

Forensic Engineering

Editor

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Preface

This book is an overview of the activities of forensic experts in the engineering professions. General chapters cover aspects of forensic activity that are common to all disciplines. Specific chapters, contributed by experts in each specialized field, detail unique aspects of forensic engineering and accident reconstruction in the various specialized disciplines.

Contributors have been carefully selected to represent a wide variety of significant experience in forensic practice. Biographical information regarding contributors is given in the section immediately following. Each chapter is a brief informative overview and is intended to be a reflection primarily of the contributor's own experiences. Viewpoints expressed in a particular chapter are the author's own, and do not necessarily represent the viewpoints of the publisher, the editor, or other contributors.

Contributors have included the following information as it relates to their specific disciplines:

- Typical clients, and scope and purpose of investigations
- Techniques, procedures, and tools used in investigation and analysis
- Interface with forensic specialists from other disciplines
- Impact of forensic activity on improved practices, products, or planning to reduce the frequency and severity of failures
- Case study examples from the contributors' experiences
- Reference lists for further reading

Some contributors have included reference to basic theories used in a typical analysis; others have focused on the organizational aspects of an investigation, or on the institutional framework for the practice of forensic engineering.

This book is the first broad overview of forensic activity and accident investigation in engineering. It is expected to appeal to a varied audience which will include forensic experts practicing in all engineering disciplines, design and construction professionals, attorneys, product manufacturers, insurance professionals, and engineering students.

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Kenneth L. Carper is a registered architect with a professional bachelor of architecture degree as well as a master's degree in structural engineering. He is a member of the American Society for Engineering Education and the American Society of Civil Engineers. Carper is a founding member and past chairman of the ASCE Committee on Dissemi-

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1. What Is Forensic Engineering?

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1.1 INTRODUCTION

1.1.1 Definitions

The forensic engineer is a professional engineer who deals with the engineering aspects of legal problems. Activities associated with forensic engineering include determination of the physical or technical causes of accidents or failures, preparation of reports, and presentation of testimony or advisory opinions that assist in resolution of related disputes. The forensic engineer may also be asked to render an opinion regarding responsibility for the accident or failure.

Milton F. Lunch, former General Counsel to the National Society of Professional Engineers (NSPE), has provided the following comprehensive definition of forensic engineering:

Forensic Engineering is the application of the art and science of engineering in the jurisprudence system, requiring the services of legally qualified professional engineers. Forensic engineering may include investigation of the physical causes of accidents and other sources of claims and litigation, preparation of engineering reports, testimony at hearings and trials in administrative or judicial proceedings, and the rendition of advisory opinions to assist the resolution of disputes affecting life or property.

A condensed definition is given by Marvin M. Specter, founding President of the National Academy of Forensic Engineers (NAFE):

Forensic Engineering is the art and science of professional practice of those qualified to serve as engineering experts in matters before courts of law or in arbitration proceedings. [Specter 1987]

1.1.2 Accident Reconstruction

Failures and accidents involving injury, loss of life, or property damage nearly always generate controversy. Hence, the investigation of such events is usually associated with litigation or the threat of litigation.

Accident investigation and reconstruction, however, need not always be directly related to litigation. Sometimes the principal purpose of accident reconstruction is to determine causation so that the accident will not be repeated. For example, Chapter 7 discusses in detail the investigation of airline accidents by the National Transportation Safety Board (NTSB). These investigations do not involve traditional litigation. In fact, the work product of an investigation by the NTSB is not admissible in legal proceedings arising from the accident. Such use of NTSB reports is forbidden by statute. The overriding concern is for a thorough and timely investigation. Recommendations are quickly disseminated to involved parties with the goal of reducing the potential for repetition of the accident (Figure 1.1). Structural failure investigations conducted by the National Bureau of Standards (NBS) have a similar purpose. NBS investigations focus on technical causation and do not attempt to assign responsibility among the involved parties. Figures 1.2 and 1.3 show test apparatus and

Figure 1.1 Investigators examining the wreckage of a cargo plane after it crashed on Mt. Rainier in Washington State. (Courtesy NTSB.)

