CHAPTER 19

SNEAK CIRCUIT ANALYSIS

CONTENT

1. INTRODUCTION

1.1 Sneak analysis is a technique designed to uncover inherent design flaws which would not normally be discovered by other review analyses and testing methods. Sneak analysis is a complex task and, for other than very simple systems, computerised sneak analysis is the only practicable approach. Computerised sneak analysis relies on an expert system and this fact should always be considered.

1.2 A sneak is an unexpected path or logic flow within a system which, under certain conditions, can initiate an undesired function or inhibit a desired function. The path may consist of hardware, software, operator actions, or combinations of these elements. Sneaks are not the result of failure and cannot necessarily be analysed by techniques such as FTA or FMECA but are latent conditions, inadvertently designed into the system or coded into the software program, which can cause it to malfunction under certain conditions.

2. SCOPE

2.1 This chapter incorporates:

- An introduction to sneak analysis;
- A description of the application of sneak analysis.

2.2 Although originally developed for application to electronic circuit designs, the technique can be applied to electro-mechanical, electrical and mechanical designs and has also been successfully extended to software design; and it can be applied directly to integrated hardware-software systems.

2.3 This analysis is particularly suitable for safety critical items.

3. METHODOLOGY

3.1 The principles governing sneak analysis are that the design is systematically reduced to its simplest elements, which are then presented in such a way that past experience can be used to direct analysis of each element's functionality.

3.2 Sneak analysis is performed on critical hardware and software to identify latent paths which cause unwanted functions to occur or which inhibit the desired functions. Sneak conditions are not caused by failure; they represent conditions inadvertently designed into the hardware or software. In analysing circuits, all possible combinations or paths through the circuitry should be identified. In sneak circuit analysis the design is systematically reduced to its simplest elements in such a way that each element and functionality may be analysed and possible inter–actions investigated. Sneak analysis is a complex task and, for other than very simple systems, computerised sneak analysis is the only practicable approach. The analysis should address the status of all elements in the item during normal operation, for example, this can be undertaken by looking at the current flowing in electrical circuits, or fluid flows in hydraulic systems.

2.3 Hardware sneaks are sneak paths, sneak opens, sneak timing, sneak indications and sneak labels. Software sneaks are classified as sneak outputs, sneak inhibits, sneak timing and sneak messages. Both types of analysis follow a similar methodology.

3.4 These are examined with the aid of specific lists of clues, built up from past experience, to identify potential sneaks.

3.5 Sneaks discovered in this way are formally reported but this is not the limit of the output from the analysis. Since the design requires to be completely and accurately documented, to enable the analysis to take place, a useful by-product is that errors and omissions in the documentation are also discovered.

LEAFLET C19/0

REFERENCES

1 Mil-Std-1543B, dated 28th October 1988, Reliability Requirements for Space and Launch Vehicles

2 Mil-Hdbk-338B, dated 1st October 1998, Electronic Reliability Design Handbook