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System Availability Management Technique for Reliability and Maintainability Analysis

A method for total system availability analysis has been conceived, based on numerical prediction of the reliability, maintainability, and availability of each individual function system; and incorporation of these functional-system estimates into an overall mathematical model which would present the reliability posture of the total system at any given time.

The analysis objective not only required an estimate of the reliability of the system under study, but also an examination of the minimum requirements that might be imposed on management planning in procurement of spares, design goals, and maintenance personnel support.

The numerical prediction of success was based on the development of reliability numbers for all components and subsystems. These numbers were then combined into the final probability statistic for the entire functional system. Reliability defines the probability of no failures during a prescribed operating period, but failure correction within allowable tolerances may diminish failure impact. Therefore, availability statistics are critical, in that operational success is dependent upon the physical availability of replacements or repairs within defined time limits.

Accurate definition of potential problems is made more difficult by priority assignments. Weighted reliability statistics are merely statistical aids and must be viewed with caution.

The Systems Operational Reliability Analysis of an operational system is accomplished in the following seven stages:

1. Drawing of a system diagram by levels.
2. Listing of components corresponding to each subsystem and assignment of a failure rate.
3. Interviewing system engineers, technicians, and maintenance personnel to establish average repair time of each component.
4. Preparing computer programs to handle reliability, maintainability, and availability for each component.
5. Preparing mathematical models for the functional and operational interrelations of each unit.
6. Making trial computer runs for reliability and availability numbers of the mathematical models.
7. Applying trial techniques on the remainder of the operational system to identify critical factors.

This technique would be helpful to large-system management where system availability is a critical factor.

Note:

Requests for further information may be directed to:

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No patent action is contemplated by NASA

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