dissertation: A Unified Multiphase Composite Material Model: An Advanced Computational Continuum-Micro Mechanics Framework (foundational basis for the Wince Internal State Model, WiSM).

M.S. / B.S., Mechanical Engineering — Mississippi State University

PUBLICATIONS & PRESENTATIONS

- Wince, J. N. A Unified Multiphase Composite Material Model: An Advanced Computational Continuum-Micro *Computational Continuum-Micro Mechanics Framework* [Doctoral dissertation, Liberty University]. Liberty University Digital Commons.
- <https://digitalcommons.liberty.edu/doctoral/7131/>
- Wince, J. and Schneider, J., 2002. "Determining the Material Properties for Aluminum 6061-T6 for Implementation in the Johnson and Cook Constitutive Equation for Predicting Dynamic Material Behavior," *ASME Southeastern Region XI Technical Conference*, Vol. 1, No. 1, pp. 12.1–12.5.
- Wince, J., 2002. *Modeling Chip Formation in Orthogonal Metal Cutting Using Finite Element Analysis*, Master's Thesis, Mississippi State University.
- Wince, J., 2004. *Heat Transfer Analysis of High-Speed Penetrator Payload and Fuze*, AFRL Munitions Directorate.
- Wince, J., 2004. *Validation of Material Constants for the Johnson and Cook Constitutive Equation and the Mie-Gruneisen Equations of State*, AFRL Munitions Directorate.
- Wince, J., 2006. *Response of Structural Components of Fixed and Mobile Targets*, DoD HPCMP Modernization Plan.
- Wince, J. and Vaughan, D., 2006. "Development of High-Fidelity Physics-Based Fast Running Model for Progressive Collapse Assessment of Above Ground Fixed Structures," *AIAA Missile Sciences Conference*.
- Darden, J., Earhart, E., Strong, H., Wince, J., Becht, D., Chilcoat, T., 2010. "Experimental Characterization and Analytical Comparison of Rolling Element Bearing Radial Stiffness," *JANNAF Joint Subcommittee Meeting*.
- **Manuscripts in Preparation (target journals indicated):**
- Wince, J. N. WiSM: Complete First-Principles Governing Theory for a Material-Agnostic Multiscale Multiphysics Constitutive Framework. (Target: Journal of the Mechanics and Physics of Solids.)
- Wince, J. N. TDEF: Thermodynamic Damage Evolution Fatigue as the Fatigue Consequence of the WiSM Governing Framework. (Target: International Journal of Fatigue.)
- Wince, J. N. PRISM: Admissible Parameter Bounding via Inverse Statistical Mechanics for Material-Agnostic Predictive Modeling. (Target: Journal of the Mechanics and Physics of Solids.)
- Wince, J. N. TDEF-PRISM: Integrated Fatigue Life Prediction Envelopes Without Physical Test Specimens. (Target: International Journal of Fatigue.)
- Wince, J. N. Contact-to-Fracture Without Finite Elements: Analytical Boundary-Value Problem for Pin-Loaded Structural Geometries Coupled to WiSM/TDEF. (Target: International Journal of Solids and Structures.)
- Wince, J. N. Experimental Validation of the WiSM/TDEF/PRISM Architecture Against Independent Mechanical and Fracture Observables. (Target: Journal of the Mechanics and Physics of Solids.)

- Wince, J. N. A WiSM-Based Mixed-Mode Boundary-Value Framework for Fracture-Risk Assessment in Constrained Perforated Glass Panel Systems. (Target: International Journal of Solids and Structures.)
- Wince, J. N. WiSM/PRISM Characterization of Cortical Bone: A Material-Agnostic Predictive Architecture for Biological Materials. (Target: Journal of the Mechanical Behavior of Biomedical Materials.)
- Wince, J. N. PHYNEX Virtual Test Engine: Computational Architecture for WiSM, TDEF, and PRISM with Multi-Solver and Hardware-Flexible Execution. (Target: International Journal for Numerical Methods in Engineering.)
- Wince, J. N. Forensic Fracture Mechanics via WiSM/TDEF/PRISM: Thermodynamically Grounded Crack-Timeline Estimation for High-Consequence Failure Analysis. (Target: Engineering Failure Analysis.)
- Wince, J. N. PRISM for Legacy Structural Life Extension: Coupon-Free Damage-Tolerance Assessment for Aging Systems. (Target: International Journal of Damage Mechanics.)
- Wince, J. N. WiSM/TDEF/PRISM for Additive Manufacturing Certification: Bounding Fatigue and Failure in Microstructurally Variable AM Components. (Target: Additive Manufacturing.)
- Wince, J. N. PRISM Temperature-Dependent Parameter Bounding: Activation-Energy Identification from PHYNEX Synthetic Mechanical Behavior Curves. (Target: Mechanics of Materials.)
- Wince, J. N. WiSM/TDEF Material-Agnostic Formulation: Observable Taxonomy and PRISM Parameter Bounding Across Material Classes. (Target: Progress in Materials Science.)
- Wince, J. N. TDEF Applied to Cortical Bone Stress Fracture: First-Principles Fatigue Progression for Biological Load Histories. (Target: Journal of Biomechanics.)
- Wince, J. N. Analytical Boundary-Value Problem for Periprosthetic Bone Fracture Assessment: WiSM/TDEF Contact-to-Fracture Without FEA for Orthopedic Implant Qualification. (Target: Journal of the Mechanical Behavior of Biomedical Materials.)

Presentations:

- Finite element analysis (FEA) lecture series and tutorials — dynamic environments, structural mechanics, and test-assessment workflows (authored and delivered).

CERTIFICATIONS & SECURITY CLEARANCE

- Department of Defense Secret & Top Secret Security / SCI Clearance (Formerly Held)
- Department of Defense Secret Clearance (Active)
- Level III DAWIA Certification in Systems Planning, Research, Development, and Engineering
- Level II DAWIA Certification in Program Management
- Level II DAWIA Certification in Test and Evaluation
- Materials Science and Engineering Certification — Mississippi State University
- Nondestructive Testing Level II Certification
- ASME Geometric Dimensioning and Tolerancing Professional Certification

SPECIALIZED TRAINING

- Damage and Fracture Investigation — Liberty University College of Engineering
- Coarse Grain Molecular Dynamics Development and Optimization — Johns Hopkins University
- Computational Material Science & Engineering — Penn State University
- Transmission Electron Microscope and Dynamic Mechanical Analyzer Training — Mississippi State University
- GE Aviation Edison School of Engineering: Jet Engine Mechanical Design Fundamentals
- Lean Six Sigma (Green Belt) — GE Aviation
- Lean Six Sigma (Green Belt) — National Aeronautics & Space Administration
- Project Management & Leadership — GE Aviation
- Operations & Risk Management — U.S. Air Force Safety Center
- System Safety Management Course — U.S. Air Force Safety Center
- Practical System Safety Course — Southern California Safety Institute
- Safety Course for Explosive Firing Site and Laboratory Personnel — Energetic Materials Research and Testing Center
- Applied Explosive Science — U.S. Air Force Research Laboratory Munitions Directorate
- Computational Continuum Mechanics — U.S. Air Force Research Laboratory Munitions Directorate

AWARDS & DISTINCTIONS

- ASME Meritorious Research Award — recognized for advancing computational mechanics and material modeling in high-impact applications.
- Missile Defense Agency Contractor of the Year (Honor Roll) — acknowledged for contributions to national defense systems engineering and mission assurance.
- U.S. Air Force Research Lab Commander's Challenge Cup Award — awarded for innovation and excellence in applied systems research and safety engineering.
- U.S. Air Force Volunteer of the Year & Angel Star Medallion — honored for service and leadership in community-based engineering and outreach initiatives.