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JOHN A. WILKINSON
SENIOR CONSULTANT

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Mr. Wilkinson is a Senior Consultant in the Mechanics Practice Group and the Operations Manager at ESI's headquarters in Aurora, IL. He has over 40 years of diverse experience in the design and analysis of structures, mechanical systems and components. His areas of expertise include design analysis, failure analysis, mechanical engineering, engineering mechanics, stress analysis, finite element analysis, fatigue analysis and fracture mechanics. During his career he has conducted hundreds of design analyses and failure investigations across a wide range of industries.

Some examples include: construction equipment; diesel and gasoline piston engine components; gas turbine engine components; railcars; electronic warfare systems and components; pipelines; process piping; pressure vessels; aircraft and helicopter structures and components; automotive components; ladders; aerial ladders; steel structure collapses and crane collapses. Many of these studies were multidisciplinary in nature and often included highly nonlinear system or material behaviors (large displacements, contact, plasticity, etc.).

In performing these studies, Mr. Wilkinson was aided by the breadth of his academic studies as an Engineering Science major with a heavy emphasis on Applied Mathematics. Prior to joining ESI, he held positions with Northrop Corporation's Defense Systems Division, Control Data Corporation's Professional Services Division and International Harvester Corporation's Construction Equipment Division.

Areas of Specialization

Design Analysis

Failure Analysis

Mechanical Engineering

Engineering and Fracture Mechanics

Stress and Fatigue Analysis

Finite Element Analysis (FEA)

Education

M.S., Engineering Science – Applied Mechanics. University of Illinois at Chicago. 1979
B.S., Engineering Science – Applied Mechanics (with Honors). University of Illinois at Chicago. 1978
Engineering Science / Applied Mathematics. Purdue University, West Lafayette, Indiana. 1969-1974

Licensed Professional Engineer (P.E.) – Currently inactive

State of Illinois ..... License No. 062-047275 - (3/1992 – 2/2022)

March 2022

Professional Affiliations/Honors

American Society of Mechanical Engineers (ASME)

Member
Former Chair, Fox Valley Section
Former Assistant Vice President for Member Affairs-Region VI
Former Member-at-Large – National Committee on Membership

American Society for Testing and Materials (ASTM)

Member
Fatigue and Fracture Committee (E08)
Sub-Committee on Computational Techniques and Procedures (E08.08.04)

Society of Automotive Engineers (SAE)

Member

International Society of Air Safety Investigators

Past Member

Positions Held

Engineering Systems Inc., Aurora, Illinois

Senior Consultant, 1994 - Present
Manager, Illinois Operations, 2011 – 2017
Manager, Applied Mechanics, 2003 – 2012
Manager, Mechanical Engineering, 1993 – 2002
Senior Engineer, 1990 – 1993

Northrop Corporation - Defense Systems Division, Rolling Meadows, Illinois

Lead Structural Engineer – Advanced Mechanical Analysis Dept., 1986 – 1990

Control Data Corporation (CDC), Downers Grove, Illinois

Principal Engineer – Professional Services Division, 1985 – 1986
Senior Engineer – Professional Services Division, 1981 – 1985

International Harvester

Design Analysis Engineer – Construction Equipment Division, 1980 – 1981

Arlington Structural Steel Co., Inc.

Assistant to the Vice President, 1974 – 1980

Presentations/Publications

"Failure Analysis of an Aluminum Chiller Pipe by Experimental Simulation and Stress Analysis," Journal of Failure Analysis and Prevention, ASM International, published online August 23, 2017, M. E., Stevenson, H. C., Iwand, J. L., McDougall, P.D., Umberger, **J. A., Wilkinson,** M. T., Kenner, D. H., Stone

"Evaluating Design Elements in Corrosion Failure Investigations." Michael E Stevenson, M.T. Kenner, E.R. Weishaupt, M.L. Hanks, J.L. McDougall, M.D. Hayes, R.P. Baron, **J.A. Wilkinson**. MS&T 2013

"Applications of Finite Element Analysis in Forensic Engineering," presented at American Society of Mechanical Engineers (ASME) Fox Valley Section Chapter Meeting, **Wilkinson, J. A.**, Kenner, M. T., Aurora, IL, November 16, 2011

"Step Ladder Failure Analysis, a Comparison of Analytical Methods," ASME 2011 International Mechanical Engineering Congress & Exposition, Denver, CO, November 11-17, 2011, M. T. Kenner, M.E. Stevenson, E. H. Knox, M. P. Van Bree, **J. A. Wilkinson** (2011)

"Tools and Techniques for Analyzing Structural Damage in Ladders," ASM International Annual Meeting, M. E. Stevenson, M. T. Kenner, **J. A. Wilkinson**, Houston, TX, October 2010

"Fundamentals of Failure Analysis: Two Examples from the Career of Charles R. Morin," presented at the Charles R. Morin Memorial Symposium on Failure Analysis & Prevention, Materials Science & Technology (MS&T), 2009 Conference and Exhibition, **J. A. Wilkinson,** M. T. Kenner, Pittsburgh, PA, October 26, 2009

"Structural Stepladder Failure: Analysis of Root Cause," ASME 2009 International Mechanical Engineering Conference and Exposition, E. H. Knox, M. P. Van Bree (presenter), M. T. Kenner, **J. A. Wilkinson,** Lake Buena Vista, Florida, November 2009

"Uses of Abaqus/Standard in Failure Analysis," SIMULIA Customer Conference, M. T. Kenner, **J. A. Wilkinson**, M. E. Stevenson, M. D. Hayes, London, England, May 2009

"The Miller Park Crane Collapse – Analysis of the Crane," presented at 2006 ABAQUS Users' Conference, Boston, Massachusetts, **J. A. Wilkinson**, M. T. Kenner, C. R. Morin, May 2006

"Stress Intensities for a Thumbnail-Shaped Surface Crack in a Solid cylinder Using ABAQUS/Standard", **J. A. Wilkinson**, M. T. Kenner, E. W. Holmes, presented at the ABAQUS Users' Conference, Boston, MA, May 2004

"Use of NASGRO Software to Predict Fatigue Crack Growth Rates in Service," **J. A. Wilkinson**, C. R. Morin, presented at the Failure Analysis Symposium, 2003 Materials Solutions Conference, ASM International, Pittsburgh, PA, October 14, 2003

"The Miller Park Crane Accident – How to Avoid Making the Same Mistakes," C. R. Morin, **J. A. Wilkinson**, M. T. Kenner, presented at the 2002 ASCE Civil Engineering Conference & Exposition, Washington, D.C., November 6, 2002

"Miller Park Crane Collapse - Root Cause Investigation," C. R. Morin, D. A. Wojnowski, R. C. Winn, **J. A. Wilkinson**, M. T. Kenner, S. J. Smith, A. V. Kenner, Department of Civil and Environmental Engineering, University of Illinois, Urbana-Champaign, March 2001

"New Tools for Design," ASM International First International Conference on Failure Prevention", **J. A. Wilkinson**, Cleveland, May 2000

"Review of NTSB Investigation, United Airlines DC-10 Crash in Sioux City, Iowa, July 19, 1989," ASM International Materials Week, C. R. Morin, R. J. Shipley, **J. A. Wilkinson**, Cincinnati, October 1996

"Failure of Epoxy-Bonded Anchor Bolts – Focus on Installation Parameters," ASM International Materials Week, C. R. Morin, **J. A. Wilkinson**, Chicago, October 1994

"Step Ladder Failure Analysis, a Comparison of Analytical Methods, "Proceedings of the ASME 2011 International Mechanical Engineering Congress & Exposition, Denver, CO. November 11-17, 2011, M. T. Kenner, M. E. Stevenson, E. H. Knox, M. P. Van Bree, **J. A. Wilkinson**. (2011)

"Failure Analysis of a Commercial Brush Chipper Hood" (Case History – Peer Reviewed), Journal of Failure Analysis and Prevention, D. M. Norfleet, M. E. Stevenson, **J. A. Wilkinson**, M. T. Kenner, D. Brickman, ASM International, published on-line August 13, 2011

"Structural Stepladder Failure: Analysis of Root Cause," ASME 2009 International Mechanical Engineering Conference and Exposition, E. H. Knox, M. P. Van Bree (presenter), M. T. Kenner, **J. A. Wilkinson**, Lake Buena Vista, Florida, November 2009

"Uses of Abaqus/Standard in Failure Analysis," SIMULIA Customer Conference, M. T. Kenner, **J. A. Wilkinson**, M. E. Stevenson, M. D. Hayes, London, England, May 2009

"The Miller Park Crane Collapse – Analysis of the Crane,"□2006 ABAQUS Users' Conference, **J. A. Wilkinson**, M. T. Kenner, C. R. Morin, Boston, MA, May 2006

"The Miller Park Crane Collapse – Analysis of the King Pin Failure," 2006 ABAQUS Users' Conference, M. T. Kenner, **J. A. Wilkinson**, C. R. Morin, Boston, MA, May 2006

"Stress Intensities for a Thumbnail-Shaped Surface Crack in a Solid cylinder Using ABAQUS/Standard," 2004 ABAQUS Users' Conference**, J. A. Wilkinson**, M. T. Kenner, E. W. Holmes, Boston, MA, May 2004

"Effect of Boundary Conditions on the Modal Analysis of a Staircase," 2004 ABAQUS Users' Conference, M. T. Kenner, **J. A. Wilkinson**, C. R. Fischer, Boston, MA, May 2004

"Analysis of a 100 ft. Aerial Ladder Collapse," 2002 ABAQUS Users' Conference, M. T. Kenner, **J. A. Wilkinson**, C. R. Morin, and M. A. Kramer, May 2002

"Analysis of a Hybrid Plate Girder Bridge During Erection: Collapse of the Tennessee Highway 69 Bridge," Progress in Structural Engineering and Materials, Vol. 4, No. 1, January-March 2002, D. A. Wojnowski, A. W. Domel, **J. A. Wilkinson**, and M. T. Kenner

"New Tools for Design", ASM International Conference Proceedings, **J. A. Wilkinson**, May 2000

"Step Ladders, Understanding Strength, Stability, Key to Accident Investigation," Claims Magazine, C. R. Morin, **J. A. Wilkinson**, G. S. Sangdahl, June 1995

"Fractography, NDE and Fracture Mechanics Applications in Failure Analysis Studies,"□Materials Characterization, C. R. Morin, R. J. Shipley, **J. A. Wilkinson**, 1994

"The Dynamic Simulation of a Video Disk Pickup Arm Assembly Using Finite Element Techniques," ANSYS Conference Proceedings, **J. A. Wilkinson**, J. R. Pentz, April 1985

Selected Project Experience

International Harvester – Construction Equipment Division (all analyses FEA-based)

- Design analysis on the front frame for the Model 570 rubber-tired front loader.
- Failure analyses on hydraulic cylinders which were experiencing fatigue failures.
- Design analyses of various mounting arrangements for a bulldozer “ripper” attachment.
- Design analyses on Rollover Protective Structures (ROPs) for construction equipment (open ROPs and cab ROPs).
- Design analysis of a seatbelt tether and its associated attachment hardware which anchored the tether to the cab floor of a bulldozer (nonlinear effects: large displacement and plasticity).
- Developed and presented internal training materials on use of the finite element method for design analysis.

CDC – Professional Services Division (FEA consulting on CDC’s timesharing network)

- Analysis of a proposed design for a new 100-ton hopper railcar.
- Dynamic simulation of a video disk pickup arm assembly (technical paper noted above).
- Dynamic analysis of a gear housing cover used on a diesel engine.
- Stress analysis of a fuel injector for a diesel engine.
- Stress analysis of a flare dispenser system for military helicopters.
- Seismic (response spectrum) analyses performed on a fan/coil unit and a platform as part of a seismic design qualification for various components used in a nuclear power plant.
- Tactile force study on the loads required to cause a convex, shallow arch polymer shell structure (basically a blister shape) to “snap-through” under finger pressure. Envisioned end use was as the exposed surface of keyboard-like device (nonlinear effects: large displacements and instability at snap-through, which required use of the RIKS procedure in Abaqus).
- Buckling analyses performed on polymer containers for liquid consumer products (nonlinear effects: large displacements and instability, RIKS procedure also used in these analyses).
- Fatigue analysis on a piston engine crankshaft.

Northrop – Defense Systems Division (Advanced Mechanical Analysis using FEA)

- Numerous dynamic analyses performed on electronic warfare external pods, Line Replaceable Units (LRUs), Electronic Circuit Boards (ECBs) and individual electronic components. The dynamic analyses usually included natural frequency and random vibration analyses or, less often, sinusoidal vibration and/or shock loading analyses.

- Failure analysis using thermal stress analyses performed on the epoxy bonding layer used to attach a ceramic microwave circuit substrate to an aluminum MUX case. This study eventually identified a relatively compliant epoxy that could accommodate the large Coefficient of Thermal Expansion (CTE) mismatch between the ceramic substrate and the thick aluminum floor of the MUX case during thermal cycle testing.

- Multiple dynamic (random vibration) analyses performed to optimize a weight-saving magnesium test fixture used to attach a large Electronic Counter Measures (ECM) pod to a shaker table during qualification testing. The fixture had to be light enough so that the combined weight of the pod and fixture would not exceed the capacity of the shaker table, yet stiff enough to ensure that there were no pod/fixture vibration modes within the frequency range of the random vibration input.

- A failure analysis involving FEA-based thermal stress analyses and material testing to determine the cause of cracking in the thermally-conductive rubber potting compound used to insulate a high-voltage transformer. The cracking was observed during thermal cycle testing of production units of a transformer that had passed its original qualification tests and subsequent post-production verification tests. The cause was found to be an undocumented change to the curing agent by the supplier which resulted in a higher elastic modulus for the rubber which, in turn, made it more susceptible to cracking when exposed to cold temperatures (-55° C).

Engineering Systems Inc. (ESI)

- Finite-Element-Analysis-based (FEA-based) thermal stress investigation to determine the cause of head cracking in a large industrial (cellulose) dryers.

- FEA stress analyses to determine the root cause of fatigue failures in large commercial centrifuge baskets.

- Development of an analytical model for a natural gas regulator.

- Structural analyses in support of the investigation into the cause of the collapse of an ore bridge.

- Finite element analyses to determine operating stress levels, residual stresses due to shot-peening, crack-mouth closure and other crack detectability issues in support of a failure analysis/inspection procedure study performed on the CF-6 fan disk failure that precipitated the crash of UAL Flight 232 in Sioux City, IA (ref: the Material Characterization paper noted above).

- FEA-based stress analysis and crack-growth calculations using NASA's Nasgro formulations to investigate the root cause of the fatigue failure of a helicopter gearshaft (ref: the Appendix in the Materials Characterization article noted above).

- Stress analysis (FEA) of a burst disk failure (nonlinear effects: large displacement and plasticity).

- Analysis of a 100 ft. aerial ladder collapse (ref: the Abaqus paper noted above).

- FEA-based structural analyses performed in support of the investigation into the cause of the collapse of the Tennessee Highway 69 bridge during erection (ref: Progress in Structural Engineering and Materials article noted above).

- FEA-based kinematic analysis of a submunition fuse to determine if it met design specifications.

- Modal testing and FEA-based natural frequency analyses performed on staircase in a university building to determine the best way to stiffen the structure to eliminate the large deflections that were occurring when it was being used by multiple students during class changes (ref: Abaqus paper noted above).

- Various analyses performed in support of the Miller Park crane collapse investigation. These analyses included detailed modeling of the king pin failure and a global model of the crane itself which was then subject to various loading and support conditions. (Details are provided in the two Miller Park Abaqus Users Conference papers noted above.)

- FEA-based thermal and stress analyses performed in support of the investigation into the root cause of the catastrophic burst failure (and subsequent bleve) of an extremely large autoclave used to grow synthetic quartz crystals.