

**THE PRACTICAL DESIGN AND TESTING OF THE AUTOMATIC  
MONITORING SYSTEM IN THE VC 10**

Presented by

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### Summary

The prime requirement of any fail-safe or failure-survival system is failure detection. This paper discusses some of the practical techniques used in the design, analysis, and testing of automatic landing systems for the Vickers VC 10 and BAC 1-11. It is argued that in the future electronic and auto-control equipment must be designed so that assessment of its fail-safety can be made with the same degree of confidence as safety analysis on the aircraft which carries it.

The paper assumes that the reader is broadly acquainted with the overall system concepts in the VC 10 and BAC 1-11 which have been outlined recently at the IATA 15th Technical Conference.

### Introduction

Automatic monitoring is a design feature of each of the two autopilots in the VC 10 installation. The prime object is to enable the detection of significant failures in either of the automatic control systems. Two such monitored autopilots can then be used as a failure survival combination by providing automatic changeover from one to the other. This is the basis of the automatic all weather landing system in the VC 10. It is illustrated in the block diagram of fig. 1, but will not be described further in this paper, which is limited to failure detection principles and practice.

#### 1. Categories of Automatic Monitoring

Automatic monitoring in the context in which it is used in the VC 10 is in fact automatic failure detection and the design techniques involved fall into three major categories:

- Category 'A'    The measurement of various system parameters with some external test device (absolute measurement).
- Category 'B'    Comparison of the device or system with a second device or system performing the same or a similar task concurrently with the first (comparison monitoring).
- Category 'C'    Overall measurement of performance of a task using some measuring means which is suitably independent of the device or system being checked (performance monitoring).

All means of failure detection involve either a measuring or a comparison process and a failure of the measuring or comparison device is always