ESD-TR-65-193

THE ELECTRONIC SYSTEMS DIVISION RELIABILITY / MAINTAINABILITY PROGRAM ELEMENTS

G. H. Allen
J. Horowitz

MARCH 1965

TECHNICAL REQUIREMENTS & STANDARDS OFFICE
ELECTRONIC SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
L. G. Hanscom Field, Bedford, Massachusetts

ELECTRONIC SYSTEMS DIVISION

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This TDR was originally presented as a paper at the

"6th Annual West Coast Reliability Symposium"

February 20, 1965

ABSTRACT

The Electronic Systems Division (ESD) has been stressing the importance of Reliability and Maintainability (R/M) in the development and acquisition of ground electronic systems/equipments. This report discusses elements of ESD R/M programs. The development of qualitative and quantitative requirements are indicated. Methods and criteria involved in the evaluation of proposals and selection of contractors are presented. Finally, contractor monitoring actions performed by ESD activities and types of problems observed are discussed.

REVIEW AND APPROVAL

This technical report has been reviewed and is approved.

Frank E. Brandeberry

FRANK E. BRANDEBERRY
Colonel, USAF
Chief, Technical Requirements & Standards Office

CONTENTS

ILLUSTRATIONS

SECTION I

I. INTRODUCTION

A. Progress

During the past ten years several significant milestones have been achieved by government and industry teams with respect to the development of the reliability and maintainability (R/M) engineering disciplines. As examples, we cite:

- Incorporation of quantitative requirements in system and equipment specifications.
- Publication of a family of reliability specifications, including the recent MIL-R-27542A, and a basic maintainability specification, MIL-M-26512.
- Approved demonstration methodology which has capitalized on the various Epstein/Sobel publications.
- Establishment of basic R&D programs leading to improved prediction techniques and more comprehensive understanding of physics of failure.

and finally,

- Development of improved management structures.

B. Organization

The establishment of contractor R/M organizations, with specific responsibilities, lines of communication and authority, has an analog within the Air Force Systems Command (AFSC). Each Division of AFSC has a Staff Office specifically charged with the responsibility for R/M and, in addition, focal points are assigned to Systems Program Offices (SPOs). Within the Electronic Systems Division (ESD) this Staff Office is assigned to the Technical Requirements and Standards Office (EST), which in turn is assigned to Assistant for Staff Support, who reports directly to the ESD Commander. The assignment of R/M focal points to ESD SPOs has been accomplished through the receipt of Air Force Institute of Technology (AFIT) graduates with M.S. degrees in System Reliability.

It is this Staff-SPO team which is assigned the responsibility for the successful accomplishment of ESD R/M programs. This team is supported with limited resources from the Rome Air Development Center (RADC) and the MITRE Corporation. For those who are interested, AFSCM 375-3, System Program Office Manual, dated 15 June 1964, and published by the AFSC, describes a typical SPO organization and methods of operation.

SECTION II

II INITIATING AN R/M PROGRAM

The ESD SPO-Staff team has several key responsibilities to discharge before a contractor can commence his part of an overall R/M program. These include:

- Preparation of statement of requirements.
- Establishment of evaluation criteria for R/M.
- Assist in evaluation of bidder's proposals, negotiation and award of contract.

A. Statement of Requirements

Responsibility for statement of requirements entails a:

- Specification of quantitative values for R/M with associated demonstration models.
- Preparation of a statement of work (SOW) which outlines a series of tasks or work elements to be accomplished by a contractor.

1. Quantitative Requirements

System quantitative values at ESD are usually expressed in terms of steady state or point statistical availability. This situation arises, since the majority of our systems are continuous demand or non-mission orientated with respect to operational requirements. Systems which have specific mission times associated with them, such as, ICBM and aircraft, are more appropriately defined in terms of success probability, MTBF, etc.

The expression of an availability requirement implies the joint control and consideration of interfaces or interactions between R/M values at the major hardware levels of a system. In terms of subcontracted hardware, a system contractor will have to impose numerical requirements in specifications, upon completion of system modeling studies, to have a probability of successfully achieving or exceeding system requirements. System hardware design strategy must reflect consideration and incorporation of malfunction or failure detection methods, application of redundant replacements and, as necessary, alternate modes of operation with less accuracy, built-in test equipment, etc.

2. Modeling Studies

Total design strategy for hardware must consider and evaluate a matrix of competing and interacting characteristics including the venerable engineering constraints of volume, weight and cost. While it is true, that ESD systems, such as 474L (BMEWS), 465L (SAC) and 412L (USAFE), are not unduely hampered by volume and weight because of their operational environment, it is also true that there is not an infinite amount of dollars available for our systems. Therefore, it follows that a solution to our system availability requirements must not limit itself strictly to the addition of hardware in redundant configuration with its associated cost penalties.

3. Some Cost Considerations

Beyond hardware design considerations and their arrangement into a configuration, there are other methods for consideration in designing systems for availability that must be cost analyzed and compared with competing design strategies. For example, cost vs. the advantages of numerical incremental effects on availability of manning a number of sites vs. the design strategy of increased hardware reliability. The variable in question, time-to-travel-to-sites from <u>fixed</u> geographical locations (repair depots) is one factor affecting system down-time and thus availability.

Recently, this type of problem confronted ESD on a system program. There existed the need for increasing system availability. Several strategies were advanced for achieving this need. One strategy involved additional computer hardware for redundancy. Another was concerned with site manning. The original system design had three of four sites unmanned. An analysis indicated increased availability comparable to redundant hardware by selective site manning at less cost. We mention this type of system analysis with the intent to encourage avoidance of habit forming application of hardware redundancy as being the <u>only</u> solution to achieving our availability requirements.

4. Demonstration Aspects

When numerical values for system availability are set forth, the problem of demonstrating such values usually reduces to a separate verification of hardware R/M characteristics, thus, the importance of numbers incorporated into hardware specifications, and a mathematical combination of results to determine the level of system achievement. We know of only one approach to the verification of availability as a statistic without resorting to separate R/M verifications.[1] While the statistical modeling approach suggested by Bailey involves sequential techniques and the examination of paired sample values of operating time-to-failure and down-time or time-to-restore operations, it still provides no relief to basic ESD problems of dollars and schedules.

At the hardware level, our MTBF numbers are usually in the 500-1,000 hour interval. To obtain sufficient paired values for decision-making, requires a waiting-time or test length which might interact unfavorably with schedule and dollar constraints. In other words, the key to

1. J. H. Bailey, <u>Foundations of Sequential Testing and Application to Availability of Data Processing Systems</u> (IBM Technical Report TR00.992), March 6, 1963.

the reported approach is to obtain a paired value sample but to do this in the face of high MTBF's requires increases in test time which may be prohibitive when interfaced with other program considerations. With these thoughts in mind, we take the following position, at this time, with regard to system and hardware demonstrations:

- Separate hardware reliability demonstrations

- Separate maintainability demonstrations

- Statistical combination of the results to determine system values

With relatively high equipment MTBFs, we have been applying variations of fixed test time modeling techniques to our hardware reliability demonstration problems. Certain of our hardware specifications have required operation within performance requirements, under specified environmental conditions, for discrete multiples of MTBF, with a cited maximum allowable number of failures (C). Inherent in this type of approach, as illustrated by Table 1, are statistical, engineering and management considerations. These are discussed in depth in ESDP 80-5 and ESDP 80-8[2].

The Cummulative Poisson expression, which is the statistical model for this Table, indicates the statistical risks or probabilities of accepting hardware having MTBF less than the required MTBF as C - values and test time vary. ESD and contractors, upon examining such an array of numbers, can, at least, numerically recognize the other's risks. This in itself should increase the probability for more satisfactory demonstration agreements.

Engineering, as in any demonstration model, must define hardware failure, cite failure counting ground-rules, specify the environmental spectrums and test methods. To management, the fixed test time model permits more accurate scheduling and budgeting than the sequential model, for example. Finally, for all key personnel assigned to a program, the model is easy to understand and administer (which is probably its greatest advantage!)

Maintainability demonstration for hardware requires a specification of a minimum number of failure simulations and logging time-to-restore operation. Fifty or sixty representative simulations are usually involved. The identification of what should be simulated is influenced by the results of and knowledge gained during engineering design reviews as well as statistical predictions of reliability.

The statistical combinations of hardware results to achieve system values usually follows the well known probability models and expressions originally postulated for reliability predictions. The much over-worked product rule has found new applications.

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2. These two ESD documents, Verification of Quantitative Reliability Reliability Requirements and Construction and Application of Probability of Acceptance Curves, are available to industry as part of ESD-TDR 64-616.

B. Qualitative Requirements

1. General Statements

SOW requirements for R/M find background information in the previously referenced MIL-R-27542 and MIL-M-26512 specifications. Those in ESD who apply these specifications are familiar with their contents and realize the need for:

- Supplementary instructions relative to the tasks or work elements suggested within the specifications.
- Selection and definition of tasks per program and the avoidance of such statements as, "Reliability shall be in accordance with MIL-R-27542".
- Integration of individual reliability and maintainability work requirements on a task by task basis.

2. Specific R/M Tasks

ESDP 80-2, General Requirements for a Reliability and Maintainability Program Plan for Electronic Systems, sets forth some basic tasks which are considered to be applicable to all our system and equipment programs. These tasks cover a wide variety of work requirements ranging from mathematical modeling to submission of reports. We view certain of these tasks, in addition to modeling and demonstration, to be essential to the achievement and maintenance of technical control for R/M. As examples:

- A task entitled "Design Reviews" should insure that such basic reliability engineering considerations as conservative application of piece parts and techniques for minimization of environmental stresses influence design strategy. A design review task, as defined by ESD, includes types of reviews, schedules, minutes, participation, and necessary corrective action follow-up.
- A task entitled "Corrective Action Management" accomplishes the need to insure that timely and effective corrective actions occur on problems limiting hardware and system R/M.

and finally,

- A task entitled "Predictions and Modeling" provides the basis for estimating numerical effects of changes influencing R/M, tracking progress toward the achievement of numerical requirements, suggesting design improvement areas, and for necessary re-apportionments of system requirements at subsystem and hardware levels.

These tasks in addition to others selected from the family of tasks defined in MIL-R-27542 and MIL-M-26512 (see Exhibit 1) are listed and described within our RFPs and IFBs. These tasks when scheduled, defined in-depth, integrated within the overall program and negotiated with a procuring activity or SPO, form the basis of a contractor's R/M program.

C. Source Selection and Evaluation Criteria

1. Bidder's Briefings

We recognize that on occasion industry may not interpret the requirements in the manner intended by ESD. To avoid management and technical problems at a later date, arrangements are made for a Bidder's Briefing, usually a week after RFPs are issued and three to four weeks before formal Proposals are to be submitted. At a Briefing, bidder's are invited to submit in writing questions on any item within an RFP that they feel requires clarification or interpretation. The questions are answered and when necessary RFP contents are modified.

2. Source Selection Board Organization

As stated previously, ESD inserts R/M requirements into RFPs. Having placed requirements into these documents, we now want to be certain that "end items" (hardware, software, etc) will satisfy our needs. As a first step in achieving this certainty, Source Selection Boards (SSBs) are established to evaluate proposals. A first action of a Convened Board is to develop specific criteria and a rating plan covering weights, factors, etc., to be used in evaluating proposals. These criteria are, of course, based on bid package requirements.

Generally speaking, a SSB is composed of three or four Groups. Each Group is assigned the responsibility for a given area of a proposal. These areas include such large groupings as management, engineering, technical requirements and logistics. Each Group may, in turn, consist of several Teams which have responsibility for one or more specialities or factors. For example, the Technical Requirements Group may have several Teams responsible for such factors as reliability, maintainability, quality assurance, test, configuration management, etc.

Personnel assigned to each Group and Team are drawn from various governmental activities as needed. They may come from a SPO, research activities, staff elements, or even other AF Commands (Air Defense, SAC, TAC). Every effort is made to obtain qualified personnel for each speciality. Usually, The MITRE Corporation will act as technical consultants to SSBs. All SSB members are instructed in matters of Board conduct and discipline in order that proper and objective decisions are made during the life of a SSB.

3. Proposal Evaluation

Proposals, when received, are studied, analyzed and evaluated by Teams assigned to a SSB. This activity is accomplished in depth and proposals are rated, not against each other, but against established criteria. Typical R/M criteria are presented in Exhibits 2 and 3.

If a proposal contains information requiring clarification, depending on the type of procurement involved, the involved bidder may be contacted to clarify his proposal. Any clarifications or additional information must be submitted in writing to a SSB.

Let's consider several R/M subfactors presented in Exhibits 2 and 3. Paper limitations prevent us from giving an in-depth discussion of each subfactor but we feel their illustrations serve to illustrate the general thinking of a SSB.

- Past Performance - We are interested in knowing what other programs a bidder has undertaken which involved comparable R/M requirements and the results obtained. RFPs request a bidder to report on this subfactor. We are in the process of developing a procedure to enable a retrieval of existing reports and data on past accomplishments in order to gain further information on a bidder's performance.

- Experience - The work experience of personnel being assigned to a program is of interest to a SSB. While names denoting reputations in R/M are impressive at first glance, we have noted in the past that these are frequently "paper" assignments. It is important that the qualifications and experience of people assigned to a position in a line R/M organization be set forth.

- Organization - The organizational structure of a bidder must indicate the lines of authority, communication channels and inter-departmental relationships which affect his R/M organization. We cannot expect to find his R/M organization reporting to a line design manager and then be assured of the effectiveness of a proposed design review task. Organizationally, we expect the R/M activity to interface with other activities, be in a position to influence design strategy <u>and</u> management decisions. Furthermore, while R/M are considered design characteristics, the influence of a R/M organization must continue throughout the testing and production phases of a program.

- Scheduling - Proper scheduling of R/M tasks is of major importance in the successful management of a program. For example, design reviews must be accomplished <u>prior</u> to release of hardware drawings to manufacturing. Considering the reliability demonstration problem confronting ESD, a careful integration of the demonstration task within the schedule structure is certain to be carefully evaluated. By the way, we have evaluated several proposals which contained demonstration tasks which, if adopted as outlined, would have been in excess of anticipated contract lengths!

- Control of Subcontractors and Vendors - The type of program affects the prime-subcontractor relationship and influences the management techniques invoked to assure satisfaction of overall system requirements. Briefly, we expect a prime contractor to have a management system which examines and corrects, when necessary, subcontractor facilities, procedures, organization and program controls. A prime contractor must plan to indoctrinate subcontractors into overall program requirements and be prepared to maintain active management surveillance and provide technical support, as needed, to subcontractors.

- Analysis of System/Equipment Problem Areas - Virtually all ESD procurements have state-of-the-art engineering type problems which affect R/M. When one considers the complexity of operations and functions required of our systems, this is understandable. Since these problems exist, specific solutions or compensating system design features, which lead to trade-offs, are rigorously evaluated. Since ESD RFPs state the requirement for R/M analyses and models, we expect that the <u>quantitative</u> effects of problems will be assessed.

- Other Program Elements - MIL-R-27542 and MIL-M-26512 suggest, as we have stated, a wide variety of work elements or tasks (see Exhibit 1). Not all of these may be inserted into a particular RFP. If a bidder feels that certain tasks should be added to those in an RFP, we expect to see some justification for his position in his proposal.

4. Rating Process

All factors (reliability, maintainability, etc.) and subfactors (organizational structures, design review activity, demonstration model, etc.) do not receive the same weight in determining a total score for a proposal. While no specific values can be stated here, in a usual SSB, R/M factors contribute about 30 - 40% of the total score received in the Technical Requirements area.

When one considers the type of complex systems involved in ESD procurements and the many competing disciplines or factors involved in the rating process, a 30 - 40% weight is a sizeable contribution to the total score.

Furthermore, it is also possible at this time that a bidder may achieve an <u>overall</u> acceptable proposal but still be relatively weak in R/M or some other discipline.

5. Contract Negotiation

It is anticipated that at the time of selection of a contractor all program requirements, including R/M, would have been satisfied. Unfortunately, while most problems will have been overcome, some may still remain. Applying the negotiated contract approach covered by ASPR III-8, further discussions and definitions of a R/M program can be undertaken.

The RFP and contractor's proposed R/M Program Plan are utilized in these discussions. Meetings are held, the first shortly after contractor selection is announced, and are continued as necessary. Each R/M task is discussed to assure that full understanding exists between ESD and contractor as to requirements and actions needed. If necessary, changes are made in the Proposed Plan. Minutes of all meetings are kept and are fully documented.

ESD is cognizant of the need for economy in system acquisitions and is receptive to suggested R/M modifications. Trade-offs of R _vs_ M, R _vs_ cost, etc., will be considered. We do try to stay within budgetary limitations on costs and will consider redirection or reemphasis of certain R/M program tasks, if proper quantitative analysis is submitted in support of suggestions.

Finally, an important consideration or constraint that we all must adapt to in planning our programs is the time compression problem. In order to meet the schedules required by governmental committments, it is sometimes necessary to start work on a contract almost coincident with contractor selection. In these cases ESD may authorize implementation of the R/M Program on a specific task basis with those tasks or portions of tasks on which agreement is not complete being delayed pending final resolution. For example, selection of suppliers and vendors may proceed at once but additional study may be needed before approval of the Failure Reporting System is granted.

SECTION III

III. R/M PROGRAM MONITORING

A. Monitoring of Contractor Progress

Following initial guidance meetings, upon Award of Contract, and approval of contractor program plan by procuring activity, verification of progress against the requirements of the approved plan is performed by the previously referenced SPO-Staff team. ESDP 80-7, Monitoring of Contractors Reliability and Maintainability Programs, serves as a general guide for accomplishing this management responsibility.

Monitoring encompasses a wide variety of activities including:

- Participation in preliminary and critical engineering design reviews.
- Review, evaluation, comments, and approval of prediction, progress, demonstration and failure summary reports.
- Review of progress at meetings conducted at contractor facilities and necessary re-direction.
- Witnessing formal R/M demonstrations.

B. Program Problems and Actions

1. Common Problems

During the past several years, our monitoring activities have caused corrective actions with regard to technical and management aspects of our programs. Some common major problems which are described in ESDP 80-4 include:

- Failure of contractors to accomplish timely design reviews.
- Inaccurate modeling practices.
- Absence of successful interface between contractor R/M and design organizations. We still recall (unhappily) that we brought about the introduction of reliability and engineering managers during a monitoring visit to a large company working on one of our more critical projects.
- Absence of well defined corrective action management procedures. On one program, field failure data flow was short-circuited and design engineering was unaware of several major problems being reported to us by the contractor's R/M organization.

2. Actions Taken

These problems are mentioned to illustrate the need for continued management interest in the R/M disciplines. To help sustain such interest, we have taken the following diverse actions on two recent programs undertaken by ESD:

- On one contract, reliability was introduced as an incentive factor. The opportunity for increased contractor profit as a result of achieving a specified quantitative objective was provided.

- On another contract, payment of fee is being apportioned over a two year period. The quantitative requirements and contractual structure requires the achievement of specific system objectives during a first year of operation following site installation and activation. These objectives are more severe for the second year. By providing contractual structure which influences resulting profit, we hope to sustain management interest in R/M.

SECTION IV

IV. SUMMARY

This report has described elements of the ESD R/M Program. We state that our responsibilities can be grouped into three general categories:

A. Stating Requirements

Quantitative expressions and contractor program requirements are incorporated into our RFPs and IFBs.

B. Evaluating Proposals and Selecting a Contractor

Bidder R/M responses to our requirements are factors in the overall contractor selection process. The weight given to R/M is not constant but varies with such factors as nature of a procurement, severity of quantitative requirements, etc. A cursory examination of an RFP and IFB reveals several competing disciplines which influence ultimate contract award.

C. Monitoring of Contractor Progress

This activity generally is performed by a SPO-Staff team. The competency of this team has greatly increased through the assignment to ESD SPOs of AFIT graduates with an M.S. degree in System Reliability.

TABLE NO 1

PROBABILITY OF ACCEPTANCE TABLES

θ_t/θ_c	C = 0	C = 1	C = 2
1/4	0.02 0.0003	0.10 0.0024	0.26 0.01
1/2	0.14 0.02	0.42 0.10	0.70 0.26
1	0.37 0.14	0.74 0.42	0.87 0.70
3/2	0.51 0.27	0.85 0.62	0.97 0.85
2	0.61 0.37	0.92 0.74	$\sim$1 0.92

NOTE 1: θ_t/θ_c = "TRUE" MTBF/CONTRACTUAL MTBF

NOTE 2: FIRST PROBABILITY NUMBER FOR THE CASE WHEN TEST TIME = CONTRACTUAL MTBF; SECOND FOR CASE WHEN TEST TIME = TWO TIMES CONTRACTUAL MTBF.

EXHIBIT 1

Twenty R/M Tasks Suggested By
MIL-R-27542 and MIL-M-26512

1. Develop and Submit R/M Plan
2. Develop, Modify R/M Mathematical Model
3. Perform Predictions of R/M
4. Apportion R/M Requirements Into Subcontracted Equipment Specifications
5. Organize and Maintain a Failure/Maintenance Data Collection System (Data Collection, Processing, Reduction and Feedback)
6. Maintain a Corrective Action System
7. Perform R/M Design Reviews and Recommend Appropriate Design Strategy
8. Review ECPs and Non-ECPs For R/M Effects
9. Submit Monthly, Quarterly, and Final Reports
10. Coordinate With Quality Assurance, Human Factors and Logistical Support Personnel
11. Conduct R/M Indoctrination and Training
12. Perform Failure Analyses
13. Propose and Conduct Part Improvement Programs
14. Perform Maintenance Analysis
15. Demonstrate R/M Requirements
16. Perform Trade-Off Evaluations and Alternate Solutions to R/M Problems
17. Manage and Control Subcontractor Effort
18. Participate in Progress Reviews with Procuring Activity
19. Review Processes and Procedures for Fabrication and Assembly
20. Recommend Changes to Operating Procedures, Maintenance Manuals, Test Equipment and Spares Requirements.

Principle
SOW para no.

EXHIBIT 2

Date________

EVALUATION CRITERIA - ___SPO
TECHNICAL REQUIREMENTS & STANDARDS GROUP (AREA)
R/M/QC TEAM (ITEM) Reliability
(Factor - 10 points)

Sub-Factor Weights	Raw Score		Adjusted Sub-Factor Score
( )	( )	1. Understanding of the Impact and Importance of Reliability Program.	( )
( )	( )	2. Program Plan Development - General considerations and tasks below:	( )
		a. Allocation of reliability requirements to each level (subassembly, component, equipment) at each stage (design, development, production).	
		b. Design reviews - plans for at least three design reviews (part, electrical, mechanical) scheduled. General approach including planning, staffing, and action modes resulting from reviews.	
		c. Reliability Predictions - Methods used to make initial predictions based on data or approved techniques. Approach used to update initial predictions based on design and test results.	
		d. Test Program - Development of test plans at each level and stage and the engineering approach used to meet contractual requirements in an economical manner. Method proposed for collection, analysis, and feedback of test results.	
		e. Test Procedures - Use of reasonable test procedures to prove achievement of required reliability. Method of establishing confidence and risk factors and remain within program schedule.	
		f. Reporting Procedure - Planning for completeness, details to be covered. Establishment of problem list and corrective action set up.	
		g. Establishment of mileposts and monitoring check points.	
		h. Subcontractor control - Methods to be used in contracting, establishing of requirements, control of work.	
		i. Training and Indoctrination - Planning for necessary training and indoctrination of all company personnel.	
( )	( )	3. Reliability Organization and Staffing - Is the reliability group in a position to exert its influence on the program (on a par with Engineering or Production)? Is the organization staffed with sufficient men to do the assigned task? Is the experience adequate to assure full compliance with schedule?	( )

TOTAL FACTOR SCORE ________

Principle
SOW para no.

EXHIBIT 3

Date ______

EVALUATION CRITERIA - ___ SPO
TECHNICAL REQUIREMENTS & STANDARDS GROUP (AREA)
R/M/QC TEAM (ITEM) Maintainability
(Factor - 10 points)

Sub-Factor Weights	Raw Score		Adjusted Sub-Factor Score
( )	( )	1. Understanding M requirements on this program including where, when and how the M requirements will be established for this system.	( )
( )	( )	2. Program Plan development - General Coordination and Tasks below:	( )
		a. Allocations of M requirements to each level (subassembly, component equipment) at each stage (design, development production).	
		b. Design Reviews - Plans for at least three (3) design reviews (part, electrical, mechanical) scheduled. General approach including planning, staffing, and action modes resulting from reviews.	
		c. Maintainability Predictions - Methods used to make initial predictions based on data or approved techniques. Approach used to up-date initial predictions based on design and test results.	
		d. Test Program - Development of test plans at each level and stage and the engineering approach used. Method proposed for collection, analysis and feedback of test results.	
		e. Test Procedures - Use of reasonable test procedures to prove achievement of required M. Method of establishing confidence and risk factors and remain within program schedule.	
		f. Reporting Procedure - Planning for completeness, details to be covered. Establishment of Problem List and corrective action set up.	
		g. Establishment of mileposts and monitoring check points.	
		h. Subcontractor control - methods to be used in contracting, establishing of requirements, control of work.	
( )	( )	3. M Organization and Staffing - Is the M group in a position to exert its influence on the program (on a par with Engineering or production)? Is the organization staffed with sufficient men to do the assigned task? Is the experience adequate to assure full compliance with schedule?	( )
( )	( )	4. Understanding of special maintainability requirements and the integration of SPO system needs into the overall system.	( )

TOTAL FACTOR SCORE ______

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Technical Requirements & Standards Office Electronic Systems Division L.G. Hanscom Field, Bedford, Massachusetts 01731	2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED 2b. GROUP N/A

3. REPORT TITLE

The Electronic Systems Division Reliability/Maintainability Program Elements

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

N/A

5. AUTHOR(S) (Last name, first name, initial)

ALLEN, George H.
HOROWITZ, Jerome E.

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
March 1965	18	10

8a. CONTRACT OR GRANT NO. In-House b. PROJECT NO. c. d.	9a. ORIGINATOR'S REPORT NUMBER(S) ESD-TR-65-193 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) N/A

10. AVAILABILITY/LIMITATION NOTICES

Qualified Requestors may obtain from DDC.
DDC release to CFSTI Authorized (Formerly OTS).

11. SUPPLEMENTARY NOTES None	12. SPONSORING MILITARY ACTIVITY Electronic Systems Division, Air Force Systems Command USAF, L G Hanscom Field, Bedford, Massachusetts 01731

13. ABSTRACT

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UNCLASSIFIED
Security Classification

14. KEY WORDS	LINK A ROLE	LINK A WT	LINK B ROLE	LINK B WT	LINK C ROLE	LINK C WT
Command and Control Systems						
Reliability						
Maintainability						
Source Selection Boards						
Program Elements (R/M)						
Qualitative Requirements (R/M)						
Quantitative Requirements (R/M)						
Program Monitoring (R/M)						
Incentives (R/M)						

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