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Analysis techniques for dependability -- Event tree analysis (ETA)

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard uses the translation method equivalent to IEC 62502.2010 "Trustworthiness Analysis Technology Event Tree Analysis (ETA)".

This standard was proposed by the Ministry of Industry and Information Technology of the People's Republic of China.

This standard is under the jurisdiction of the National Technical Committee for Reliability and Maintainability of Electrical and Electronic Products (SAC/TC24).

This standard was drafted. The Fifth Institute of Electronics, Ministry of Industry and Information Technology.

Introduction

This standard specifies the basic principles and procedures of the credibility analysis technology--event tree analysis (ETA).

IEC 60300-3-1 explicitly lists ETA as a general method for credibility assessment, which is equally applicable to risks and safety.

Sexual analysis research. A brief description of ETA is also available in IEC 60300-3-9.

Since the emergence of ETA in the 1860s, its basic principles have remained unchanged. This method was successfully applied to the nuclear industry for the first time, namely

WASH-1400 report [31] 1) published by the American Atomic Energy Commission in 1975.

In the following years, ETA was widely accepted as a mature technology for credibility and risk analysis, including aviation and nuclear

It is widely used in many industrial fields including steel, chemical, offshore oil, natural gas,

national defense and transportation systems.

Compared to other credibility analysis techniques (such as Markov models), ETA is based on a relatively simple mathematical principle. But just as

As described in IEC 60300-3-1, since the processing of related events is often tricky, the implementation of ETA requires highly specialized application techniques.

In addition, when applying the event tree for qualitative and quantitative analysis, its close relationship with Fault Tree Analysis (FTA) can be utilized.

This standard aims to determine the basic principles of ETA unification and its use as a technical method for assessing system credibility and risk-related metrics.

General application.

1) The numbers in square brackets refer to the references.

Credibility Analysis Technology Event Tree Analysis (ETA)

1 Scope

This standard specifies the basic principles of event tree analysis (ETA) and models the consequences of initial events and the credibility of these consequences.

Guidance on qualitative and quantitative analysis of risk-related measures.

Specifically, this standard discusses the following related to the event tree.

a) define basic terms, describe the application of the symbols and graphical representations;

b) describing the program steps for constructing the event tree;

c) detail the assumptions, limitations and advantages of conducting the analysis;

d) identify the relationship between the method and other credibility and risk-related technologies and clarify their scope of application;

e) give guidance on qualitative and quantitative evaluation;

f) Provide practical cases.

This standard applies to all industries that need to assess the credibility and risk-related metrics of the consequences of the initial event.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article.

Pieces. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 2900.13-2008 Electrotechnical terminology credibility and quality of service (IEC 60050-191.1990, IDT)

IEC 61025.2006 Fault Tree Analysis [(Faulttreeanalysis(FTA)]

3.1 Terms and definitions

The following terms and definitions as defined in GB/T 2900.13-2008 apply to this document.

3.1.1

Node node

A point in the event tree graph that describes two or more possible outputs of the mitigating factor.

Note. The top event in the corresponding fault tree can be directly associated with a node.

3.1.2

Common cause commoncause

The cause of multiple events.

[IEC 61025.2006, definition 3.15]

Note. In certain situations, the time frame in which multiple events occur should be indicated. For example, multiple events occur simultaneously at a certain time, or in a very short time

Internally occur one after another.

Examples. specific natural disasters (eg, fires, floods), failure of engineering systems, biological infections or human factors.

3.1.3

Event event

The occurrence of a certain state or activity.