

# THE ESD CONTROL PROGRAM HANDBOOK

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JEREMY M SMALLWOOD

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# **The ESD Control Program Handbook**

*Jeremy M Smallwood*

Electrostatic Solutions Ltd

Southampton, UK

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*To Jan, who has often put up with my grumpy non-communication while I've been writing this book. To Alia, now making her own life journey. To Caroline, who tragically died so young.*

*To the subject of electrostatics and ESD, that has kept me occupied, perplexed and challenged for many hours.*

*To the many people who have attended my courses and asked so many awkward questions that helped me understand while trying to explain. To my fellow ESD practitioners whose opinions and expertise give us many interesting, and sometimes heated, debates - and who mainly agree the answer to most electrostatic questions is - "it depends."*

# Introduction

Electrostatic discharge (ESD) can damage or destroy many types of modern electronic components, or modules or assemblies containing electrostatic discharge-susceptible (ESDS) components.

In electronics manufacturing, sensitivity to ESD became a general concern after the adoption of metal-oxide-semiconductor (MOS) transistor technology exacerbated by decreasing internal physical size of semiconductor component features and the rise of integrated circuits (ICs). The first Electrical Overstress/Electrostatic Discharge Symposium in the USA was organized in 1979 (Reliability Analysis Center [1979](#)). The 1980 Symposium (Reliability Analysis Center [1980](#)) shows papers on topics as diverse as theory and practice, device failure analysis studies, failure mechanisms and modeling, design of device protective networks, and implementing ESD controls, facility evaluation and effective training. Standards and technical handbooks also emerged around this time. The standards gave requirements for an ESD control program, while the technical handbooks gave technical data and tutorial material useful for educating the user and developing the ESD control program. ElectroStatic Attraction (ESA) of contaminant particles is a problem for manufacturers of semiconductor devices and displays. For operating electronic systems, ESD provides a source of electromagnetic interference (EMI) that can result in system crash, malfunction or data corruption.

Thus, the issues of ESD in electronic components and systems give two areas of interest. Issues of ESD control during electronic component, assembly and system manufacture are largely concerned in preventing damage