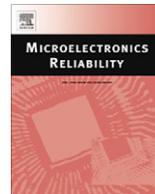


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# Microelectronics Reliability

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## Book Review

### Book review: *Effective FMEAs*

*Effective FMEAs* by Carl Carlson presents good engineering practices. Mr. Carlson's insights on the value and broad applicability of Failure Modes and Effects Analysis (FMEA), gained over 30 years of experience as a reliability engineer, are apparent in this book. While the book is formatted as a standard classroom textbook, complete with FMEA examples and end of chapter questions, it contains enough real-world references to highlight the book's practicality and overcome the "pure theory" feel that is often associated with classroom textbooks. The book's opening chapter presents a good business case for the use of FMEA techniques and supports it with documented success stories. These stories show the range of industries and applications that can benefit from implementing FMEA techniques, including products such as exercise equipment, food, and electronics.

Mr. Carlson's review of the fundamental concepts of FMEAs is given in Chapter 3. The main objectives of traditional FMEAs are reviewed, as well as the other more niche uses such as *Hazard Analysis*, which focuses on safety risks throughout a product's life cycle; *Business Process FMEA*, which focuses on the business aspects of FMEA; and *Failure Modes, Mechanisms, and Effects Analysis* (FMMEA), which helps prioritize actions by identifying related failure mechanisms. Chapter 3 presents the standard FMEA worksheet and clearly identifies how to determine each section of the FMEA, including system failure modes, potential effects, causes, and recommended actions. It also discusses some of the more quantitative aspects of FMEA, such as how to rank severity, likelihood of failure, and opportunity for detection.

The remainder of the book builds on the fundamentals discussed in Chapter 3. In Chapter 4, Mr. Carlson discusses how to implement FMEA in a business environment, including suggestions on how to select candidate projects and when in the project FMEA analysis should be conducted. Chapter 5 discusses how to prepare for FMEA projects, such as how to assemble a team and what ground rules and tasks should be set first. It discusses how to effectively take action on a given system based on the results of the FMEA in order to improve reliability and reduce risk. The chapter also presents a simple case study of an all-terrain bicycle. This

FMEA case study is developed in different stages from Chapter 5 to Chapter 9.

Beyond these success stories and other real-world examples that supplement sections throughout the book, are Chapters 8 (Case Studies) and 9 (Lessons Learned for Effective FMEAs). Chapter 8 is dedicated to exemplifying the entire FMEA processes on real-world failures, some of which are quite well-known (such as the failure of the Space Shuttle Challenger's O-Ring). Chapter 9 reviews past FMEAs, such as the failure of many FMEA teams to include integration and interface failure modes into their block diagrams, and shows how to learn from their mistakes.

Chapters 10 and 11 are primarily geared towards managers who are interested in implementing FMEA techniques in their organization. These chapters will be very helpful for successful implementation of FMEA. Mr. Carlson also addresses the concept of failure modes, effects and criticality analysis in Chapter 12 and faulty tree analysis (FTA) in Chapter 14. Mr. Carlson describes in detail techniques that have evolved from FMEA in Chapter 15, including topics like FMMEA, Hazard Analysis, failure modes, effects and diagnostic analysis (FMEDA), and reliability centered maintenance (RCM). Chapter 16 discusses the availability and applications of FMEA software.

Overall, the book gives a wide perspective on the many uses of FMEA while adding very valuable industry insights. A unique and very helpful feature of the book was the "All-Terrain Bicycle Case Study," which was a simple and easy to understand case study that re-occurred throughout the entire book. It was a single example used to demonstrate many facets of FMEA, and worked to tie the book together beautifully. The book is valuable as a learning tool for FMEA and its clear relevance to real-world industry practices make it useful for both students and reliability practitioners.

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