

## **CARR ENGINEERING, INC.**

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### **Technical Biography for Eldon G. Leaphart**

I am a resident of the State of Texas and an employee of Carr Engineering, Inc. (CEI), a Texas corporation at 12500 Castlebridge Drive, Houston, Texas 77065. I received my bachelor's degree in Electrical Engineering and a master's degree in Electrical Engineering with emphasis in Control Systems, both from The Ohio State University in Columbus, Ohio in 1987 and 1991 respectively. I have compiled more than 30 years of automotive engineering experience, including collegiate co-op assignments prior to 1987 combined with professional employment from 1987 until the present. Over the course of my professional career, I have been involved with areas of algorithm development, software architecture design, failsafe and diagnostic design, functional safety development, and system engineering requirements management emphasizing controlled brake and controlled suspension products.

From 1987 until 2004, I held several Algorithm Development and System Engineer roles for the Delco Products division of General Motors. This same division later became Delphi Chassis. In these roles I was responsible for the specification, design, evaluation, and testing of multiple vehicle systems including safety, handling, and braking systems, including various levels of integration with powertrain (engine/transmission) systems and steering systems. During these assignments, I gained state-of-the-art experience with electronic sensor processing, diagnostic and failsafe implementation, serial communications, and control algorithms.

From 2004 until 2016, I held two Engineering Manager positions with Delphi Chassis (later becoming BWI Group, Inc.). The first position I held, from 2004 to 2008, was Manager of the Diagnostics and Communications group. In this role I was responsible for providing technical direction regarding diagnostic algorithms, failsafe design, serial diagnostic communication protocols, and bootloader flashing methods for core products. My second managerial position, from 2008 to 2016, was that of Manager of the Systems and Software Group. In this capacity, I was responsible for providing technical direction to the software teams responsible for software implementation within controlled brake products (anti-lock brakes, traction control, and stability control). The software teams under my leadership spanned global locations, including Brighton, Michigan; Shanghai, China; and Bangalore, India.

Managing the development of production embedded software for Delphi's safety systems also required me to become well versed in industry methods such as ASPICE (Automotive Software Process Improvement Capability determination) along with various disciplines of systems engineering to effectively specify, communicate, implement, and verify requirements. Over the last 10 years, I have developed particular expertise in the areas of functional safety design and the management processes for system engineering requirements. Since 2008, I have been a member of the U.S. Technical Advisory Group responsible for the development of the ISO-26262 functional safety standard for road vehicles. In this capacity, I work on the committee to review and vet technical and editorial comments submitted for the standard.

Since February 2016, I have been employed as a Principal Engineer at CEI. In this role, my goal is to rely on my 30-plus years of industry experience to perform investigations to determine the causes, conditions, and circumstances of defect allegations related to all forms of embedded system design, not just those specifically found in automotive microprocessors. Regardless of the application, I am able to analyze claims pertaining to embedded system design, failsafe strategy, software implementation, and failure mode analysis. In the automotive context, this includes emerging technologies such as advanced driver assistance system (ADAS) features, autonomous driving technologies and their derivatives, and cybersecurity matters.

Throughout my professional career I have been afforded an opportunity to publish and present material related to my work as an engineer. This effort began in 1991 with my master's thesis, "*A DSP Hybrid Simulator for Evaluating Anti-Lock Brake System Control Design*" and has continued to the present. I have authored and co-authored two SAE papers in my area of expertise and have been invited to present at several technical conferences focusing in the areas of functional safety and software development. Most recently, I have developed and currently teach SAE Course C1704: ADAS Application: Automatic Emergency Braking. In addition to publishing and presentation, I have been named to several U.S. Patent Awards in these same areas, and have been the recipient of two GM Boss Kettering Awards: Automotive Chassis Control – Integrated Chassis (1996) and Unified Brake and Suspension Control (2000).