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Australian Standard®

Analysis techniques for dependability—Event tree analysis (ETA)

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- Asset Management Council
- Australian Industry Group
- Australian Organisation for Quality
- CSIRO Information and Communication Technologies Centre
- Department of Defence (Australia)
- Energy Networks Association
- Engineers Australia
- Independent Transport Safety & Reliability Regulator
- Risk Management Association of Australia
- Risk Management Institution of Australasia
- The University of New South Wales
- University of Wollongong

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PREFACE

This Standard was prepared by the Standards Australia Committee QR-005, Dependability.

The objective of this Standard is to specify the basic principles of event tree analysis and to provide guidance on modelling the consequences of an initiating event using the event tree methodology. It explains how to analyse those consequences qualitatively and quantitatively and provides examples of event tree applications in the context of dependability and risk managements.

This Standard is identical with, and has been reproduced from IEC 62502, Ed.1.0 (2010), *Analysis techniques for dependability—Event tree analysis (ETA).*

As this Standard is reproduced from an International Standard, the following applies:

(a) Its number appears on the cover and title page while the International Standard number appears only on the cover.

(b) In the source text 'this International Standard' should read 'this Australian Standard'.

(c) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

Reference to International Standard	*Australian Standard*
IEC 61025 Fault tree analysis (FTA)	AS IEC 61025 Fault tree analysis (FTA)

Only international references that have been adopted as Australian or Australian/New Zealand Standards have been listed.

The term 'informative' has been used in this Standard to define the application of the annex to which it applies. An 'informative' annex is only for information and guidance.

CONTENTS

INTRODUCTION

This International Standard defines the basic principles and procedures for the dependability technique known as Event Tree Analysis (ETA).

IEC 60300-3-1 explicitly lists ETA as an applicable method for general dependability assessment. It is also used in risk and safety analysis studies. ETA is also briefly described in the IEC 60300-3-9.

The basic principles of this methodology have not changed since the conception of the technique in the 1960's. ETA was first successfully used in the nuclear industry in a study by the U.S. Nuclear Regulatory Commission, the so-called WASH 1400 report in the year 1975 [31][1].

Over the following years, ETA has gained widespread acceptance as a mature methodology for dependability and risk analysis and is applied in diverse industry branches ranging from the aviation industry, nuclear installations, the automotive industry, chemical processing, offshore oil and gas production, to defence industry and transportation systems.

In contrast to some other dependability techniques such as Markov modelling, ETA is based on relatively elementary mathematical principles. However, as mentioned in IEC 60300-3-1, the implementation of ETA requires a high degree of expertise in the application of the technique. This is due in part to the fact that particular care has to be taken when dealing with dependent events. Furthermore, one can utilize the close relationship between Fault Tree Analysis (FTA) and the qualitative and quantitative analysis of event trees.

This standard aims at defining the consolidated basic principles of the ETA and the current usage of the technique as a means for assessing the dependability and risk related measures of a system.

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[1] Figures in square brackets refer to the bibliography.

AUSTRALIAN STANDARD

Analysis techniques for dependability—Event tree analysis (ETA)

1 Scope

This International Standard specifies the consolidated basic principles of Event Tree Analysis (ETA) and provides guidance on modelling the consequences of an initiating event as well as analysing these consequences qualitatively and quantitatively in the context of dependability and risk related measures.

More specifically, this standard deals with the following topics in relation to event trees:

a) defining the essential terms and describing the usage of symbols and ways of graphical representation;

b) specifying the procedural steps involved in the construction of the event tree;

c) elaborating on the assumptions, limitations and benefits of performing the analysis;

d) identifying relationships with other dependability and risk-related techniques and elucidating suitable fields of applications;

e) giving guidelines for the qualitative and quantitative aspects of the evaluation;

f) providing practical examples.

This standard is applicable to all industries where the dependability and risk-related measures for the consequences of an initiating event have to be assessed.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-191:1990, *International Electrotechnical Vocabulary – Chapter 191: Dependability and quality of service*

IEC 61025:2006*, Fault tree analysis (FTA)*

3 Terms, definitions, abbreviations and symbols

For the purposes of this document, the following terms and definitions, as well as those given in IEC 60050-191, apply.

3.1 Terms and definitions

3.1.1
node
point in the graphical representation of the event tree depicting two or more possible outcomes for the mitigating factor

NOTE The top event of the corresponding fault tree can directly be linked to a node.

3.1.2
common cause
cause of occurrence of multiple events
[IEC 61025:2006, 3.15]