



Failure Analysis Associates®

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**John D. Martens, Ph.D., M.B.A., P.E., CFEI**  
**Principal Engineer and Office Director**

**Professional Profile**

Dr. John D. Martens is a Principal Engineer in Exponent's Electrical Engineering and Computer Science practice and the Director of the Chicago-area offices. He specializes in control systems and software, microprocessor-based and computer systems, circuit design and analysis, electronic components failure analysis, automotive control systems, electronic stability control systems, programmable logic controllers (PLCs) and process control (including DCS and SCADA analysis), robotics and automation, computer vision, consumer products design and failure analysis, and intellectual property issues.

Prior to joining Exponent, Dr. Martens managed the embedded control systems group at Delphi Corporation, a leading global supplier of mobile electronics and transportation systems, and led an R & D team from development to commercialization of an active rear steering system for improved vehicle performance. Dr. Martens has experience developing and testing electronic stability control systems. Dr. Martens' robotic experience includes developing methods and algorithms for the automatic control of a stair-climbing mobile robot. He has experience programming PLCs and analyzing process control systems.

As a member of Delphi's Innovation Center, Dr. Martens actively supported Delphi's Intellectual Property (IP) portfolio as an inventor (8 United States patents and 1 European patent) and provided analyses related to patent prosecution, validity, and infringement questions as well as prior art research and enablement. Dr. Martens has continued his active involvement in IP matters at Exponent. His most recent IP activity has involved products such as software-controlled systems including computer hard drive control and fluid delivery systems.

Dr. Martens' facilities management experience at Delphi includes equipment specification, procurement, installation, and maintenance. His facilities experience also includes the maintenance of a mechatronics research and development laboratory containing several industrial robots and control systems.

Dr. Martens is active in the field of industrial process control, including burner management and combustion control systems for industrial boilers and furnaces. He has advised his clients regarding the appropriate level of safeguards necessary for the safe operation and control of their systems, assisted them in implementing those safeguards, and audited their installations. He draws from his accident investigation experience and his knowledge of industry standards to perform process hazard analyses.

## **Academic Credentials and Professional Honors**

M.B.A., The University of Michigan (*with High Distinction*), 2003

Ph.D., Electrical Engineering and Computer Science, Case Western Reserve University, 2000

M.S., Electrical Engineering and Applied Physics, Case Western Reserve University, 1993

B.S., Electrical Engineering and Applied Physics, Case Western Reserve University (*summa cum laude*), 1993

Tau Beta Pi Engineering Honor Society; Eta Kappa Nu/IEEE's Award for Outstanding Senior in Electrical Engineering; Ohio Aerospace Institute Fellowship; Centerior Energy Fellowship; General Motors Scholarship; Case Alumni Association Scholarship; Dean's High Honors

## **Licenses and Certifications**

Registered Professional Engineer, Illinois, #062-058837

Registered Professional Engineer, Michigan, #6201057824

Registered Professional Engineer, Missouri, #2010036256

Registered Professional Engineer, North Carolina, #037584

Registered Professional Engineer, Ohio, #E-65142

Registered Professional Engineer, Texas, #105276

Registered Professional Engineer, West Virginia, #19078

Registered Professional Engineer, District of Columbia, #PE906421

Registered Professional Engineer, New York, #086510-1

Certified Fire and Explosion Investigator (CFEI), #17603-9653

Crash Data Retrieval Technician Levels 1 & 2, Collision Safety Institute

## **Patents and Patent Applications**

Patent 6,789,002 B1: Determination of Vehicle Payload Condition, September 7, 2004 (with A. Hac).

Patent 6,804,594 B1: Active Steering for Handling/Stability Enhancement, October 12, 2004 (with T. Brown, A. Chandy, H. Chen, and C. Gryczan).

Patent 6,862,506 B2: Method for Automatically Adjusting Reference Models in Vehicle Stability Enhancement (VSE) Systems, March 1, 2005 (with E. Bedner, K. Boswell, H. Chen, and B. McDonald).

Patent 6,879,896 B2: System and Method for Using Vehicle Operator Intent to Adjust Vehicle Control System Response, April 12, 2005.

Patent 6,926,114 B2, Assist Modification in Active Front Steering, August 9, 2005 (with F. Bolourchi, K. Boswell, J. Dickinson, and E. Bedner).

Patent 6,942,057 B2: Feel Control for Active Steering, September 13, 2005 (with K. Boswell and F. Bolourchi).

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Patent 7,083,025 B2: Method for Implementing Vehicle Stability Enhancement Reference Models for Active Steer Systems, August 1, 2006 (with E. Bedner and K. Boswell).

Patent 7,213,675 B2: Method and System for Anti-Static Steering for Vehicle Steering Systems, May 8, 2007 (with C. Gryczan).

European Patent EP 1357013B1: System and Method for Using Vehicle Operator Intent to Adjust Vehicle Control System Response, June 6, 2007.

European Patent Application 02078139.9: Method for Automatically Adjusting Reference Models in Vehicle Stability Enhancement Systems.

European Patent Application 02079498.8: Feel Control for Active Steering.

### **Publications and Presentations**

Arora A, Martens JD. Energy storage for BEV's: An engineering perspective. IEEE Transportation Electrification Conference and Expo (ITEC' 13), Dearborn, MI, June 16–19, 2013. (Half-day tutorial).

Martens JD, Arora A. Understanding the role of software in product failures. IEEE Symposium on Product Compliance Engineering, Portland, OR, November 5–7, 2012.

Morrison DR, Fecke M, Martens, JD. Migrating an incident reporting system to a CCPS process safety metrics model. *Journal of Loss Prevention in the Process Industries* 2011, in press.

Martens JD, Fecke, M, Ogle, RA, Bishop, JA. Functional testing for industrial control systems. Proceedings, ASME 2011 International Mechanical Engineering Congress & Exhibition IMECE2011, Denver, CO, November 11–17, 2011.

Arora A, Martens JD, Babic D. AC & DC adapters safety considerations. IEEE Symposium on Product Compliance Engineering, San Diego, CA, October 10–12, 2011.

Fecke M, Martens JD, Cowells J, Morrison DR. A guide to developing and implementing safety checklists: Plant steam utilities. *Process Safety Progress* 2011; 30(3):240–250.

Ramirez JC, Fecke M, Morrison DR, Martens JD. Root cause analysis of an industrial boiler explosion (and how hazard analysis could have prevented it). Proceedings, ASME 2010 International Mechanical Engineering Congress & Exhibition IMECE2010, Vancouver, Canada, November 12–18, 2010.

Morrison DR, Fecke M, Martens JD. Migrating an organizational incident reporting system to a CCPS process safety metrics model. 2010 Annual Symposium, Mary Kay O'Connor Process Safety Center, Texas A&M University, College Station, TX, October 26, 2010.

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Fecke M, Morrison DR, Martens JD, Cowells JT. A guide to developing and implementing safety checklists: Plant steam utilities. American Institute of Chemical Engineers, 2010 Spring National Meeting, 25<sup>th</sup> Center for Chemical Process Safety International Conference, San Antonio, TX, March 22–24, 2010.

Morrison DR, Martens JD, Ogle RA, Cowells JT. Root cause analysis of a cryogenic refrigeration system explosion. American Institute of Chemical Engineers, 2009 Spring National Meeting, 43<sup>rd</sup> Annual Loss Prevention Symposium, Tampa, FL, April 26–30, 2009.

Morrison DR, Martens JD, Ogle RA, Cowells JT. Accident investigation using process control event diagrams. American Institute of Chemical Engineers, 2009 Spring National Meeting, 24<sup>th</sup> Annual CCPS International Conference, Tampa, FL, April 26–30, 2009.

Martens JD, Johnson G, So P. Design considerations for consumer products utilizing high voltage. Presentation, 2006 IEEE Symposium on Product Safety and Compliance Engineering, IEEE Product Safety Engineering Society, (PSES), Irvine, CA, October 23–24, 2006. Also approved for publication in the IEEE PSES 2006 Conference Proceedings.

Martens JD, Hac A, Brown T. Detection of vehicle rollover. 2004 SAE World Congress, No. 04-Annual-848, Detroit, MI, March 2004 (Book SP-1869, paper number 2004-01-1757).

Martens JD. Lyapunov-based, on-line identification for backstepping control. Department of Electrical Engineering and Computer Science, Ph.D. Dissertation, Cleveland, OH, Case Western Reserve University, 2000.

Martens JD, Newman WS. Stabilization of a mobile robot climbing stairs. 1994 IEEE Proceedings and IEEE Video Proceedings of the International Conference on Robotics and Automation, San Diego, CA, p. 2501–2507, May 1994.

Martens JD. Enhanced teleoperation of a mobile robot. CAISR Technical Report #93-111, Master's Thesis, Case Western Reserve University, 1993.

### **Doctoral Thesis**

Martens JD. Lyapunov-based, on-line identification for backstepping control. Case Western Reserve University, Cleveland, OH, 2000.

## Prior Experience

- Manager, Embedded Control Systems, Delphi, Brighton, MI, 2004–2005
- Project Manager, Active Chassis Systems, Delphi, Brighton, MI, 2000–2004
- Research Assistant, Electrical Engineering and Applied Physics, Case Western Reserve University, Cleveland, OH, 1997–2000
- Project Manager, CAM-LEM, Inc., Cleveland, OH, 1996–1997
- Advanced Chassis Control Engineer, Delco Chassis, Division of General Motors, Dayton, OH, 1995–1996
- Advanced Facilities Engineer, Delco Chassis, Division of General Motors, Dayton, OH, 1994–1995
- Laboratory Facilities Manager, Center for Automation and Intelligent Systems Research (CAISR) Mechatronics Laboratory, Case Western Reserve University, Cleveland, OH, 1992–1993
- Intern, Delco Chassis, Division of General Motors, Dayton, OH, 1991
- Intern, Delco Chassis, Division of General Motors, Rochester, NY, 1990
- Repair Technician, Affiliated T.V. Shops, Eastlake, OH, 1988–1989

## Selected Project Experience

### Systems and Controls

Dr. Martens has over 25 years of experience specifying, designing, constructing, and analyzing control systems. A representative sampling of projects is listed below. These projects have involved control systems for products, processes, and machines ranging from office equipment to industrial processes with project scopes ranging from design and design reviews to accident investigation and failure analysis. Control systems generally consist of sensors, controllers, and actuators and Dr. Martens' work in design and analysis of control systems has ranged from detailed reviews of individual components to analysis of complex integrated systems.

### *Control Systems for Products*

- Academic test grading system: evaluated control system for an academic test grading system (card scoring) used in schools to determine potential issues with ability to read scoring sheets.
- Automatic racquetball serving machine: designed and constructed an automatic racquetball serving machine with variable speed and pitch.
- Automatic revolving and sliding doors: analyzed control system for their potential role in various accidents related to automatic doors.
- Automotive antilock brake system: analyzed control system for antilock brakes and compared operation to industry standards and practices.
- Automotive stability control: designed, implemented, and obtained patents on several vehicle stability, rollover, and steering control methods.
- Business card scanner accuracy: analyzed accuracy of control system used to scan business cards and perform optical character recognition.

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