

Professional Curriculum Vitae of Stephen L. Carmichael

Integrated Systems Research, Inc.

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Education	Master of Science – Mechanical Engineering University of Cincinnati – 1989
	Bachelor of Science in Engineering – Mechanical University of Cincinnati – 1986 Summa Cum Laude
Patents	Hydro-Electric Clutch/Brake Drive – Patent #4,739,865 – 1988 GE90 Engine Testing Mount Adapter – Patent #5,396,791 – 1995
Publication	ASME Paper GT2012-68021: Auxiliary Turbine Generator Set Isolation System Design for US Navy Vessel - June 2012
Civic Service	Engineering Representative on the Amusement Ride Safety Board for the State of Ohio – 1997 through 2001
	Member of the Mechanical Engineering Technology Advisory Committee for Cincinnati State Technical College – 2000 to 2010
	Adjunct Instructor at Cincinnati State Technical College Classes of Instruction: Kinematics and Dynamics, Machine Design, Strength of Materials

Professional Experience

Overview and Capabilities

During the past 24 years, has provided technical consulting services through Integrated Systems Research, Inc. Areas of expertise are system and machine design, structural dynamics, thermal system design, and metal fatigue. System design guidance is provided utilizing the method of Analysis Leading Design (ALD). This approach reduces uncertainty in the design decision process, increasing design efficiency, and minimizing risk by quantifying the relative impact design variables and options have on system performance

The ALD process is documented in ASME Paper GT2012-68021, which was a design of a structural isolation system used in a US Navy vessel. [GT2012-68021](#) is a link to the paper. Leading Rolls-Royce in implementing ALD resulted in successfully providing the Navy with a system compliant design, on time, and under cost.

Another example of leading Rolls-Royce to implement ALD was in finding a solution for a failure that occurred during an engine certification test. This is captured in a white paper entitled *Using DOE Strategies in Migrating Existing Designs to New Applications*. Rolls-Royce successfully certified the engine on time, awarding the outside engineering team for its excellence in providing a cost-effective and timely solution with distinctive recognition. This success on the Trent 1000-TEN also led to the implementation of the design process on the Trent 7000. [Using DOE Strategies in Migrating Existing Designs to New Applications](#) is a link to the paper.

Below is a list of other professional, project, and design services provided through Integrated Systems Research, Inc.

Structural Dynamics:

A wide-range of support is provided in the discipline of structural dynamics:

- Retained on several occasions as an expert witness for both structural and biodynamic systems
- Dynamic evaluation of steel roller coasters for Paramount Kings Island and providing design solutions to fatigue failures in running rails, support ties, and carriage bogies
- Design and evaluation of engine support systems for FAA certification on the GE-90

- Design and analysis of structure borne noise isolation system for RR4500 ATG
- Design of transportation hardware and engine mounting features employing PSD analysis
- Design of isolation systems for compactors and off the road earth moving equipment
- Led the design of GE Test Site 7 for the JSF engine program. Developed a Dynamic Data Recovery (DDR) process for the program. Transfer functions between the propulsion system's vector ports and load strings of a multi axis thrust measuring frame were empirically generated. Using a least squares approach of Hermitian matrices, the process recovered the loads at each individual vector port and eliminated both magnitude and phase distortion created by the dynamic signature of the facility.
- Design and evaluation of power generator sets for seismic qualification
- Analysis of HIFR fuel element excitation from fluid structural interaction

Structural Fatigue:

Provides consultation for structural fatigue issues employing strain life methodologies and assessing fitness for service employing damage tolerance approaches.

Authored a two-day seminar on structural fatigue and fracture mechanics entitled *Practical Design Technology for Fatigue*. Seminars have been held at:

- Western Michigan University
- Rotex Corporation
- Copeland Corporation
- Aircraft Braking
- Woodward Aerospace
- Parker Aerospace

Thermal Design and Analysis:

Substantial experience in evaluating electronic, power generation, and aircraft system components under steady state and transient thermal conditions. Analyses oftentimes incorporate a combination of radiation, convection, and conduction. The analyses have been used for the design of packaging electronics, flow diverters doors in power plants, aircraft engine components, and components within nuclear reactors. Companies for which this support has been provided are:

- GE Aircraft
- Rolls-Royce Aerospace
- NuWaves Engineering
- Woodward Aerospace
- Oak Ridge National Laboratory

For additional information reference the Integrated Systems Research, Inc. website. <https://www.isrtechnical.com>