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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:  
Technology Utilization Officer  
Kennedy Space Center  
Kennedy Space Center, Florida 32899  
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## System Availability Plans for a Technician for Reliability and Maintainability Analysis

The purpose of this document is to provide a system availability plan for a technician performing reliability and maintainability analysis. The plan is intended to be used as a guide for the technician in the development of a system availability plan for a specific system. The plan is based on the following assumptions:

- The technician is familiar with the system and its components.
- The technician has access to the necessary resources, including personnel and equipment.
- The technician is working in a controlled environment.

The plan is organized into the following sections:

- 1. Objectives
- 2. Scope
- 3. Responsibilities
- 4. Resources
- 5. Schedule
- 6. Risks
- 7. Reporting
- 8. Review

The following information is provided for each section:

- 1. Objectives: The technician shall develop a system availability plan for the system, including the identification of critical components and the determination of their failure modes and effects.
- 2. Scope: The plan shall cover the entire system, including all components and their interconnections.
- 3. Responsibilities: The technician shall be responsible for the development and execution of the plan.
- 4. Resources: The technician shall have access to the necessary resources, including personnel and equipment.
- 5. Schedule: The plan shall be completed within a specified time frame.
- 6. Risks: The technician shall identify and assess the risks associated with the plan.
- 7. Reporting: The technician shall provide regular reports on the progress of the plan.
- 8. Review: The plan shall be reviewed and approved by the appropriate authority.

A detailed description of the system and its components is provided in the following sections:

- 1. System Description: A high-level overview of the system and its purpose.
- 2. Component Description: A detailed description of each component and its function.
- 3. Interconnections: A description of the interconnections between the components.
- 4. Failure Modes and Effects: A description of the failure modes and effects for each component.

The following information is provided for each section:

- 1. System Description: The system is a complex system consisting of many components. The purpose of the system is to provide a reliable and maintainable service.
- 2. Component Description: Each component is described in terms of its function and its failure modes. The failure modes are identified and their effects are described.
- 3. Interconnections: The interconnections between the components are described in terms of their type and their location.
- 4. Failure Modes and Effects: The failure modes and effects for each component are described in terms of their frequency and their severity.

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