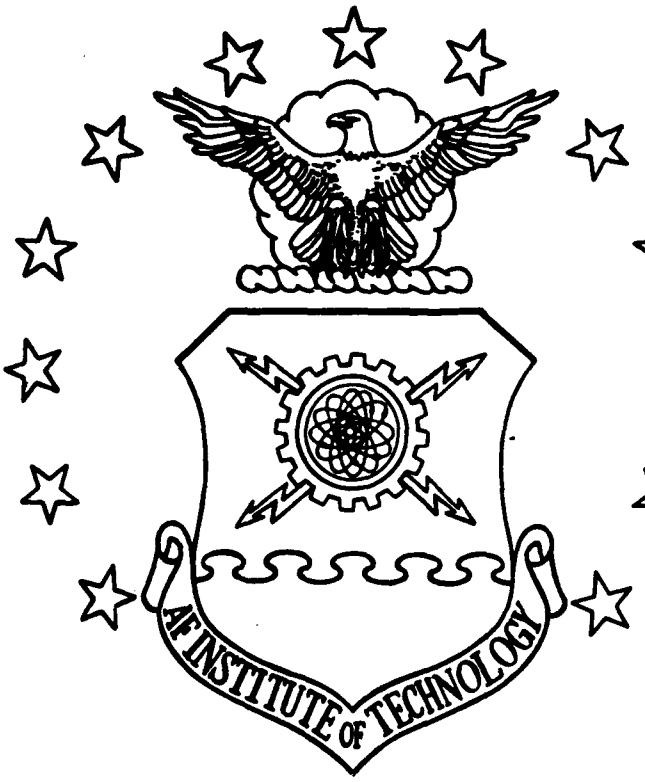

A COMPARISON OF THE AIR FORCE, ARMY, AND NAVY TEST AND EVALUATION RELIABILITY AND MAINTAINABILITY DATA BASE SYSTEMS

THESIS

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The contents of this document are technically accurate, and no sensitive items, detrimental ideas, or deleterious information is contained therein. Furthermore, the views expressed in the document are those of the author and do not necessarily reflect the views of the School of Systems and Logistics, the Air University, the United States Air Force, or the Department of Defense.

AFIT/GLM/LSY/91S-54

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THESIS

Presented to the Faculty of the School of Systems and Logistics of the Air Force Institute of Technology Air University In Partial Fulfillment of the Requirements for the Degree of Master of Science in Logistics Management

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Preface

The purpose of this study was to develop a single source document which would improve the communication process between service members of the Air Force, Army, Navy, and Marines when involved in Joint or Multiservice Acquisition Programs. The study approach was to define, compare, and translate terms used to collect information on Reliability and Maintainability on aviation systems while they are undergoing Test and Evaluation during the Full-Scale Development Phase.

This research effort was possible only through the combined efforts of many people. First my wife, who took care of our nonacademic lives for the duration of this effort and who put her own goals on hold to support my efforts. Next, I would like to thank the many people from the different services who took the time to teach me the intricacies of each of the services' actual use of their reliability and maintainability data bases, particularly Mr. Roger Hoffman, Army, Cpt Andrew Jackson, Air Force, Mr. Don Williams, Navy.

And I am deeply indebted to Mr. Brett Andrews, my advisor, and Mr. Carroll Widenhouse, my reader, for their generous sharing of their vast knowledge and experience.

Donald L. Scantlan Jr.

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Definitions

Data Element. "A basic unit of information having a unique meaning and which has sub-catagories (data items) of distinct units or values" (6:2). Examples of data elements are aircraft tail number, manufacturer, skill identifier code, geographic location, and military unit.

Data Item. "A sub-unit of descriptive information or value classified under a data element" (6:2). For example the data element geographic location contains data items such McCord AFB, Ft. Hood, Pensacola NAS.

Joint Reliability and Maintainability Review Board. Board of representatives from System Developing Contractors and Acquiring Services who review Test and Evaluation Reliability and Maintainability Data to assure the accuracy and credibility of test data and reports.

Joint Service Acquisition Program. "An acquisition program which encompasses the requirements of and is staffed by members of two or more services" (4:29)

Maintainability. "The measure of the ability of an item to be retained in or restored to specified condition when maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair" (7:5).

Multiservice Acquisition Program. An acquisition program which is managed and staffed by a single service for acquisition by more than one service.

Reliability. "The duration or probability of failure-free performance under stated conditions" (7:8).

Scoring Conference. Conference attended by material developer, test agency, user representative, and independent evaluator personnel to review test events for anomalies and applicability to system evaluation.

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Abstract

This study was conducted to create a single source document which could be used by test and evaluation personnel involved in joint programs for translating reliability and maintainability terms. The comparison begins by describing the forms, data elements, and data items, as collected by the Air Force's System Effectiveness Data System, the Army's Reliability, Availability, Maintainability Logistics System, and the Navy's Maintenance and Material Management, Maintenance Data System. The "Findings" paragraph is a stand-alone document which could serve as a translating dictionary for reliability and maintainability data elements between the different service's data systems. Upon the conclusion of this study, several recommendations were made. 1. The Army should adopt the Work Unit Code structure of MIL-SPEC MIL-M-38769C. 2. The services need to agree upon the length of the Work Unit Code. 3. The services should establish a minimum set of collected data elements and items. 4. The services should publish an agreement on reliability, availability, and maintainability data elements and items for test and evaluation. Additionally it is noted that the major differences in data collection methodology is the Army's use of independent data collectors for improved data accuracy.

A COMPARISON OF THE AIR FORCE, ARMY, AND NAVY TEST AND EVALUATION RELIABILITY AND MAINTAINABILITY DATA BASE SYSTEMS

I. Introduction

Research Objective

The effectiveness of this country's military power is becoming more dependent upon cooperation between its different military services. Changes in the operational structures of each service, such as the creation of Joint Commands and Joint Duty assignments and the attention being paid by Congress and Service leaders to these positions underscore the criticality of improved cooperation. In the logistics arena, improved cooperation can have many advantages. Well managed joint acquisition programs can: optimize the resources spent on research, development and production programs, improve and simplify tactical logistics operations, and increase logistical and operational flexibility. Joint acquisition programs attain these improvements by:

a. Improving coordination and reducing redundant management and development efforts.

b. Reducing development and production costs by coordinating laboratory efforts, improving the exchange of technical information and increasing contract lot sizes to lower per unit costs.

c. Improving interoperability and interservice standardization which improves combined arms operations and reduces logistical support requirements and increases logistical and operational flexibility.

The overall understanding and expectation that Congress has in these programs was stated in a 1984 General Accounting Office report on joint major system acquisition by the military services as;

> While there are many impediments to overcome in conducting joint programs, the reality is that single service systems cannot be afforded for every possible use. Joint programs, properly launched and administered, are a way to lessen budget affordability problems and at the same time satisfy the needs of more than one user (16:iv).

The primary intent of this study was to eliminate one of the "impediments" to successful joint acquisition programs by improving the communication between the services through improved underatanding of each service's reliability and maintainability data as collected during test and evaluation. The improvement in communication expected from this effort is based on the philosopher Voltaire's observation, "If you wish

to converse with me, define your terms" (1:35). All communication is based on an agreement of definitions and the services will not be able to effectively communicate on Reliability and Maintainability (R & M) issues until they agree on the names and definitions of the terms (Data Elements and Data Items) which are collected during test and evaluation programs and are then used for program decision making and planning.

In addition to the pragmatic reasons for improving the compatibility of the services' data bases, there are the requirements to comply with the standardization procedures and policies found in Department of Defense Directive (DODD) 5000.9 "Standardization of Military Terminology" (9:1), 5000.11 "Data Elements and Data Codes Standardization Program (6:1), Department of Defense Instructions (DODI) 5000.12 "Data Elements and Data Codes Standardization Procedures" (5:1), DODI 5000.18 "Implementation of Standard Data Elements and Related Features" (8:1).

The overall benefit expected from this study is similar to the expected benefits of the DoD's Reliability Standardization Document Program; "... the establishment of enforceable reliability requirements, avoidance of unnecessary acquisition costs, improvements in system cost effectiveness, and decreased support costs" (11:7).

Problem Statement

For the Department of Defense to realize the cost advantages of successful joint service acquisition programs, accurate communication between the services on R & M parameters is essential. Currently, each of the services has developed individual data base systems for gathering R & M data on weapon systems undergoing developmental and operational (Full-Scale Development Phase) test and evaluation. These data base systems are not compatible, use several different terms for the same event or parameter, and create difficulties in communication between systems acquisition personnel of the various services attempting to cooperate on multiservice programs.

To improve the communication between the services on R & M issues the terms used by these data base systems need to be better understood by the services not actually collecting the information. The expected improvement in communication between the services would increase the confidence level of the supporting services (those not directly controlling the test events), which would consequently reduce the likelihood of expensive, redundant test efforts (18).

Research Questions. To improve the compatibility of data base definitions used during R & M test and evaluation this research began by asking the following questions:

1. What are the R & M data elements and items contained in the Air Force's System Effectiveness Data System (SEDS)?

2. What are the R & M data elements and items contained in the Army's Reliability, Availability, Maintainability and Logistics (RAM/LOG) System?

3. What are the R & M data elements and items contained in the Navy's Maintenance Material Management (3-M), Maintenance Data System (MDS)?

Investigative Questions. Once each data base system was defined, the following questions were applied to the individual elements and items contained in each system:

1. What like R & M data elements does each service collect using different data element names (Air Force How Malfunction Codes, Army Failure Codes, and Navy Malfunction Codes are all used to describe Equipment Failure Modes)?

2. What like R & M data elements does each service collect using different data items (Air Force collects Work Unit Codes (WUC) to 5 places, Army collects up to 13 Places and the Navy uses 7 places)?

3. What different terms do the services apply to the same R & M data items (e.g. the Action Taken term for "repair not authorized at this level" is: NRTS (Not Repairable This Station) for the Air Force and the Army, however, the Navy uses BCM (Beyond Capability of Maintenance))?

4. What data elements are not collected by one of the services (Navy does not collect skill codes) or are collected by only one service (only Navy collects catapult data)?

5. How can the R & M data elements and items in the data base systems be translated to improve compatibility of the data bases and understanding between the services?

Scope and Limitations of Study

This research will primarily address the actual data elements and items as collected during developmental and operational test and evaluation programs using the most data intensive system used by each service. Specifically, this study concentrates on the data collection systems used for reliability and maintainability evaluation of systems during the full-scale development phase.

Although each service also uses several different follow-on data collection systems for mature weapon system logistics and maintenance data collection, these follow-on systems were not considered for study. Nor does this study address the many different analysis and report generating systems used after the data has been collected. Additionally, only those data systems currently defined by the services' regulations and official documentation were used in this study.

II. Background

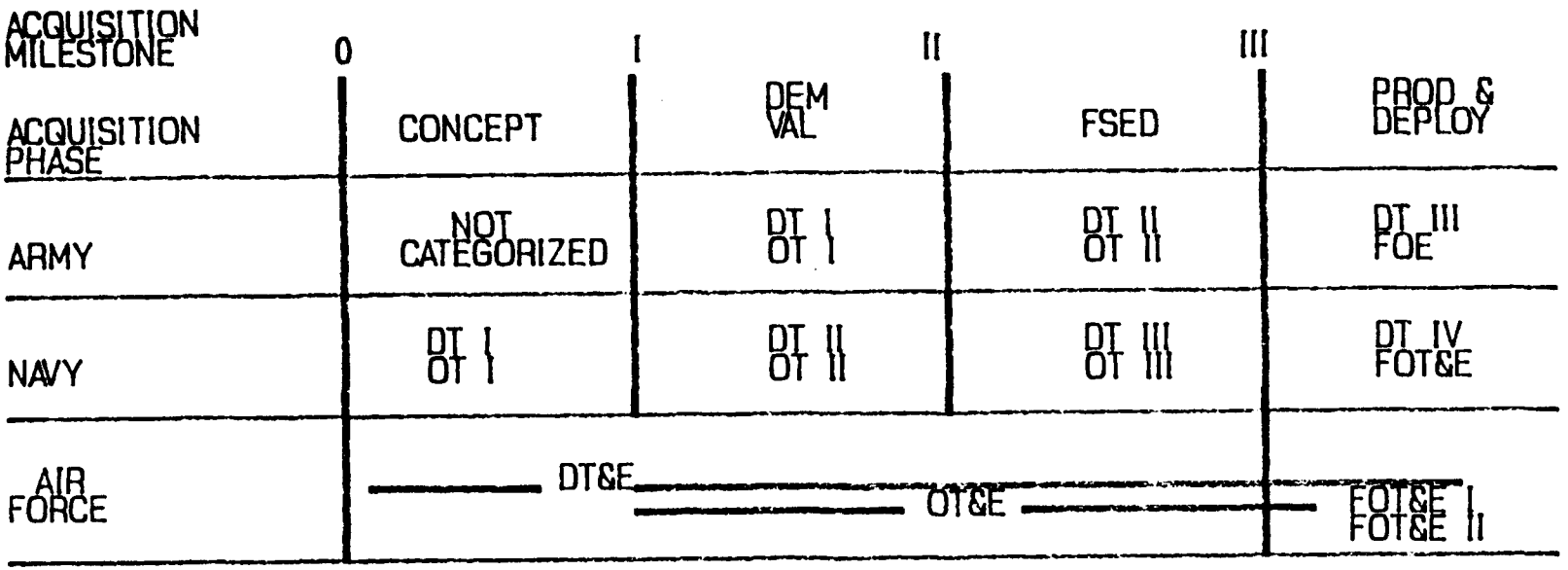
> Demonstration of a system's technical capabilities and its operational effectiveness and suitability by the conduct of appropriate T & E will be a key requirement for decisions to commit additional resources to a program, to advance it from one acquisition phase to another, and to field a system (10:2).

Uses and Purposes of Test and Evaluation Data Base Systems

There are essentially two types of test and evaluation programs conducted during the acquisition process. Developmental testing (DT) is conducted by, or under direct supervision of, the developing and/or procuring agency for the purpose of "evaluating technical performance of prototype equipment" (3:10-2). Operational testing (OT) is conducted by military personnel, in a military usage environment, "to determine the degree to which new equipment fulfills military operational requirements" (3:10-2). Each of these two types of testing are typically broken down into four different levels called DT I, DT II, OT I, OT II, etc. These different levels are related to the program's progression through the acquisition system milestones.

However as can be seen in figure 1, the same milestone period test events are not referred to as the same levels between the services. Despite the different names for the same milestone period testing, testing conducted by the service agencies during the same milestone period generally have the same objectives (this is just a small example of how common terms can cause confusion in multi-service testing). During the Full-Scale Development phase, test and evaluation focuses on the complete system for the first time as T & E program focus changes from "component and subsystem checks to full system checks" (3:10-1). During this phase each service uses a computerized data base system for the collection of R & M Data. This data is used to: make comparisons between competing contractors, test the designs against contract specifications, and to validate and update entries in the Logistics Supportability Analysis Report.

The information generated from these tests is then used to make decisions about which design(s) meet the goals for Reliability and Maintainability and should progress to the Production and Deployment Phase. Additionally, projections about the system's supportability can then be made from this data and be used in life cycle cost analyses/comparisons, for long range planning for personnel and training issues, and manpower and support equipment requirements.



FOT&E: FOLLOW ON T & E

Fig. 1. Test and Evaluation Phases

Examples of Potential Difficulties

V-22. Since its establishment in December 1981 (17:11), the Joint Services Aircraft Program, the V-22 Tiltrotor, has included the Army, Navy, and the Air Force. Despite the fact that the designation of executive service has changed from the Army to the Navy, all three services still have plans for acquiring a varying number of V-22 airframes. The decision to proceed to full-scale development was made in May 1986 and Developmental testing is being conducted at the Naval Air Test Center, Patuxent River, MD.

Since the Air Force is planning to use the aircraft in the special operations role, the Special Operations System Program Office (SOSPO) has the responsibility to fill the Air Force's seat at the Joint Reliability and Maintainability Review Board. One of the requirements in upholding this responsibility is to review the R & M test data. The Navy V-22 Program Office provided the SOSPO with computer tapes containing the test events as collected using the Navy's data collection system (the developing contractor is performing the data collection then providing it to the Navy). Once provided with these tapes, over 320 man hours was expended by the Air Force R & M Engineer and computer programmers adjusting data fields and translating terms and codes before the data could be entered into an Air Force computer for creating reports and reviewing the data (19).

Additionally, differences in failure definitions and maintenance actions prevented the R & M engineer from completing his review of the data with the confidence normally expected of T & E data. These problems in data definition, interpretation, and collection methods could mean that the Air Force will have to perform duplicative testing to gather information which could have been captured during the Navy's testing had the data systems of the two services been more compatible (19).

ATARS. The Advanced Tactical Air Reconnaissance System (ATARS) is a tactical imagery gathering aviation system being developed for multi-service use on manned and unmanned aerial vehicles. During its test and evaluation it will be flown on Air Force, Navy, and Marine aircraft and drones while test event and evaluation data is gathered using different R & M data collection systems.

The ATARS Chief of Test and Evaluation, Aeronautical Systems Division, Air Force Systems Command, is responsible for coordinating the multiservice test and evaluation effort. In accordance with The Memorandum of Agreement on Multiservice Operational Test and Evaluation (MOT&E) and Joint Test and Evaluation (JT&E), he is responsible, as the lead agency's test and evaluation coordinator, for the effort to "consolidate all of the inputs of the supporting agencies"

and to provide "all the information needed" to develop their own "independent evaluation report/final test report" (15:5,6).

The ATARS Chief of T & E has several concerns regarding the collection of R & M data by the different services while ATARS is being tested on the different aircraft. His first concern is that even after a year of meetings, phone calls, and conferences the agreement on which data elements and data items will be collected and used is a precarious at best. Currently, the data will be collected using 3-M forms and procedures while the ATARS is flown on Navy and Marine aircraft or using SEDS forms and procedures while the ATARS is flown on Air Force aircraft.

The ATARS program office will be responsible for publishing the overall test report using the 3-M data which has been translated (making several assumptions about translations and conditions) and merged with the SEDS data as collected by several different Air Force agencies and units.

His second concern is that since there is still some disagreement/compromise about the data elements and items to be collected, that some test events may have to be repeated to confidently answer all of the test issues. This redundant testing may cause additional costs to the ATARS program which could be avoided using a cohesive multi-service test data collection system.

Another concern was that the differences in data collection methodology and data elements and items meanings would cause differing interpretations by the different services on the ATARS' suitability and effectiveness. That is, that the performance of the ATARS would be at the same level for all types aircraft, yet the data collection and translation methodologies would introduce interpretation differences by the different users. These conflicting interpretations could create unnecessary turbulence amoung the ATARS joint program, evaluation, and review committees. (18).

III. Research Technique and Comparison Methodology

> There is great potential for misunderstanding the Multi-Service environment because common or nearly common terms do not always have the same meaning in the different services. For example, consider the (deceptively) simple word "initial". ... The Army describes IOC FDTE (Initial Operational Capability, Force Development Test and Evaluation) as a test activity which is conducted subsequent to a full production decision. The Navy and Air Force both describe Initial Operational Test and Evaluation (IOT&E) as a test activity conducted prior to a full major production decision (3:10-4).

Definition Documentation

This research began with a thorough search of DOD directives, instructions, specifications, and plans, individual service regulations and publications, and independent civilian organization (e.g. American Society for Quality Control) documentation on terms and definitions used to document reliability and maintainability studies. This search resulted in a library of documents whose purpose was to:

> ...be used as a common base for R & M definitions and to reduce the possibility of conflicts, duplications, and incorrect interpretations either expressed or implied elsewhere in documentation (7:iii).

Comparison Technique

The technique used to determine compatibility and the resulting proposed definitions and translations was a very subjective one relying on the author's sixteen years of military experience including more than three years as an Aviation Systems Test and Evaluation Project Officer and over six years in maintenance positions from crew-chief to maintenance officer in organizational and intermediate aviation units.

The data elements and data items were compared and classified as: Presently Compatible or Incompatible; Unique to one service or not collected by just one service.

Presently Compatible elements and items are those whose form and code are interchangeable between the services data bases without modification. An example would be the failure mode codes which are used by each service are 3 digit codes whose definitions are common between services. Incompatible elements and items are those whose form or code are not interchangeable. An example would be "When Discovered Codes" (currently each service uses peculiar codes to represent when system discrepancies are discovered). The author compared these codes and definitions to the previously stated references in search of a translating element or item which would present the least conflict to the current data base systems.

Incompatible elements and codes were categorized into two classes. Elements which are collected by two services, but, not the third will be listed (the Air Force and Army collect skill codes of the person performing work, the Navy does not). Unique codes would be those codes which would be unique to one service (for example codes pertaining to catapult launches for Navy Aircraft are unique).

Following the completion of the comparison, the translated elements and items were merged into a "Common Elements and Items Dictionary" which were distributed for comments to Test and Evaluation personnel from each service for comments. These comments are provided in Appendix D of this thesis.

Differences in the methodologies used by the services during data collection will be discussed in Section IV.

Description of the Air Force's System Effectiveness Data System (SEDS)

The description and purpose of SEDS as stated in Air Force Pamphlet 80-24 is as follows:

> SEDS is the Reliability and Maintainability (R&M) data acquisition, storage, retrieval, and analysis system used by Air Force Systems Command (AFSC) during the development, test, and evaluation of new systems. ... The objectives of SEDS are to provide a system that will:
>
> a. Facilitate monitoring early test data.
>
> b. Help identify unreliable or unmaintainable parts or components.
>
> c. Provide substaining information for discrepancy or unsatisfactory reports.
>
> d. Facilitate determination of contractor compliance with specifications.
>
> e. Provide a data base from which performance estimates for new equipment can be made.
>
> f. Facilitate estimates of logistics support requirements (12:17).

References. The SEDS data system is generally described in AFP 80-24. The specific instructions for use of the SEDS system are contained in AFSCP 66-5. Individual weapons system peculiar codes, as well as references for frequently used common codes, are contained in Technical Orders known as "dash o sixes" (-06 series TO's).

Forms. The data is collected in test programs through the use of two forms, one for operational data and one for maintenance data. Operational data is collected through the

use of the AFFTC Form 300, "Aircraft Debriefing Record" (Figures 2 & 3). Maintenance Data is collected through the use of the AFSC Form 258, "Maintenance Discrepancy/Production Control Credit Record" (Figures 4 & 5). Instructions for completing the AFSC 258 are contained in AFSCP 66-5 and are included here as Table 1 (13:3-5).

Data Elements. The AFFTC Form 300 is organized into four sections: Aircraft and Mission Identification, Subsystem Use and Reliability, Mission Objectives, and Subsystem Discrepancies. The Data Elements collected on the AFFTC Form 300 are shown in Table 2.

The AFSC Form 258 is organized into seven sections: Aircraft and Job Identification, Failed Item, Installed Item, Personnel and Task Identification and Timing, Technical Order Identification and Procedure Narrative, and Piece Parts Replaced during Repair. The Data Elements collected on the AFSC Form 258 are shown in Table 3.

Data Items. Most of the data items for the AFFTC Form 300 are not coded and are self explanatory. There are however, four data elements which use coded data items: Type Mission, Mission Effectiveness, Reliability Codes (system), and When Discovered (these When Discovered Codes are for the use of the pilot and are different from the When Discovered

Codes used on the AFSC Form 258). These codes are entered by the pilot and are printed on the AFFTC Form 300 and listed in this document in Appendix A.

Most of the data items for the AFSC Form 258 are not coded and are self explanatory. The data items can be classified into two categories; maintenance production control information and test event/R & M information. However, for this study, only those elements and codes which apply to test event/R & M data collection will be addressed. The following coded data items are explained and listed in Appendix A: When Discovered, Work Unit Codes, How Malfunction Codes, Delay Codes, Action Taken Codes, T.O. Sufficiency Codes, and Tools/AGE Codes.

AIRCRAFT DEBRIEFING RECORD

TYPE: F-15

CARD NO	1 AIRCRAFT TYPE	2 TO SERIAL NO.	3. MISSION NO.	4. DATE DAY	MONTH	YEAR	5 T.O. TIME HOURS	MIN	6 DURATION HOURS	MIN	7 TYPE MISSION	8 MAN EFFECT	9 LAND. TIME
10	F 1 5	A											

10. GEAR CYCLES	11 MAX MACH	12. MAX ALT	13. HIGH G	14. L-AB LITES	R-AB LITES	15 AB TIME LEFT	RIGHT	16 JFS ATT	SUPER TIME	17 RNDS COUNTED	RNDS CYCLED	RNDS FIRED
0 0	0	0	0 0									

11	18 PILOT	19.	20 L-ENG START TIME	L-ENG STOP TIME	R-ENG START TIME	R-ENG STOP TIME

CARD NO	BLOCK NO	REL CODE	SYSTEM NAME
20	21		AIRFRAME
	22		CREW STATION
	23		LANDING GEAR
	24		FLIGHT CONTROLS
	25		ENVIRONMENTAL CONTROL
	26		
	27		
	28		ELECTRICAL SYSTEM
	29		LIGHTING SYSTEM
	30		HYDRAULIC SYSTEM
	31		FUEL SYSTEM INTERNAL
	32		FUEL SYSTEM EXTERNAL
	33		OXYGEN SYSTEM
	34		MISC UTILITIES
	35		FLIGHT INSTRUMENTS
	36		
	37		AUX UHF REC
	38		AUTOMATIC FLIGHT CONTROL
	39		UHF COMMUNICATIONS
	40		IFF TRANSPONDER
	41		IFF INTERROGATOR, AAI
	42		IFF EVALUATOR , AAI
	43		TACAN
	44		UHF-ADF
	45		ILS
	46		INTEGRATED COM/NAV
	47		ATTITUDE DIRECTOR INDICATOR
	48		VERTICAL DISPLAY GROUP
	49		HEAD UP DISPLAY
	50		

CARD NO	BLOCK NO	REL CODE	SYSTEM NAME
20	51		AIR DATA SYSTEM
	52		HORIZONTAL SITUATION IND
	53		MALFUNCTION ANALYZER & RECORDER
	54		EXCEEDANCE COUNTER
	55		ATTITUDE HEADING REFERENCE
	56		RADAR SET
	57		
	58		CENTRAL COMPUTER COMPLEX
	59		LEAD COMPUTING GYRO
	60		INERTIAL NAVIGATION
	61		
	62		TAC-ELECTRONIC WARFARE SYSTEM
	63		RWR
	64		EWWS
	65		ARMAMENT/WEAPONS DELIVERY
	66		ARMAMENT CONTROL SET
	67		GUN SYSTEM
	68		
	69		JFS
	70		PROPULSION
	71		SECONDARY POWER
	72		
	73		BIT SYSTEM (TELE-PANEL)
	74		EMERGENCY SYSTEM
	75		
	76		
	77		INSTRUMENTATION
	78		AVIONICS STATUS PANEL
	79		
	80		

MISSION OBJECTIVES

30 THRU 39

SIGNATURE OF AIRCRAFT COMMANDER

SIGNATURE OF DEBRIEFER

CODE FOR BLOCKS AS INDICATED

BLOCK 7 (TYPE MISSION)

01 TRANSITION OR TRAINING
02 TEST SUPPORT
3 OTHER SUPPORT
04 SYSTEM TEST
05 PERFORMANCE TEST
06 STABILITY & CONTROL TEST
07 RELIABILITY DEMONSTRATION
08 FUNCTIONAL CHECK FLIGHT

BLOCK 8 (MISSION EFFECTIVENESS)

1. FLOWN AS BRIEFED
2. MISSION DEVIATION
3. AIR ABORT
4. GROUND ABORT
5. FLOWN AS BRIEFED & ADDITIONAL EVALUATION PERFORMED

NOTE: MISSIONS CHANGED FOR OTHER THAN MAINTENANCE ARE CODED 1

RELIABILITY CODES

1. OPERATED SATISFACTORY
2. DEGRADED OPERATION-NEW DISCREPANCY
3. FAILED BUT NO ABORT-NEW DISCREPANCY
4. FAILED CAUSING ABORT-NEW DISCREPANCY
5. USED BUT DEGRADED-UNCLEARED DISCREPANCY
6. USED BUT DEGRADED-ENGINEERING DEFICIENCY
7. UNUSEABLE-UNCLEARED DISCREPANCY
8 UNUSEABLE-ENGINEERING DEFICIENCY
BLANK - EQUIPMENT NOT USED

AFFTC FORM DEC 73 300 REPLACES AFFTC FORM 0-286, MAY 72, WHICH WILL BE USED

Fig. 2. AFFTC Form 300 (Front)

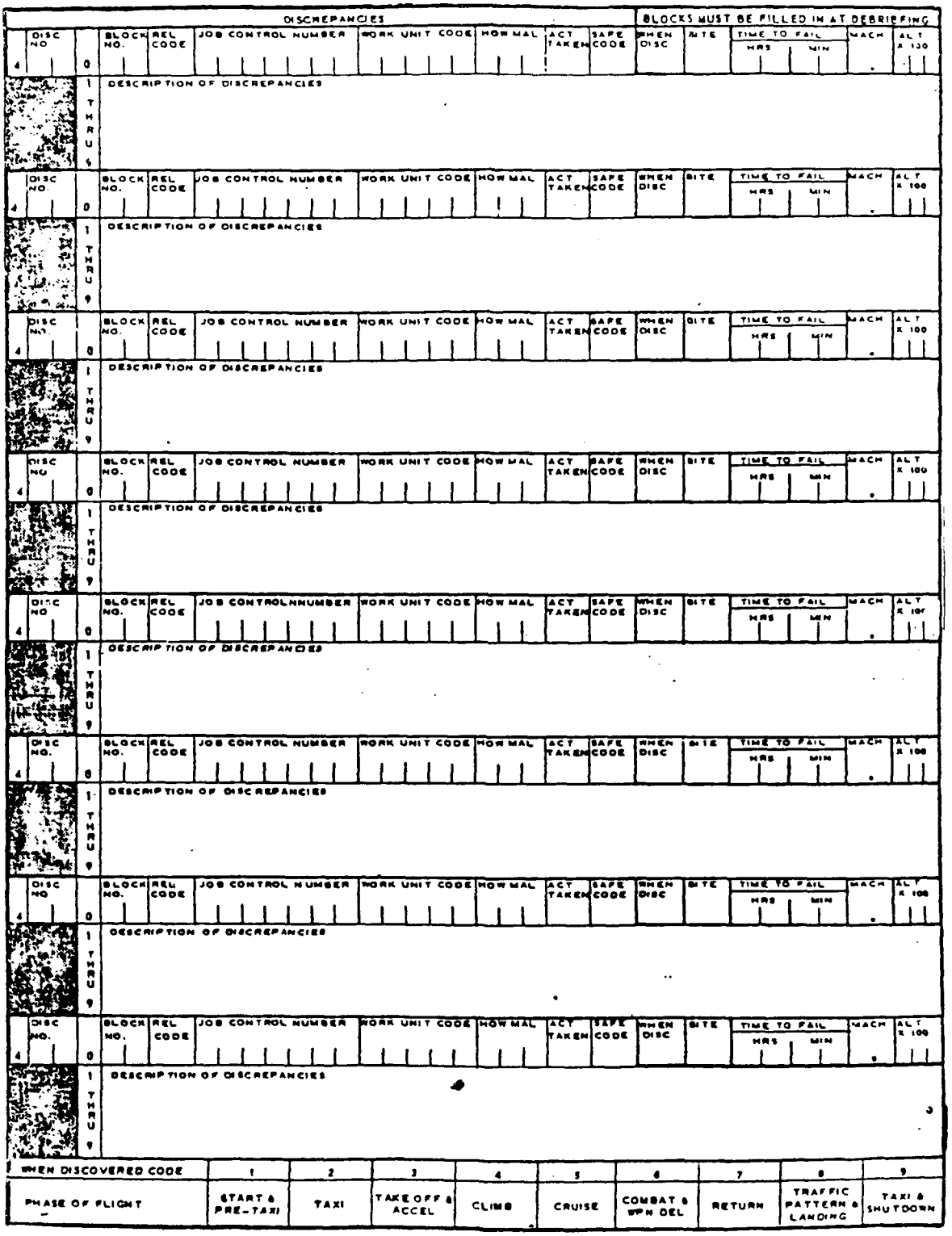


Fig. 3. AFFTC Form 300 (Back)

Table 1

Instructions for Preparing AFSC Forms 258/258-4

A	B
Block	Entry
A	The unique number for each maintenance task as assigned by job control.
B	Priority of work as set by job control.
C	Time that the specialists are required as directed by job control.
D	Location/parking area where work is to be done.
E	Estimated man-hours required to do each maintenance task.
F	No entry required. For optional use.
1	Preprinted on form.
2	Preprinted on form.
3	Work center code of the work center where the work is performed.
4	Mission, design, and series *(MDS)* assigned to equipment being worked on. Where items have not been assigned a MDS, use the applicable work unit code *(WUC)* of basic item. For a complete higher assembly use WUC, part number, or noun as designated by the host engineering section. NOTE: For engines enter type, model, series, and modification.
5	Complete serial number of weapons system, support equipment, engine, and so forth, on which work is being done.
6	Time to the nearest whole hour, cycles, or miles for equipment identified in blocks 4 and 5.
7	Numeric date and local time when problem was discovered. For TCTOs/TCDs enter date and time TCTO/TCD was received onbase; for example, 24/07/6/0600 for 24 Jul 76 at 6 AM. *(Leave blank for support general.)*
8	Date in numerics by day, month, and year in which the job is performed: for example, 24/07/6 for 24 Jul 76.
9	Work order number entry goes here. The work order number has eight positions. POSITION ONE - first digit of equipment being worked on, for example, *(A)* aircraft, *(G)* support equipment, or *(X)* engine. POSITION TWO - type maintenance being done. This code can be found in -06 WUC manual; for example, *(A)* service or *(B)* unscheduled. NOTE: For all R&D maintenance and T.O. verification without regard to type maintenance, this position will be "X." POSITION THREE THRU SIX - basic four digits of equipment ID number; for example, 0280 or 0117. POSITIONS SEVEN AND EIGHT - two digit equipment class which shows type equipment being worked on; for example, FG for F-15. This code can be found in T.O. 00-20-2. Example of a work order number: AX0282FG.
10	Leave blank.
11	Appropriate code from the -06 WUC manual to show when the defect or need for a maintenance action was found. *(Leave blank for support general and TCTOs.)*
12	Position number of engine on which work is required or is being performed. An entry is required in this item when work unit code entered in block 19 begins with 21, 22, or 23.
13	Activity identity code of activity being supported. These codes will be assigned at base level by production analysis section.
14	Five digit manufacturer's code assigned to item shown in block 19 *(WUC)*. *(Leave blank for support general.)*
15	Noun from the -06 WUC manual which shows the item on which maintenance is being done. This is a maximum of 15 characters in length and must agree with the work unit code entered in block 19 *(WUC)*. For engine work enter the engine type, model, series, and modification designation. *(Leave blank for support general.)*
16	Serial number of item shown in block 19 *(WUC)*. For those items where no serial number has been assigned, enter a dash. *(Leave blank for support general.)*

Table 1 (Cont)

Instructions for Preparing AFSC Forms 258/258-4

A	B
Block	Entry
17	Time to the nearest whole hour, cycles, miles, or landings for item identified in block 19 *(WUC)*. If no time record is available, enter a dash. *(Leave blank for support general.)*
18	Part number of item shown in block 19 *(WUC)*. "NSL" will not be entered in this block. *(Leave blank for support general.)*
19	Work unit code from the -06 WUC manual which identifies the item on which maintenance is required. *(Leave blank for support general.)*
20	Leave blank.
21	How malfunction code from the -06 WUC manual that best describes the nature of the problem of the item shown in block 19 *(WUC)*. *(Leave blank for support general.)*
22	Federal supply class of the item shown in block 19 *(WUC)*. *(Leave blank for support general.)*
23	Leave blank.
24	TCTO or TCD data code.
25	Five digit manufacturer's code assigned to item shown in block 19 *(WUC)*. *(Leave blank for support general.)*
26	Noun from the -06 manual which shows the item entered in block 19 *(WUC)*. For engine work enter the engine type, model, series, and modification designations. This noun is a maximum of 15 characters in length. *(Leave blank for support general.)*
27	Serial number of item shown in block 19 *(WUC)*. For those items where no serial number has been assigned, enter a dash. *(Leave blank for support general.)*
28	Time to the nearest whole hour, cycles, miles, or landings for item shown in block 19 *(WUC)*. If no time record is available, enter a dash. *(Leave blank for support general.)*
29	Part number of item shown in block 19 *(WUC)*. "NSL" will not be entered in this block. *(Leave blank for support general.)*
30	Full description of problem or work to be done. Remarks will be transcribed from applicable history records when available, including punctuation *(period, comma, dash, or slash, etc.)* where needed to improve readability. *(This narrative will be keypunched.)*
H	Signature and grade of individual who discovered the problem. Problems which are transferred from other records will show the signature and grade of individual who does the form.
31	Prefix - Category of Labor. *(See T.O. 00-20-2)* AFSC - Air Force Speciality Code *(AFSC)* for the person doing the maintenance. Suffix - Assigned to the AFSC of the person doing the maintenance. Nr - Number of personnel *(crew size)* doing the maintenance. NOTE: A separate line entry is required for each different category of labor, AFSC, or crew size.
32	Time when work actually starts *(to the nearest five minutes)* using local military time; for example, 1435 for 2:35 PM.
33	Time when work was completed or delayed *(to the nearest five minutes)*. Use local military time; for example, 1515 for 3:15 PM.
34	Code that best describes the primary reason for first delay encountered. Codes are located on back side of forms. These additional delay codes may be used: D - End of shift. B - Rest break/meals. Y - Research T.O.s.
35	Time when work was continued after a delay *(use military time)*.
36	Time when work was completed or again delayed *(use military time)*.
37	Code that best describes the primary reason for second encountered delay or work stoppage.
38	Support general work unit code that shows work being done *(leave blank for all other maintenance actions)*.

Table 1 (Cont)

Instructions for Preparing AFSC Forms 258/258-4

A	B
Block	Entry
39	Work center code for work center actually doing the work, if different from entry in block 3.
40	Number of times that action shown in block 41 or 38 was taken. When an action has not been completed, enter a zero.
41	Codes according to applicable T.O. 00-20 series and appropriate -06 WUC manual. *(Leave blank for support general and TCTOs.)*
42	Number of T.O. being used as a reference for doing the maintenance action. For TCTO/TCD enter the TCTO/TCD number. If T.O. is not available, leave blank and use applicable codes on back side of AFSC Forms 258/258-4 to complete blocks 44 and/or 45 as applicable.
43	Latest date of T.O. publication, either the basic publication date or change to basic date. For TCTO/TCD enter date of TCTO/TCD. Enter date by day, month, and year; for example, 02/08/4 for 2 Aug 74.
44	Applicable code from back side of form which best describes the effectiveness of the T.O. or TCTO/TCD being used.
45	Applicable code from the back side of AFSC Forms 258/258-4 which best describes the Tools/AGE effectiveness.
I	Signature and grade of person or senior member of work center who did or supervised repair work.
46	Full description of action taken *(column 41)* to item referred to in block 19 *(or column 38 for support general).* In addition, enter "Operational Checked OK" if applicable, as part of corrective action and page and paragraph of T.O. used. Include appropriate punctuation *(period, comma, slash, or dash, etc.)* to improve readability. *(This narrative will be keypunched.)*
J	Leave blank.
K	Signature of supervisor after review of form for completeness and accuracy of entries and to verify that all follow-up action has been recorded.
L	Checkmark appropriate box of this block. In addition, enter an appropriate code in the upper right hand corner of this block. Select the code from this list: Code — Equipment A — Aircraft B — Engine C — AGE F — Off Equipment *(shop work)* E — Commodity *(Serially numbered and controlled item or component in an off-equipment status)* G — Missile D — AN/Nomenclatured CEM H — Non AN/Nomenclatured CEM
M	Date transcribing actions were completed.
N	Signature of individual who completed transcribing action.
47	Part number of items replaced during bench check/repair, including such items as circuit boards, small subassemblies, bell cranks, hydraulic lines, sheet metal brackets, small access doors and covers. Recording of common hardware obtained from bulk stocks, such as nuts, bolts, screws, washers, safety wire, clamps, gaskets, seals, hose connections, and electrical wiring will not be required. Noun shown in applicable illustrated parts breakdown *(IPB)* or the -06 WUC manual. If the item is not identified in these manuals, enter noun which best identifies the part. This noun is a maximum of 15 characters in length. Work unit code - If a component that is replaced has an assigned work unit code, enter its work unit code. Otherwise, enter the next higher assembly work unit code from which the part was removed; for example, 73000 or 75000. Designated reference/circuit symbol or noun which best identifies the item. Type Failure - A check mark in the appropriate column to indicate whether the failure is primary or secondary. NOTE: Primary failure is defined as that piece part problem that was the direct cause of the assembly of component failure. Secondary failure is defined as a problem caused by the primary failure

Table 1 (Cont)

Instructions for Preparing AFSC Forms 258/258-4

A	B
Block	Entry
47 Cont'd	Quantity of like parts being replaced. How malfunctioned code from the -06 WUC manual which best describes the nature of the failure or problem of the component or part. Manufacturer's code of the installed part. *(See H4-1 IPB manuals.)* Federal supply class *(FSC)* of installed item. This code may be found in the H-2-3 supply handbook. If FSC code is not assigned, enter the FSC code for another item of the same kind.

TABLE 2

DATA ELEMENTS FROM AFFTC FORM 300

AIRCRAFT DEBRIEFING RECORD

Aircraft and Mission Identification Section

- Aircraft Type
- Aircraft Serial No.
- Mission No.
- Date
- Take-off Time
- Duration of Flight
- Type Mission
- Mission Effectiveness (successful completion ?)
- No. of Landings
- Test Peculiar Codes
- Pilot's Name

Subsystem Use and Reliability Section

- Reliability Code (from bottom of form)
- Subsystem Name (Weapons System Peculiar)

Mission Objective Section

- Mission Objective (narrative)

System Discrepancies Section

- Discrepancy Number (by flight)
- Subsystem Block No. (from front of form)
- Reliability Code (from front of form)
- Job Control No. (assigned by maintenance support)
- Work Unit Code (from -06 TO)
- How Malfunction Code (from -06 TO)
- Action Taken Code (from -06 TO)
- When Discovered (from bottom of form)
- BITE (Built In Test Equipment Code)
- Time to Fail (hours of operation on item until failure)
- Altitude
- Description of Discrepancy (narrative)

AFSC (PUB) K2

10	A JOB CONTROL NUMBER / B PRI	C TIME SPEC REQD	D WORK AREA	E ESTIMATED MANHOURS	F.	1. COP NR 0	2 REPORT NUMBER No 740192		
	3. BASIC WORK CENTER	4. ITEM IDENTIFICATION		5 SERIAL NUMBER	6. TIME/CYCLES MILES	7. WHEN DISCOVERED TIME (Day-Mo-Yr-Hours)			
	8. DATE THIS REPORT (Day-Mo-Yr)	9. WORK ORDER NUMBER		10. ORIG REPORT NUMBER	11. WHEN DISC CODE	12. EMD POSN NO	13. ACTIVITY IDENT		
20	FAILED ITEM								
	14. MANUFACTURER	15. NOUN - ENGINE TYPE MODEL/SERIES MOD		16. SERIAL NUMBER	17. TIME/CYCLES/MILES	18. PART NUMBER			
	19. WORK UNIT CODE	20. SYMBOL	21. HOW MAL	22. FEDERAL SUPPLY CLASS	23.	24.			
30	INSTALLED ITEM								
	25. MANUFACTURER	26. NOUN - ENGINE TYPE MODEL/SERIES MOD		27. SERIAL NUMBER	28. TIME/CYCLES/MILES	29. PART NUMBER			
40 THRU 49	6 SUPPLY DOCUMENT NUMBER (Issue or Demand)			30. DESCRIPTION OF DISCREPANCY OR MAINTENANCE REQUIRED					
					H. DISCOVERED BY				

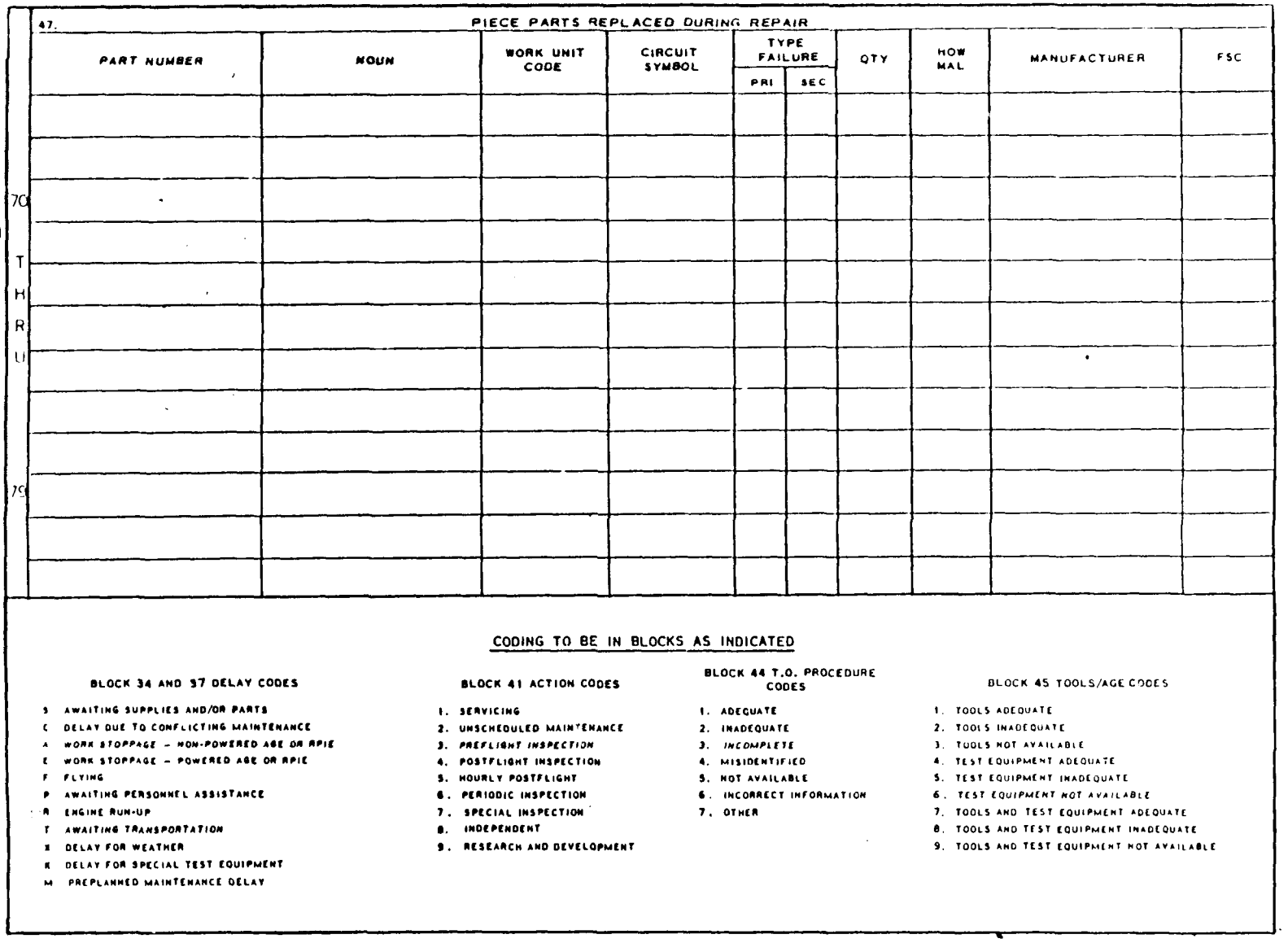
	31. PRE FIX	AFSC	SUF	NR	32. START	33. STOP	34. DELAY CODE	35. START	36. STOP	37. DELAY CODE	38. WORK UNIT CODE	39. ASSISTING WORK CENTER	40. UNITS	41. ACT
50														
51														
52														
53														
54														
55														
56														
57														
58														
59														

60	42. T.O. NUMBER	43. T.O DATE (Day-Mo-Yr)	44. T.O. PROCEDURE	45. TOOLS/AGE	I. CORRECTED BY
61 THRU 69	46. CORRECTIVE ACTION				J. INSPECTED BY

K SUPERVISOR	L. RECORDS ACTIONS ☐ UNCLEAR DISCREPANCY ☐ REPLACEMENT TIME CHANGE ☐ DATA TRANSCRIBED TO RECORDS	M. DATE TRANSCRIBED (Day-Mo-Yr)	N. TRANSCRIBED BY

AFSC FORM JUL 73 258 PREVIOUS EDITIONS WILL BE USED. MAINTENANCE DISCREPANCY/PRODUCTION CREDIT RECORD

Fig. 4. AFSC Form 258 (Front)



47. PIECE PARTS REPLACED DURING REPAIR

PART NUMBER	NOUN	WORK UNIT CODE	CIRCUIT SYMBOL	TYPE FAILURE		QTY	HOW MAL	MANUFACTURER	FSC
				PRI	SEC				

70 THRU 79

Fig. 5. AFSC Form 258 (Back)

CODING TO BE IN BLOCKS AS INDICATED

BLOCK 34 AND 37 DELAY CODES

- S AWAITING SUPPLIES AND/OR PARTS
- C DELAY DUE TO CONFLICTING MAINTENANCE
- A *WORK STOPPAGE – NON-POWERED AGE OR RPIE*
- E WORK STOPPAGE – POWERED AGE OR RPIE
- F FLYING
- P AWAITING PERSONNEL ASSISTANCE
- R ENGINE RUN-UP
- T *AWAITING TRANSPORTATION*
- X DELAY FOR WEATHER
- K DELAY FOR SPECIAL TEST EQUIPMENT
- M PREPLANNED MAINTENANCE DELAY

BLOCK 41 ACTION CODES

1. SERVICING
2. UNSCHEDULED MAINTENANCE
3. *PREFLIGHT INSPECTION*
4. POSTFLIGHT INSPECTION
5. HOURLY POSTFLIGHT
6. PERIODIC INSPECTION
7. SPECIAL INSPECTION
8. INDEPENDENT
9. RESEARCH AND DEVELOPMENT

BLOCK 44 T.O. PROCEDURE CODES

1. ADEQUATE
2. INADEQUATE
3. *INCOMPLETE*
4. MISIDENTIFIED
5. NOT AVAILABLE
6. INCORRECT INFORMATION
7. OTHER

BLOCK 45 TOOLS/AGE CODES

1. TOOLS ADEQUATE
2. TOOLS INADEQUATE
3. TOOLS NOT AVAILABLE
4. TEST EQUIPMENT ADEQUATE
5. TEST EQUIPMENT INADEQUATE
6. *TEST EQUIPMENT NOT AVAILABLE*
7. TOOLS AND TEST EQUIPMENT ADEQUATE
8. TOOLS AND TEST EQUIPMENT INADEQUATE
9. TOOLS AND TEST EQUIPMENT NOT AVAILABLE

TABLE 3

DATA ELEMENTS FROM AFSC FORM 258

MAINTENANCE DISCREPANCY/PRODUCTION CONTROL CREDIT RECORD

Aircraft and Job Identification Section

- Job Control No. (assigned by maintenance)
- Priority (assigned by maintenance)
- Time Specialist Required (as determined by maintenance)
- Work Area (location where work is to be performed)
- Estimated work hours
- Report No. (preprinted no. for form control)
- Basic Work Center (maintenance shop identification)
- Item Identification (aircraft/equipment type)
- Serial No.
- Time/Cycles/Miles
- When Discovered (date,time)
- Date of Report
- Work Order No. (8 digit no. which identifies: type equipment, type maintenance, equip ID No. and equipment type code)
- Original Report No. (used to tie subsequent reports)
- When Discovered Code (from -06 TO)
- Engine Position No.
- Activity Identification (unit ID of supported unit)

Failed Item Section

- Manufacturer
- Noun of Item
- Serial No.
- Time/Cycles/Miles
- Part No.
- Work Unit Code
- How Malfunction Code
- Federal Supply Class

Installed Item Section

- Manufacturer
- Noun of Item
- Serial No.
- Time/Cycles/Miles
- Part No.

TABLE 3 (cont)

DATA ELEMENTS FROM AFSC FORM 258 MAINTENANCE

DISCREPANCY/PRODUCTION CONTROL CREDIT RECORD

Requisition No. and Discrepancy Description Section

- Supply Requisition No.
- Discrepancy (narrative or maintenance required)

Personnel Identification and Task Timing Section

- Category of Labor (from T.O. 00-20-2)
- AFSC (skill identifier)
- Suffix (to skill identifier)
- No. of personnel performing on this line
- Task Start Time
- Task Stop Time
- Delay Codes (from bottom of form)
- Work Unit Code
- Work Center Code (if different than identified in Aircraft and Job Identification section)
- No. of Times task was repeated

Technical Order Identification Section

- Technical Order No. and Date
- T.O. Sufficiency Code (from back of form)
- Tools/Air Ground Equipment Sufficiency Code (from back of form)
- Corrective Action Narrative

Piece Parts Replaced During Repair Section (for off-aircraft repairs)

- Part No.
- Noun of Part
- Work Unit Code (of replaced item or next higher assembly)
- Circuit Symbol (from repair manual or drawings)
- Type of Failure (primary or secondary)
- Quantity
- How Malfunction Code
- Manufacturer
- Federal Supply Class

Description of the Army's Reliability, Availability, Maintainability, and Logistics (RAM/LOG) Data System

The Army RAM/LOG system is generally described in the COBRO Corporation RAM Data Collection Services Description Document as:

> ...a comprehensive data collection system intended to capture all aspects of Reliability, Availability, Maintainability, and Logistics data. There are two types of data collection methods available. They are Full RAM and Modified RAM Data Collection. Full RAM is the method best suited for new or modified systems. This type of data collection allows the capture of all essential data elements for complete analysis and reporting. ... Modified RAM Data Collection is a data collection system that captures only selected events, does not capture maintenance man hours and can be tailored to suit particular needs (2:2).

Unlike SEDS and 3-M MDS (which is described in the next section), data collected by the Army RAM/LOG system is usually (although not required to be), collected, proofed, computerized, and sorted by an independent contractor. This contractor (there are several available), specializes in data collection, automation, and analysis, and is independent of the material developer, the test agency, the user, and the weapon system contractor. Additionally, neither the forms used nor the data collected are used for maintenance production control purposes. Only data related to test and evaluation events (and entries required to relate the forms to their respective events) are recorded on the forms.

References. Specific instructions for the use of the RAM/LOG system are written specially for each test program following conferences with representatives from the offices of the: Weapon System Program Manager, User's Representative (TRADOC System Manager), and the Test Project Officer. These representatives determine the flight profiles, preplanned maintenance demonstrations, and other test events to be conducted, as well as the particular data elements which are required to insure the effective evaluation of the weapon system. Once the data elements are identified, the data contractor provides copies of the "Data Collectors Handbook" for approval by the Test Project Officer for the interested offices. Once approved, the handbook is issued to the data collectors (personnel hired by the data contractor or on some tests, military personnel detailed to be data collectors).

Forms. While the forms used to collect data for the RAM/LOG system are customized for each test project, they all start from the baseline form set known as the AMSAV-Q RAM/LOG Forms (AMSAV-Q 1249, 1250, 1250a, 1251, 1266, 862). These forms, their official names, their common used names (card number), and their figure number in this document are shown in Table 4.

TABLE 4

RAM/LOG FORMS TITLES/USAGE

FORM	CARD	TITLE/USAGE	FIG
1249	100	Flight Debriefing & Servicing	6
1250	200	Maint. Fault/Action Data	7
1250a	200c	Continuation for 1250	8
1251	300	Component/Parts Usage Data	9
1252	400	Utilization/Diag/Recorder Data	10
1266	500	Narrative	11
862	600	Aircraft Time Line	12

Data Elements. Tables 5 through 10 list the data elements by the forms on which they are collected.

Data Items. The RAM/LOG system relies heavily on the use of coded data items. Table 11 lists the forms by their card no. and the number of data elements collected (only the ones related to test and evaluation are counted, not those used for form control) and the number of coded data items used on those forms. Appendix B is a listing of typical codes used during a test and evaluation program.

FLIGHT DEBRIEFING & SERVICING

1. CARD NUMBER (1-3)	2. CONTROL NUMBER (4-14)	3. FLOW NUMBER (15-25)	4. LOCATION (26-27)	5. CONFIGURATION (28-32)				
				ACFT	UTIL	WPN	AVIONICS	VISIONICS
100								

6. PROFILE NUMBER (33-35)	7. HOURS SCHEDULED (36-38)	8. CREW		
		a. PILOT	d. CREW	g. (a & b)
		b. COPILOT	e. PASSENGER	h. (a, b, & c)
		c. CREW CHIEF	f. OTHER	i. ALL

9. CLIMATIC CONDITIONS (39-40)	10. PRESSURE ALTITUDE (41-44)	11. TEMP °C (45-47)	12. TAKE-OFF TIME (48-51)	13. STARTS				14. LANDINGS (62-63)	15. HOURS FLOWN (64-66)
				ENGINE GROUND		AIR			
				#1 (52)	#3 (54)	#1 (57)	#3 (59)		
				#2 (53)	#4 (55)	#2 (58)	#4 (60)		
		+ −			APU (56)		APU (61)		

16. HOURS RUN-UP (67-68)	17. TURN AROUND TIME		18. FLIGHT RESULT (77)	19. PROFILE RESULT (78)	20. MISSION DECISION (79-80)		21. DEBRIEFER & DATE
	START (69-72)	STOP (73-76)			BOARD	DT/OT	

22. CARD NUMBER (1-14)	23. CREW	PILOT (15-17)	COPILOT (18-20)	CREW CHIEF (21-23)	CREW (24-26)	PASS (27-29)	PASS (30-32)	PASS (33-35)	PASS (36-38)	PASS (39-41)	PASS (42-44)	
101												

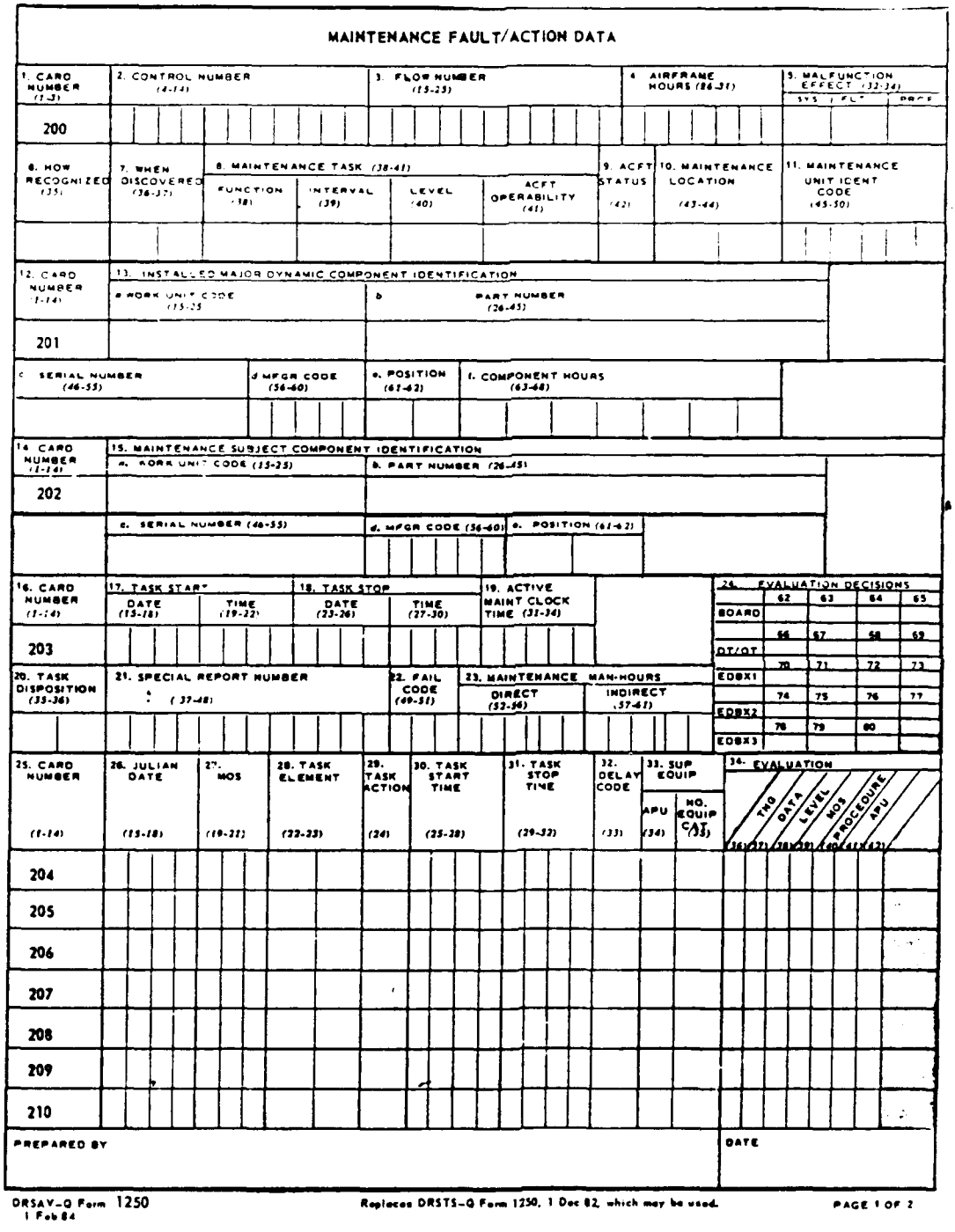
24. CARD NUMBER (1-14)	25. SCORING QUESTIONS											
	#1 (15)	#2 (16)	#3 (17)	#4 (18)	#5 (19)	#6 (20)	#7 (21)	#8 (22)	#9 (23)	#10 (24)		
102												
	#11 (25)	#12 (26)	#13 (27)	#14 (28)	#15 (29)	#16 (30)	#17 (31)	#18 (32)	#19 (33)	#20 (34)		

26. CARD NUMBER (1-14)	27. ACTION (15)	28. ITEM (16)	29. TYPE (17-18)	30. QUANTITY (19-22)	31. UNITS (23)	32. SYSTEM (24-25)	33. HOW DONE (26)	34. NO. PERSONS (27)	35. SERVICE TIME	
									START (28-31)	STOP (32-35)
103										
104										
105										
106										
107										
108										
109										
110										

DRSTS-Q Form 1249
1 Apr 78

Replaces DRSAV-L Form 1249, 1 Mar 76, which may be used.

Fig. 6. AMSAV-Q Form 1249 (100) Card



MAINTENANCE FAULT/ACTION DATA

1. CARD NUMBER (1-3)	2. CONTROL NUMBER (4-14)	3. FLOW NUMBER (15-25)	4. AIRFRAME HOURS (26-31)	5. MALFUNCTION EFFECT (32-34) SYS / FLT / PROF
200				

6. HOW RECOGNIZED (35)	7. WHEN DISCOVERED (36-37)	8. MAINTENANCE TASK (38-41) FUNCTION (38)	INTERVAL (39)	LEVEL (40)	ACFT OPERABILITY (41)	9. ACFT STATUS (42)	10. MAINTENANCE LOCATION (43-44)	11. MAINTENANCE UNIT IDENT CODE (45-50)

12. CARD NUMBER (1-14)	13. INSTALLED MAJOR DYNAMIC COMPONENT IDENTIFICATION a. WORK UNIT CODE (15-25)	b. PART NUMBER (26-45)
201		

c. SERIAL NUMBER (46-55)	d. MFGR CODE (56-60)	e. POSITION (61-62)	f. COMPONENT HOURS (63-68)

14. CARD NUMBER (1-14)	15. MAINTENANCE SUBJECT COMPONENT IDENTIFICATION a. WORK UNIT CODE (15-25)	b. PART NUMBER (26-45)
202		

c. SERIAL NUMBER (46-55)	d. MFGR CODE (56-60)	e. POSITION (61-62)

16. CARD NUMBER (1-14)	17. TASK START DATE (15-18)	TIME (19-22)	18. TASK STOP DATE (23-26)	TIME (27-30)	19. ACTIVE MAINT CLOCK TIME (31-34)
203					

20. TASK DISPOSITION (35-36)	21. SPECIAL REPORT NUMBER (37-48)	22. FAIL CODE (49-51)	23. MAINTENANCE MAN-HOURS DIRECT (52-56)	INDIRECT (57-61)

24. EVALUATION DECISIONS

	62	63	64	65
BOARD				
	66	67	68	69
OT/OT				
	70	71	72	73
EOSX1				
	74	75	76	77
EOSX2				
	78	79	80	
EOSX3				

25. CARD NUMBER (1-14)	26. JULIAN DATE (15-18)	27. MOS (19-21)	28. TASK ELEMENT (22-23)	29. TASK ACTION (24)	30. TASK START TIME (25-28)	31. TASK STOP TIME (29-32)	32. DELAY CODE (33)	33. SUP EQUIP APU (34)	NO. EQUIP (35)	34. EVALUATION TMD (36)	DATA (37)	LEVEL (38)	MOS (39)	PROCEDURE (40)	APU (41) (42)
204															
205															
206															
207															
208															
209															
210															

PREPARED BY

DATE

DRSAV-Q Form 1250
1 Feb 84

Replaces DRSTS-Q Form 1250, 1 Dec 82, which may be used.

PAGE 1 OF 2

Fig. 7. AMSAV-Q Form 1250 (200) Card

MAINTENANCE FAULT/ACTION DATA (CONTINUATION)

CONTROL NUMBER (1-16)																

25. CARD NUMBER (1-14)	26. JULIAN DATE (15-18)	27 MCS (19-21)	28. TASK ELEMENT (22-23)	29. TASK ACTION (24)	30. TASK START TIME (25-28)	31. TASK STOP TIME (29-32)	32 DELAY CODE (33)	33 SUP EQUIP APU (34)	33 SUP EQUIP NO EQUIP CAT (35)	34. EVALUATION TNG (36)	DATA (37)	LEVEL (38)	MOS (39)	PROCEDURE (40)	APU (41)	(42)
2																
2																
2																
2																
2																
2																
2																
2																
2																
2																

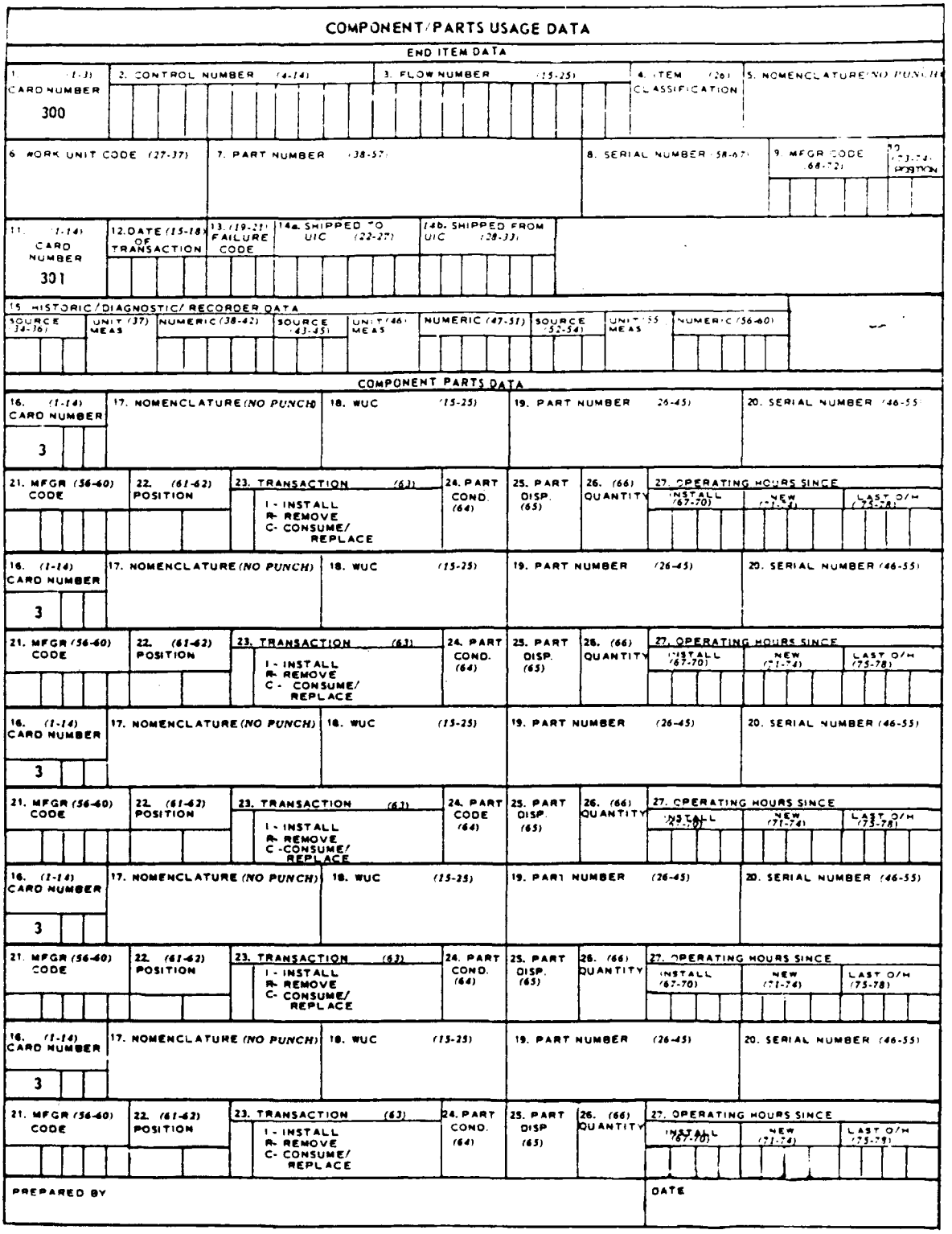
GSE/TMDE IDENTIFICATION

1. CARD NUMBER (1-16)	2. EQUIPMENT CATEGORY (43)	3. NOMENCLATURE (44-58)	4. PART NUMBER (59-78)	5. EVAL (79)
2				
2				
2				
2				
2				
2				
2				
2				
2				
2				

PREPARED BY	DATE

AMSAV-Q Form 1250a

Fig. 8. AMSAV-Q Form 1250a (200 Continuation)



COMPONENT/PARTS USAGE DATA

END ITEM DATA

1. (1-3) CARD NUMBER	2. CONTROL NUMBER (4-14)	3. FLOW NUMBER (15-25)	4. ITEM (26) CLASSIFICATION	5. NOMENCLATURE (NO PUNCH)
300				

6. WORK UNIT CODE (27-37)	7. PART NUMBER (38-57)	8. SERIAL NUMBER (58-67)	9. MFGR CODE (68-72)	10. (73-74) POSITION

11. (1-14) CARD NUMBER	12. DATE (15-18) OF TRANSACTION	13. (19-21) FAILURE CODE	14a. SHIPPED TO UIC (22-27)	14b. SHIPPED FROM UIC (28-33)
301				

15. HISTORIC/DIAGNOSTIC/RECORDER DATA

SOURCE (34-36)	UNIT (37) MEAS	NUMERIC (38-42)	SOURCE (43-45)	UNIT (46) MEAS	NUMERIC (47-51)	SOURCE (52-54)	UNIT (55) MEAS	NUMERIC (56-60)

COMPONENT PARTS DATA

16. (1-14) CARD NUMBER	17. NOMENCLATURE (NO PUNCH)	18. WUC (15-25)	19. PART NUMBER (26-45)	20. SERIAL NUMBER (46-55)
3				

21. MFGR (56-60) CODE	22. (61-62) POSITION	23. TRANSACTION (63) I - INSTALL R- REMOVE C- CONSUME/ REPLACE	24. PART COND. (64)	25. PART DISP. (65)	26. (66) QUANTITY	27. OPERATING HOURS SINCE: INSTALL (67-70)	NEW (71-74)	LAST O/H (75-78)

16. (1-14) CARD NUMBER	17. NOMENCLATURE (NO PUNCH)	18. WUC (15-25)	19. PART NUMBER (26-45)	20. SERIAL NUMBER (46-55)
3				

21. MFGR (56-60) CODE	22. (61-62) POSITION	23. TRANSACTION (63) I - INSTALL R- REMOVE C - CONSUME/ REPLACE	24. PART COND. (64)	25. PART DISP. (65)	26. (66) QUANTITY	27. OPERATING HOURS SINCE: INSTALL (67-70)	NEW (71-74)	LAST O/H (75-78)

16. (1-14) CARD NUMBER	17. NOMENCLATURE (NO PUNCH)	18. WUC (15-25)	19. PART NUMBER (26-45)	20. SERIAL NUMBER (46-55)
3				

21. MFGR (56-60) CODE	22. (61-62) POSITION	23. TRANSACTION (63) I - INSTALL R- REMOVE C -CONSUME/ REPLACE	24. PART CODE (64)	25. PART DISP. (65)	26. (66) QUANTITY	27. OPERATING HOURS SINCE: INSTALL (67-70)	NEW (71-74)	LAST O/H (75-78)

16. (1-14) CARD NUMBER	17. NOMENCLATURE (NO PUNCH)	18. WUC (15-25)	19. PART NUMBER (26-45)	20. SERIAL NUMBER (46-55)
3				

21. MFGR (56-60) CODE	22. (61-62) POSITION	23. TRANSACTION (63) I - INSTALL R- REMOVE C- CONSUME/ REPLACE	24. PART COND. (64)	25. PART DISP. (65)	26. (66) QUANTITY	27. OPERATING HOURS SINCE: INSTALL (67-70)	NEW (71-74)	LAST O/H (75-78)

16. (1-14) CARD NUMBER	17. NOMENCLATURE (NO PUNCH)	18. WUC (15-25)	19. PART NUMBER (26-45)	20. SERIAL NUMBER (46-55)
3				

21. MFGR (56-60) CODE	22. (61-62) POSITION	23. TRANSACTION (63) I - INSTALL R- REMOVE C- CONSUME/ REPLACE	24. PART COND. (64)	25. PART DISP (65)	26. (66) QUANTITY	27. OPERATING HOURS SINCE: INSTALL (67-70)	NEW (71-74)	LAST O/H (75-79)

PREPARED BY	DATE

AMSAV-Q Form 1251
1 Sep 84

Replaces DRSAV-Q Form 1251, 1 Feb 84, which may be used.

Fig. 9. AMSAV-Q Form 1251 (300 Card)

UTILIZATION/DIAGNOSTIC/RECORDER DATA

GENERAL DATA

1. CARD (1-3) NUMBER	2. CONTROL NUMBER (4-14)	3. FLOW NUMBER (15-25)	4. TIME OF DAY (26-29)	5. [illegible] (30-35)	6. [illegible]	7. AIRFRAME HOURS (35-39)
400						

SPECIFIC SYSTEM COMPONENT DATA

8. CARD (1-14) NUMBER	9. NOMENCLATURE (NO PUNCH)	10. WORK UNIT CODE (15-19)	11. PART NUMBER (20-39)	12. SERIAL NUMBER (40-49)
401				

13. MFGR CODE (50-54)	14. POSITION (55-56)	15. COMPONENT CUM HOURS (57-60)	16. DATA SOURCE (61-62)	17. UNIT OF MEASURE (63)	18. READOUT/INDICATION (64-79)

8. CARD (1-14) NUMBER	9. NOMENCLATURE (NO PUNCH)	10. WORK UNIT CODE (15-19)	11. PART NUMBER (20-39)	12. SERIAL NUMBER (40-49)
4				

13. MFGR CODE (50-54)	14. POSITION (55-56)	15. COMPONENT CUM HOURS (57-60)	16. DATA SOURCE (61-62)	17. UNIT OF MEASURE (63)	18. READOUT/INDICATION (64-79)

8. CARD (1-14) NUMBER	9. NOMENCLATURE (NO PUNCH)	10. WORK UNIT CODE (15-19)	11. PART NUMBER (20-39)	12. SERIAL NUMBER (40-49)
4				

13. MFGR CODE (50-54)	14. POSITION (55-56)	15. COMPONENT CUM HOURS (57-60)	16. DATA SOURCE (61-62)	17. UNIT OF MEASURE (63)	18. READOUT/INDICATION (64-79)

8. CARD (1-14) NUMBER	9. NOMENCLATURE (NO PUNCH)	10. WORK UNIT CODE (15-19)	11. PART NUMBER (20-39)	12. SERIAL NUMBER (40-49)
4				

13. MFGR CODE (50-54)	14. POSITION (55-56)	15. COMPONENT CUM HOURS (57-60)	16. DATA SOURCE (61-62)	17. UNIT OF MEASURE (63)	18. READOUT/INDICATION (64-79)

8. CARD (1-14) NUMBER	9. NOMENCLATURE (NO PUNCH)	10. WORK UNIT CODE (15-19)	11. PART NUMBER (20-39)	12. SERIAL NUMBER (40-49)
4				

13. MFGR CODE (50-54)	14. POSITION (55-56)	15. COMPONENT CUM HOURS (57-60)	16. DATA SOURCE (61-62)	17. UNIT OF MEASURE (63)	18. READOUT/INDICATION (64-79)

8. CARD (1-14) NUMBER	9. NOMENCLATURE (NO PUNCH)	10. WORK UNIT CODE (15-19)	11. PART NUMBER (20-39)	12. SERIAL NUMBER (40-49)
4				

13. MFGR CODE (50-54)	14. POSITION (55-56)	15. COMPONENT CUM HOURS (57-60)	16. DATA SOURCE (61-62)	17. UNIT OF MEASURE (63)	18. READOUT/INDICATION (64-79)

PREPARED BY	DATE

AMSAV-Q Form 1252
1 Sep 84

Replaces DRSAV-Q Form 1252, 1 Feb 84, Which may be used.

Fig. 10. AMSAV-Q Form 1252 (400 Card)

NARRATIVE

1. CARD NUMBER (1-3)	2. CONTROL NUMBER (4-14)	3. RELATED FORM IDENTIFICATION (15)	4. FLOW NUMBER (16-26)
500		(1, 2, 3 or 4)	

5. TECHNICAL DATA NOTES

PREPARED BY	DATE

AMSAV-Q Form 1266
1 Sep 84

Replaces DRSAV-Q Form 1266, 1 Feb 84, which may be used.

Fig. 11. AMSAV-Q Form 1266 (500 Card)

AIRCRAFT TIME LINE

GENERAL DATA

1. CARD NUMBER	2. CONTROL NUMBER	3. LOCATION (13–16)	4. ACFT SERIAL NUMBER (17–23)	5. AIRFRAME HOURS (24–29)
	9 9 9 2			

6. CARD NUMBER (1–14)	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL NUMBER (25–35)	12. EVAL (36)
6						
6. CARD NUMBER (1–14)	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL NUMBER (25–35)	12. EVAL (36)
6						
6. CARD NUMBER (1–14)	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL NUMBER (25–35)	12. EVAL (36)
6						
5. CARD NUMBER (1–14)	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL NUMBER (25–35)	12. EVAL (36)
6						
6. CARD NUMBER (1–14)	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL NUMBER (25–35)	12. EVAL (36)
6						
6. CARD NUMBER (1–14)	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL NUMBER (25–35)	12. EVAL (36)
6						
6. CARD NUMBER (1–14)	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL CODE (25–35)	12. EVAL (36)
6						
6. CARD NUMBER (1–14)	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL CODE (25–35)	12. EVAL (36)
6						
6. CARD NUMBER (1–14)	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL NUMBER (25–35)	12. EVAL (36)
6						
6. CARD NUMBER (1–14)	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL NUMBER (25–35)	12. EVAL (36)
6						
6. CARD NUMBER	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL NUMBER (25–35)	12. EVAL (36)
6						
6. CARD NUMBER (1–14)	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL NUMBER (25–35)	12. EVAL (5)
6						
6. CARD NUMBER (1–14)	7. START TIME (15–18)	8. STOP TIME (19–22)	9. ACFT STATUS (23)	10. READINESS CODE (24)	11. REFERENCE CONTROL NUMBER (25–35)	12. EVAL (36)
6						

PREPARED BY

AMSAV-Q Form 862
1 Jan 86

Edition of 1 Sep 84 may be used.

Fig. 12. AMSAV-Q Form 862 (600 Card)

TABLE 5

DATA ELEMENTS FROM AMSAV-Q FORM 1249

FLIGHT DEBRIEFING & SERVICING (100 CARD)

Control No. (10 digit code identifying: date, aircraft no., level of maintenance, event sequence, and if the event is mission related or not)
Flow No. (used for subsequent (subset) events, to tie forms and data back to original event)
Location
Aircraft Configuration (system installation configuration)
- Aircraft (overall configuration, armed, medevac, etc)
- Utility (hoist, cargo system, etc)
- Weapon Systems
- Avionics Systems
- Visionics

Profile No. (profiles identify specific flight events (typically mission oriented) to be accomplished by the pilot)
Hours Scheduled (usually expected duration of profile)
Crew (using Personnel Identification Codes)
- Pilot, Copilot, Crewchief, Passengers, Others

Climatic Conditions (general conditions on departure)
Pressure Altitude (at departure)
Temperature (at departure)
Take-off Time
No. of engine starts (ground or air starts)
No. Landings
Hours Flown
Hours Run-up
Turn-around time (time for refuel, rearm, retrofit, etc)
Flight Result (successfulness of flight)
Profile Result (successfulness of meeting profile objectives)
Mission Decision (before and after scoring conference)
Test Peculiar Questions Results

FOR SERVICING ONLY
Type of Service
Item Consumed by type (hyd fluid, fuel, oxygen, etc)
Type (particular type of oil, fluid, etc)
Quantity (amount added/removed)
Unit (unit of measure)
System (system being serviced: engine, APU, hyd, etc)
How Done (manual, ground support equipment, etc)
No. Persons
Service Time (start & stop)

TABLE 6

DATA ELEMENTS FROM AMSAV-Q FORM 1250

MAINTENANCE FAULT/ACTION DATA (200 CARD)

Control No. (see Table 5)
Flow No. (see Table 5)
Airframe Hours
Malfunction Effect (codes describing impact of malfunction):
- System effectiveness
- Flight accomplishment
- Profile success

How Recognized (code describing how fault was detected)
When Discovered
Maintenance Task:
- Function (Action Taken Codes: test, inspect, etc)
- Interval (unscheduled, scheduled, and frequency)
- Level (level of maintenance: organizational, support, depot)

Aircraft Operability (effect of task on use of aircraft)
Aircraft Status (as entered in logbook by maintenance)
Maintenance Location
Maintenance Unit Identification Code
Major Component Identification (next higher assy)
- Work Unit Code, Part No., Serial No., Manufacturer, Position, Component Hours

Maintenance Subject Identification
- Work Unit Code, Part No., Serial No. Manufacturer, Position

Task Start Time (date and hours)
Task Stop Time (date and hours)
Active Clock Maintenance (elapsed time of maintenance event)
Special Report No. (if external report or analysis required)
Fail Code (Failure Mode Code)
Maintenance Man Hours
- Direct
- Indirect

Task Accomplishment Description Items:
- Julian Date
- MOS (skill identifier)
- Task Element (used to identify direct/indirect event)
- Task Action (Action Taken Codes)
- Delay Codes
- Support Equipment Required to accomplish task
- APU (on aircraft APU, if use is required for task)
- Equipment Category (other type ground support equipment required to accomplish task)

Evaluation Decisions (for use during scoring conferences)

TABLE 7

DATA ELEMENTS FROM AMSAV-Q FORM 1251

COMPONENT/PARTS USAGE DATA (300 CARD)

End Item Data:

Control No. (see Table 5)
Flow No. (see Table 5)
Item Classification (Major Assy: engine, transmission, etc)
Nomenclature
Work Unit Code
Part No.
Serial No.
Manufacturer
Position
Date of Transaction (supply action)
Failure Code (Failure Mode Code)
Shipped to: Unit Identification Code
Shipped from: Unit Identification Code
Historic/Diagnostic/Recorder Data
    Source (code for source: BITE, recorder, etc)
    Unit of Measure
    Numeric (code as given by indicating device)

Component Data

Nomenclature
Work Unit Code
Part No.
Serial No.
Manufacturer
Position
Transaction (install, remove, consume, etc)
Part condition code (serviceable, unserviceable, etc)
Part Disposition (disposed, reworked, sent to depot , etc)
Quantity
Operating Hours Since:
    Installation
    New
    Last Overhaul

TABLE 8

DATA ELEMENTS FROM AMSAV-Q FORM 1252

UTILIZATION/DIAGNOSTIC/RECORDER DATA (400 CARD)

General Data

Control No. (see Table 5)
Flow No. (see Table 5)
Time of Day
Profile of Last Flight
Location
Airframe Hours

Specific System/Component Data

Nomenclature
Work Unit Code
Part No.
Serial No.
Manufacturer
Position
Component Hours
Data Source
Unit of Measure
Readout/Indication

TABLE 9

DATA ELEMENTS FROM AMSAV-Q FORM 1266

NARRATIVE DATA (500 CARD)

Control No. (see Table 5)
Flow No. (see Table 5)
Related Form ID (Card No. related to this narrative)
Narrative (remarks concerning event requiring this form)
Technical Data Notes (Narrative for Technical Data and references used in support event Narrative)

This form is a free-form "Remarks" form used when needed to explain anomalies in events or in data collection procedures.

TABLE 10

DATA ELEMENTS FROM AMSAV-Q FORM 862

AIRCRAFT TIME LINE (600 CARD)

General Data

Control No. (see Table 5)
Location
Aircraft Serial No.
Airframe Hours

Aircraft Status

Start Time (for this status symbol)
Stop Time (for this symbol)
Status Symbol (per aircraft logbook)
Readiness Code (Not Mission Capable; Supply, Maintenance)
Reference Control No. (Control No. of 200 Card associated with status change)
Evaluation (used for scoring conferences)

TABLE 11

NUMBER OF CODED DATA ITEMS BY CARD

CARD	NO. DATA ELEMENTS	NO. DATA ELEMENTS USING CODED DATA ITEMS
100	34	14
200	41	18
300	22	6
400	14	5
500	1	0
600	6	2

Description of the Navy's Maintenance and Material Management (3-M), Maintenance Data System (MDS)

The Navy Maintenance and Material Management (3-M) system is generally described in NAVINST 4790.2E, The Naval Aviation Maintenance Program, Volume 5, Maintenance Data System, Chapter 2, Introduction. The Maintenance Data System (MDS) portion of 3-M was designed to:

> ...provide statistical data for use at all management levels relative to:
> a. Equipment maintainability and Reliability.
> b. Equipment configuration, including alteration and Technical Directive (TD) status.
> c. Equipment mission capability and utilization.
> d. Material usage.
> e. Material nonavailability.
> f. Maintenance and material processing times.
> g. Weapon system and maintenance material costing (14:2-1)

In contrast to SEDS and RAM/LOG, 3-M MDS was not specifically designed for test and evaluation. The MDS is used at the Naval Air Test Center as well as in Operational Aviation Maintenance Units in the Fleets. While this one data system for all units makes the Navy's data homogeneous through out the Navy, it also creates a data system which is cumbersome for test and evaluation purposes (compared to SEDS and RAM/LOG). 3-M has many coded data items which have no applicability to weapon system evaluation. Additionally the VIDS/MAFs (Visual Information Display System/Maintenance Action Form) primary purpose is maintenance production

control and many of the data elements are not applicable to R & M test and evaluation.

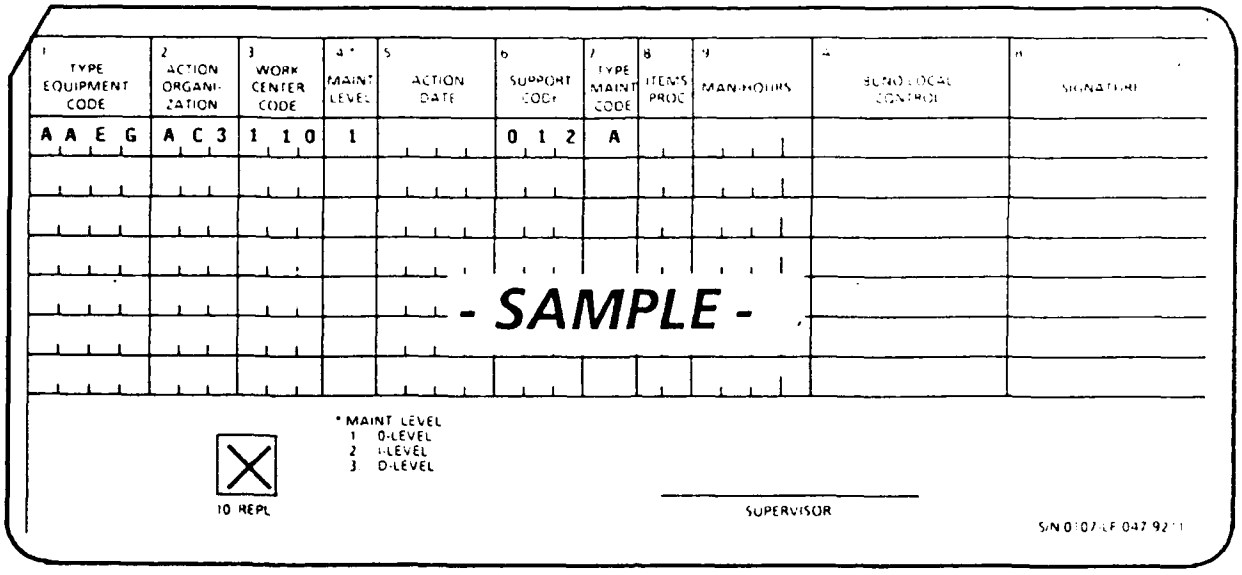
References. The MDS system in 3-M is generally described and specifically instructed in the 10 chapters and 20 appendices of OPNAVINST 4790.2E. The appendices list all of the non-weapon specific codes which are used on the data collection forms. Weapon specific codes, as well as references to many frequently used common codes, are published in Work Unit Code Manuals for each weapon system.

Forms. The MDS system uses three forms for its Reliability, Availability, and Maintainability data collection. They are the:

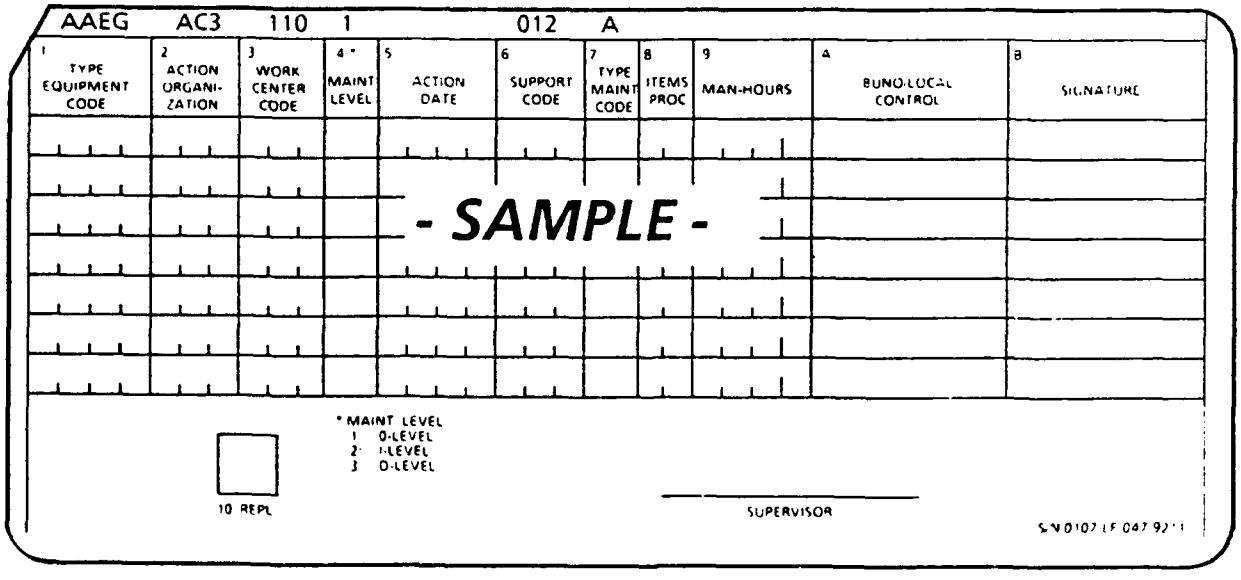
1. OPNAV Form 4790/42, Support Action Form (SAF), used to record functions other than corrective maintenance (figure 13).

2. OPNAV Form 4790/60, Visual Information Display System/Maintenance Action Form (VIDS/MAF), used for production control and maintenance event information data collection (figure 14).

3. OPNAV Form 3710/4, Navy Flight Record Form (NAVFLIR), used to collect operational/utilization data, (figure 15).



SAF (OPNAV 4790/42) Replenishment Card



Prepunched/Preprinted Card

Fig. 13. OPNAV Form 4790/42

No. EGY1523

COPY 1

WORK CENTER REGISTER, CONTROL AND PROCESSING COPY

VIDS/MAF OPNAV 4790/60 (REV 5-68) S/N 0107-LF-002-5800

5 PART FORM

USE BALL-POINT PEN PRESS HARD

ENTRIES REQUIRED SIGNATURE

NONE LOGS REC ☐ ☐ ☐

LOCAL USE

ACCUMULATED WORK HOURS

NAME/SHIFT | TOOL BOX | DATE | MAN HOURS | ELAPSED M/T

ACCUMULATED AWM HOURS

DATE | TIME | REASON | HOURS

REFERENCE

79 INDEX	08 F/P	09 AWP	10 A/T	11 MAL	14 MFGR	(H-Z) FAILED/REQUIRED MATERIAL 19 PART NUMBER	34 REF SYMBOL	41 QTY	PROJ	43 PRI	46 DATE ORD	48 REQ NO	53 DATE REC
	☐	☐											
	☐	☐											
	☐	☐											
	☐	☐											
	☐	☐											
	☐	☐											
	☐	☐											

FOLD

TECHNICAL DIRECTIVE IDENTIFICATION

REPAIR CYCLE

	DATE	TIME	EOC
RECEIVED	B08	B12	B16
IN WORK	B19	B23	B27
COMPLETED	B30	B34	

AWAITING MAINTENANCE

B38 B39 HOURS | B43 B44 HOURS | B48 B49 HOURS

MAINTENANCE/SUPPLY RECORD

JOB STATUS	DATE	TIME	EOC
B53	B54	B58	B62
B65	B66	B70	B74
C08	C09	C13	C17
C20	C21	C25	C29
C32	C33	C37	C41
C44	C45	C49	C53
C56	C57	C61	C65
D08	D09	D13	D17

JOB CONTROL NUMBER

REMOVED/OLD ITEM

G08 MFGR | G13 SERIAL NUMBER

G23 PART NUMBER | G36 DATE REMOVED

G42 TIME/CYCLES | G47 TIME/CYCLES | G52 TIME/CYCLES

INSTALLED/NEW ITEM

G08 MFGR | G13 SERIAL NUMBER

G23 PART NUMBER

G38 TIME/CYCLES | G43 TIME/CYCLES | G48 TIME/CYCLES

DISCREPANCY

PILOT/INITIATOR

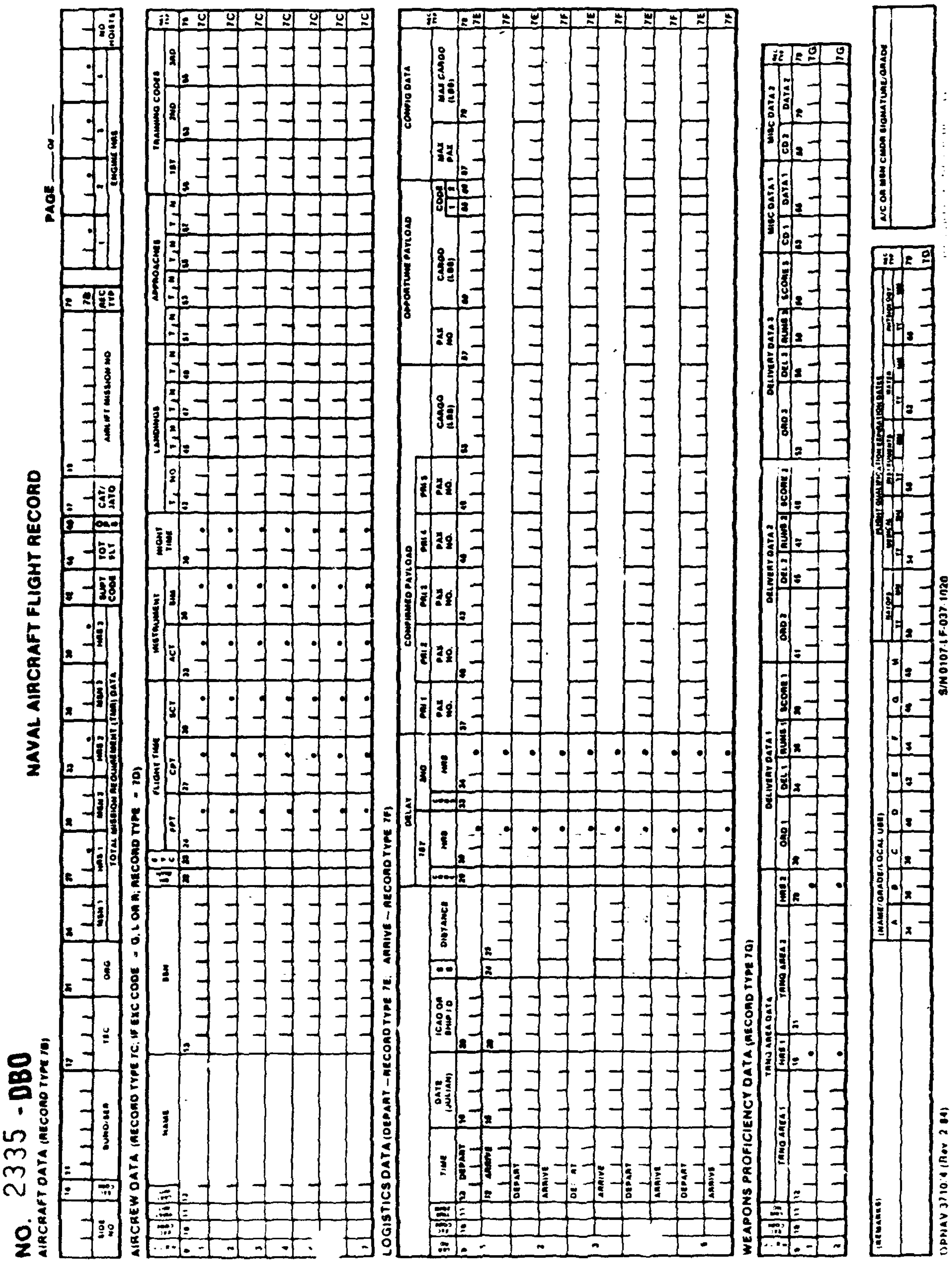
CORRECTIVE ACTION

CORRECTED BY | INSPECTED BY | SUPERVISOR | MAINT CONTROL

MODEX | PRI | TURN-IN DOCUMENT | SYSTEM/REASON | MCN

☆ U.S. GOVERNMENT PRINTING OFFICE 1989—605 808

Fig. 14. OPNAV Form 4790/60


NO. 2335 - DBO

NAVAL AIRCRAFT FLIGHT RECORD

AIRCRAFT DATA (RECORD TYPE 7B)

AIRCREW DATA (RECORD TYPE 7C; IF EXC CODE = Q, L OR R; RECORD TYPE = 7D)

LOGISTICS DATA (DEPART — RECORD TYPE 7E, ARRIVE — RECORD TYPE 7F)

WEAPONS PROFICIENCY DATA (RECORD TYPE 7G)

S/N 0107-LF-037-1020

OPNAV 3710/4 (Rev 2 84)

Fig. 15. OPNAV Form 3710/4

As with the SEDS system the person performing the work has the responsibility for recording maintenance event data, then the work center supervisor proofs the form.

Data Elements. The SAF is used for noncorrective support events and can be preprinted for repetitive events (fueling, rearm, etc). The data elements contained on the SAF are Shown in Table 12.

The VIDS/MAF form is used for corrective maintenance events. The form is organized into 11 sections. They are:

1. Accumulated Work Hours.
2. Accumulated Awaiting Maintenance Hours.
3. Failed/Required Material.
4. Basic Event Information.
5. Technical Directive Identification.
6. Repair Cycle Data.
7. Removed/Old Item Data.
8. Installed/New Item Data.
9. Awaiting Maintenance Hours.
10. Maintenance/Supply Record.
11. Narrative and Document Control Section.

The data elements which are contained on the VIDS/MAF are shown in Table 13.

The NAVFLIR form is used to collect operational/utilization data. The form is divided into five sections:

1. Aircraft Data.
2. Aircrew Data.
3. Logistic Data.
4. Weapons Proficiency Data.
5. Remarks.

The data elements contained on the NAVFLIR form are show in Table 14.

Data Items. Many of the data elements in the MDS system use coded data items. These codes are explained in Appendices D through S in OPNAVINST 4790.2E. However, only those coded data items which are applicable to R & M test and evaluation were addressed in this study.

There are no coded data items on the NAVFLIR which relate to R & M test and evaluation (all of the R & M significant data is entered in plain language, narrative form). The following coded data items from the VIDS/MAF were used in this study and are explained in Appendix C (of this document): Action Taken Codes, Time/Cycle Prefix Codes, Type Maintenance Codes, Malfunction Description Codes, Work Unit Codes, Awaiting Maintenance Reason Codes, Type Equipment Codes, and When Discovered Codes. Except for the Support Action Codes, the codes which are used on the SAF are the same codes which are used on the VIDS/MAF.

TABLE 12

DATA ELEMENTS FROM OPNAV FORM 4790/42

SUPPORT ACTION FORM (SAF)

Type Equipment (identifies either end item or category of equipment)
Action Organization (identifies organization performing service)
Work Center Code (identifies work center (shop) performing service)
Maintenance Level (organizational, Intermediate, Depot)
Action Date
Type Maintenance (scheduled, unscheduled, etc)
Items Processed (used one form for several identical actions)
Man Hours
BUNO (Airframe No.)

TABLE 13

DATA ELEMENTS FROM OPNAV FORM 4790/60

VISUAL INFORMATION DISPLAY SYSTEM/MAINTENANCE ACTION FORM (VIDS/MAF)

Accumulated Work Hours

Name/Shift (name of worker/work shift)
Tool Box (ID tool container used, for tool control)
Date
Man Hours
Elapsed Maintenance Time

Accumulated Awaiting Maintenance Hours

Date
Time
Reason (for delay for maintenance)
Hours (running total of delay hours)

TABLE 13 (cont)

DATA ELEMENTS FROM OPNAV FORM 4790/60

VISUAL INFORMATION DISPLAY SYSTEM/MAINTENANCE ACTION FORM (VIDS/MAF)

Failed/Required Material

Index (a letter used to trace significant failed parts against a particular maintenance action)
Action Taken (Corrective Action Codes)
MAL (Malfunction Description Codes)
Manufacturer
Part No.
Quantity
Project Code
Priority (as requisitioned)
Date Ordered
Requisition No.
Date Received (when part is received from supply)

Basic Information

Work Unit Code (of component being worked on)
Action Organization (organization performing maintenance)
Transaction Code (21 different codes describing the type of data or reason for submitting form)
Maintenance Level (O,I,D)
Action Taken Code
Malfunction Code (Malfunction Description Code)
Items Processed (if more than one action was taken on the same component for this form)
Man Hours (total for this form)
Elapsed Maintenance Time
Type Equipment (end item or category of equipment code)
BU/Serial No. (airframe/serial No.)
When Discovered
Type Maintenance (scheduled, unscheduled, etc)
Position Codes (left,right, upper, lower,etc)
Fault Isolation Detection (BIT equipment indication)
Safety/Engineering Report Serial No. (if separate analysis report required)
METER (identifies equipment under calibration control)
Inventory Control (identifies inventory status of equipment during event)

Technical Directive

This block is used to indicate compliance with directed maintenance event/inspection/modification.

TABLE 13 (cont)

DATA ELEMENTS FROM OPNAV FORM 4790/60

VISUAL INFORMATION DISPLAY SYSTEM/MAINTENANCE ACTION FORM (VIDS/MAF)

Repair Cycle

Date, Time, and Equipment Operational Code (when malfunction was reported)
Date, Time, and Equipment Operational Code (when maintenance was started)
Date and Time, (when maintenance was completed)

Removed/Old Item

Manufacturer
Serial No.
Part No.
Date Removed
Time/Cycles (using prefix codes to represent unit of measure for time or type of cycles)

Installed/New Item

Manufacturer
Serial No.
Part No.
Time/Cycles

Awaiting Maintenance

Time and codes for maintenance delays.

Maintenance/Supply Record

Status (awaiting maintenance or supply)
Date
Time
Equipment Operational Capability (status)

Narrative

Description of Discrepancy
Description of Corrective Action
Fault initiator/identifier

Document Control

Job Control No. (organization, date, and sequence No.)

TABLE 14

DATA ELEMENTS FROM OPNAV FORM 3710/4

NAVY AIRCRAFT FLIGHT RECORD (NAVFLIR)

Aircraft Data

BUNO/Ser No. (airframe No.)
Type Equipment Code (end item or equipment identifier)
Organization (unit identifier code)
Mission Code (type mission code)
Hours (per type mission)
Catapults/JATO
Engine Operating Hours
No. of Hoist Operations

Aircrew Data

Data used for Aviator Records

Logistics Data

Time of Departure/Take Off
Distance Traveled
Delay, Time and Reason
No. passengers
Weight of Cargo
Configuration (Max No. of Passengers/ Max weight of Cargo)

Weapons Proficiency Data

Type Ordinance used and Misc. data

Remarks

Narrative remarks, local use and Aviator Qualification Data.

IV. Findings

Presently Compatible Data Elements

A compatible data element is one where the information contained in the element could be used by any of the three services once the differences in coding was determined. Essentially, this is where the information collected can be used in algorithms or formulas to evaluate system effectiveness. The determination of compatibility does not mean that the information contained in the individual services data bases is synonymous or homogeneous with the other services' data bases (i.e. have the same format and field length). It means that the information is compatible to the application of typical R & M test and evaluation parameters and if this data is provided to a supporting service, these elements would provide information which could be used in evaluation. The opposite of this situation would be where a data element would be needed, but, since it was not collected, a test event would have to be repeated for the supporting service to conduct its analysis/evaluation. Table 15 lists all of the data elements determined to be compatible.

TABLE 15

COMPATIBLE DATA ELEMENTS

SEDS	RAM/LOG	3-M MDS
# Landings	# Landings	# Landings
Acft Ser #	Acft #	Bureau #
Acft Status	Acft Status	Acft Status
Action Taken	Maint Task Functn	Action Taken
Activity ID	Unit ID Code	Action Org
BITE Indication	BITE Codes	Fault Isolation
Corrective Action *	Corrective Action *	Corrective Action*
Date (YYMMDD)	4 digit julian	4 digit julian
Delay Reason	Delay Reason	AWM Reason
Discrepancy *	*Discrepancy	Discrepancy *
Engine Posn No.	Position Codes	Position Codes
Engine Start/Stop	Eng Recorder Reading	Eng Operating Hrs
Failed Item	Maint Subject	Failed Material
How Malfunction	Failure Codes	Malf'n Description
Maint Level (O,I,D)	Maint Level (O,I,D)	Maint Level(O,I,D)
Manufacturer *	Manufacturer *	Manufacturer *
Misn Objective *	Profile Codes	Misn Reqmnt Codes
Noun of Item *	Noun of Item *	Noun of Item *
Part # & NSN	Part # & NSN	Part # & NSN
Pilot's Name *	Crew Data (coded)	Crew Names *
Requisition #	Requisition #	Requisition #
Service WUC's	Type Service	Service WUC
Subsystem Name *	thru WUC	thru WUC
Take-off time	Hours Flown	Mission Hours
Task Time (service)	Service Time	Man Hours (SAF)
Test Peculiar-Questions	Test Peculiar-Fields	Test Peculiar-Flags
Time to Fail	Time since ...	Time Prefix Codes
Type Maint	Maint Task Interval	Type Maintenance
Type Mission	Profile	Misn Requirement
When Disc (date)	When Disc (date)	When Disc (date)
When Discovered	When Discovered	When Discovered
Work Unit Codes	Work Unit Codes	Work Unit Codes

* This element is entered in Narrative form

Incompatible Data Elements

Incompatible data elements are those data elements which are either not collected by one of the services or are unique to one of the services. If the information contained in the data element was considered not to be compatible with typical R & M algorithms or logistical analysis formulas it was considered "not collected". Table 16 lists those data elements which are not collected by one of the services. Table 17 lists those data elements which are collected by only one service. The relevance of these tables is important to test and evaluation personnel for the following reasons. If you are the person responsible for analyzing the test results of another service's test and evaluation program, you should know before the test begins which data elements are going to be collected. Also if you are the person responsible for providing test and evaluation data to supporting services, you should recognize what data elements they expect to be collected. Each of the data bases have provisions for collecting data which is not standard. This data, however, can only be collected if it is agreed to before testing begins. Data not collected, or not provisioned for in the beginning of a test is either very difficult to extract or completely lost, and either redundant testing must be accomplished or the analysis deleted. Either course of action results in a less efficient test program.

TABLE 16

DATA ELEMENTS NOT COLLECTED BY ONE SERVICE

SEDS	RAM/LOG	3-M MDS
Acft Type	N/C	Type Equipmnt Code
Misn Effectiveness	Profile Result	N/C
Reliability Code	Malfunction Effect	N/C
Discrepancy #	Control #	N/C
Altitude	Altitude	N/C
Work Center	N/C	Work Center
Item Identification	N/C	Type Equipmnt Code
AFSC	MOS	N/C
Task Strt/Stop Time	Task Strt/Stop Time	N/C
Tech Order Data	Tech Manual Data	N/C
Tools/AGE Sufcncy	Tools,GSE Evaluation	N/C
N/C	PIC for Maintainer	Maintainer
N/C	Acft Status Change-date/time	Acft Status Change date/time
N/C	# Passengers	# Passengers
N/C	Cargo Weight	Cargo Weight

TABLE 17

DATA ELEMENTS UNIQUE TO ONE SERVICE

Data Elements Unique to SEDS:

When Discovered (time)
Federal Supply Classification: (this code is common to all services but only the Air Force enters it into the data base)
Category of Labor
Circuit Symbol

Data Elements Unique to RAM/LOG:

Acft Status Change: (by event)
Acft Status start/stop time (detailed by event)
Test Location (by event)
Maintenance Location (by event)
Climatic Condition
Temperature
# of Engine Starts
Hours Run-up
Consumables Used

TABLE 17 (cont)

DATA ELEMENTS UNIQUE TO ONE SERVICE

How Recognized
Aircraft Operability (different from Acft Status)
Major Component Data (Next Higher Assy data: WUC, Hrs, etc)
Indirect Maintenance Man Hours
Task Element (Direct/Indirect)
Support Equipment Required
APU Operating Hours
Shipped to: (parts shipped for analysis)
Shipped from: (parts received from analysis or supply)
Subsystem status and availability tracking
Hours Scheduled
Malfunction effect by: System, Flight, Profile effect
Part Condition
Part Disposition
How Done (for services, e.g. Hot refuel procedures)
The ability to track utilization/Diagnostic/ and recorder data on a constant basis in the data base
The ability to enter narrative data and comments concerning test events/demos into the data base

Data Elements Unique to 3-M MDS:

Failed Part Index
Date Part Received from Supply
Catapults/JATO
# of Hoist Operations
Repair Cycle general data tracking

Presently Compatible Data Items

Data items were considered compatible if their form and definitions were common and synonymous. These codes could be entered into any of the three services data bases and would be considered homogeneous.

TABLE 18

COMPATIBLE DATA ITEMS

SEDS	RAM/LOG	3-M MDS
How Mal Codes	Failure Codes	Mal Description-Codes
Part #'s and NSN	Part #'s and NSN	Part #'s and NSN
Fed Supply Codes	Fed Supply Codes	Fed Supply Codes
Maint Level Codes	Maint Level Codes	Maint Level Codes

Additionally, any codes which were in compatible data elements which were entered in narrative form.

Incompatible Data Items

Incompatible Data Items were those data items where either the form of the definition was not compatible or the code was not used by one of the services.

TABLE 19

INCOMPATIBLE DATA ITEMS

SEDS	RAM/LOG	3-M MDS
Type Msn Codes	Profile Codes	Msn Codes
Msn Effectiveness	Flight/Profile-Result Codes	N/C
Reliability Codes	Flight/Profile-Result Codes	N/C
When Discovered (as used on AFFTC 300 Form)	When Discovered	N/C
When Discovered (as used on AFSC 258 form)	When Discovered	N/C
Work Unit Codes	Work Unit Codes	Work Unit Codes
Delay Codes	Delay Codes	Delay Codes
Action Taken Codes	Maint Funct Codes	Action Taken Codes
AFSC	MOS	N/C
TO Procedure Codes	Evaluation Codes	N/C
Tools/AGE Codes	Evaluation Codes	N/C
Type Maint Codes	Maint Task Interval	Type Maint Codes
N/C	Position Codes	Position Codes
BITE Codes	Data Source Codes	N/C

Data Items Unique to One Service

Data elements which were collected using codes which were not used by other services were classified as unique. This did not necessarily mean that the information was not collected, only that the code use to collect the information was unique to one service. The use of these coded data items by other services would increase data base compatibility by reducing the reliance on narrative entries.

TABLE 20

DATA ITEMS UNIQUE TO ONE SERVICE

Data Item Codes Unique to SEDS:

Circuit Symbols

Data Item Codes Unique to RAM/LOG

How Recognized Codes
Location Codes
Aircraft Configuration Codes
Profile Codes
Personnel Identification Codes
Climatic Condition Codes
Service Action Codes (contained in service WUC in SEDS & 3-M)
General Service Item Codes
Type Service Item Codes
How Done Codes
Task Element Codes
Support Equipment Codes
Part Condition Codes
Data Source Codes
Narrative (as a stand-alone data element)

Data Item Codes Unique to 3-M MDS

Type Equipment Codes
Support Action Codes
Time/Cycle Prefix Codes

Common Elements and Items Dictionary

The tables which follow make up a translating dictionary of data items and data elements as used in each of the data bases. The data elements which are shown as "N/C, (not collected)" would have to be negotiated before testing begins to ensure that supporting services get the information they need to perform their own studies and analyses. The data items as they exist are not homogeneous(they are not technically compatible to a computer), however, the information as collected by each system would enable supporting services to perform reliability and maintainability studies to a degree that would probably prevent redundant testing.

TABLE 21

DATA ELEMENTS TRANSLATION: SEDS to Others

SEDS	RAM/LOG	MDS
# Landings	# Landings	# Landings
Acft Ser #	Acft #	Bureau #
Acft Status	Acft Status	Acft Status
Acft Type	N/C	Type Equipmnt Code
Action Taken	Maint Task Functn	Action Taken
Activity ID	Unit ID Code	Action Org
AFSC	MOS	N/C
Altitude	Altitude	N/C
BITE Indication	BITE Codes	Fault Isolation
Corrective Action *	Corrective Action *	Corrective Action*
Date (YYMMDD)	4 digit julian	4 digit julian
Delay Reason	Delay Reason	AWM Reason
Discrepancy #	Control #	N/C
Discrepancy *	Discrepancy *	Discrepancy *
Engine Posn No.	Position Codes	Position Code
Engine Start/Stop	Eng Recorder Reading	Eng Operating Hrs
Failed Item *	Maint Subject *	Failed Material *
How Malfunction	Failure Codes	Malf'n Description
Item Identification	N/C	Type Equipmnt Code
Maint Level (OID)	Maint Level (OID)	Maint Level (OID)
Manufacturer *	Manufacturer *	Manufacturer *
Misn Effectiveness	Profile Result	N/C
Misn Objective *	Profile Codes	Misn Reqmnt Codes
Noun of Item *	Noun of Item *	Noun of Item *
Part # & NSN	Part # & NSN	Part # & NSN
Pilot's Name *	Crew Data (coded)	Crew Names *
Reliability Code	Malfunction Effect	N/C
Requisition #	Requisition #	Requisition #
Service WUC's	Type Service	Service WUC
Subsystem Name *	thru WUC	thru WUC
Take-off time	Hours Flown	Mission Hours
Task Strt/Stop Time	Task Strt/Stop Time	N/C
Task Time (service)	Service Time	Man Hours (SAF)
Tech Order Data	Tech Manual Data	N/C
Test Peculiar-Questions	Test Peculiar-Fields	Test Peculiar-Flags
Time to Fail	Time since ...	Time Prefix Codes
Tools/AGE Codes	Tools/GSE Eval	N/C
Type Maint	Maint Task Interval	Type Maintenance
Type Mission	Profile	Misn Requirement
When Disc (date)	When Disc (date)	When Disc (date)

TABLE 21 (cont)

DATA ELEMENTS TRANSLATION: SEDS to Others

SEDS	RAM/LOG	MDS
When Discovered	When Discovered	When Discovered
Work Center	N/C	Work Center
Work Unit Codes	Work Unit Codes	Work Unit Codes

* This element is entered in Narrative form
N/C Not Collected

TABLE 22

DATA ITEMS TRANSLATION: SEDS to Others

SEDS	RAM/LOG	MDS
Action Taken Codes	Maint Funct Codes	Action Taken Codes
AFSC	MOS	N/C
BITE Codes	Data Source Codes	N/C
Delay Codes	Delay Codes	Delay Codes
Fed Supply Codes	Fed Supply Codes	Fed Supply Codes
How Mal Codes	Failure Codes	Mal DescriptionCodes
Maint Level Codes	Maint Level Codes	Maint Level Codes
Msn Effectiveness	Flight/Profile Result Codes	N/C
Part #'s and NSN	Part #'s and NSN	Part #'s and NSN
Reliability Codes	Flight/Profile-Result Codes	N/C
TO Procedure Codes	Tools/GSE Eval Codes	N/C
Tools/AGE Codes	Evaluation Codes	N/C
Type Maint Codes	Maint Task Interval	Type Maint Codes
Type Msn Codes	Profile Codes	Msn Codes
When Discovered (as used on AFFTC 300 Form)	When Discovered	When Discovered
When Discovered (as used on AFSC 258 Form	When Discovered	When Discovered
Work Unit Codes	Work Unit Codes	Work Unit Codes

Additionally, any items which were in compatible data elements which were entered in narrative form.

TABLE 23

DATA ELEMENTS TRANSLATION: RAM/LOG to Others

RAM/LOG	MDS	SEDS
4 digit julian	4 digit julian	Date (YYMMDD)
# Landings	# Landings	# Landings
# Passengers	# Passengers	N/C
Acft #	Bureau #	Acft Ser #
Acft Status	Acft Status	Acft Status
Acft Status Change-date/time	Acft Status Change-date/time	N/C N/C
Altitude	N/C	Altitude
BITE Codes	Fault Isolation	BITE Indication
Cargo Weight	Cargo Weight	N/C
Control #	N/C	Discrepancy #
Corrective Action *	Corrective Action*	Corrective Action*
Crew Data (coded)	Crew Names *	Pilot's Name *
Delay Reason	AWM Reason	Delay Reason
Discrepancy *	Discrepancy *	Discrepancy *
Eng Recorder Readg	Eng Operating Hrs	Engine Start/Stop
Failure Codes	Malf'n Description	How Malfunction
Hours Flown	Mission Hours	Take-off time
MOS	N/C	AFSC
Maint Level (OID)	Maint Level (OID)	Maint Level (OID)
Maint Subject	Failed Material	Failed Item
Maint Task Functn	Action Taken	Action Taken
Maint Task Interval	Type Maintenance	Type Maint
Malfunction Effect	N/C	Reliability Code
Manufacturer *	Manufacturer *	Manufacturer *
Noun of Item *	Noun of Item *	Noun of Item *
PIC for Maintainer	Maintainer's Name	N/C
Part # & NSN	Part # & NSN	Part # & NSN
Position Codes	Position Codes	Engine Posn No.
Profile	Misn Requirement	Type Mission
Profile Codes	Misn Reqmnt Codes	Misn Objective *
Profile Result	N/C	Misn Effectiveness
Requisition #	Requisition #	Requisition #
Service Time	Man Hours (SAF)	Task Time (service)
Task Strt/Stop Time	N/C	Task Strt/Stop Time
Tech Manual Data	N/C	Tech Order Data
Test Peculiar-Fields	Test Peculiar-Flags	Test Peculiar-Questions
Time since ...	Time Prefix Codes	Time to Fail
Tools/GSE Eval	N/C	Tools/AGE Codes
Type Service	Service WUC	Service WUC's
Unit ID Code	Action Org	Activity ID

TABLE 23 (CONT)

DATA ELEMENTS TRANSLATION: RAM/LOG to Others

RAM/LOG	MDS	SEDS
When Disc (date)	When Disc (date)	When Disc (date)
When Discovered	When Discovered	When Discovered
Work Unit Codes	Work Unit Codes	Work Unit Codes

* This element is entered in Narrative form
N/C Not Collected

TABLE 24

DATA ITEMS TRANSLATION: RAM/LOG to Others

RAM/LOG	MDS	SEDS
Data Source Codes	N/C	BITE Codes
Delay Codes	Delay Codes	Delay Codes
Evaluation Codes	N/C	Tools/AGE Codes
Failure Codes	Mal DescriptionCodes	How Mal Codes
Fed Supply Codes	Fed Supply Codes	Fed Supply Codes
Flight/Profile Result Codes	N/C	Man Effectiveness
Flight/Profile Result Codes	N/C	Reliability Codes
MOS	N/C	AFSC
Maint Funct Codes	Action Taken Codes	Action Taken Codes
Maint Level Codes	Maint Level Codes	Maint Level Codes
Maint Task Interval	Type Maint Codes	Type Maint Codes
Part #'s and NSN	Part #'s and NSN	Part #'s and NSN
Position Codes	Position Codes	N/C
Profile Codes	Man Codes	Type Man Codes
TOOLS/GSE Eval Codes	N/C	TO Procedure Codes
When Discovered	When Discovered	When Discovered (from AFFTC 300 and AFSC 258)
Work Unit Codes	Work Unit Codes	Work Unit Codes

Additionally, any items which were in compatible data elements which were entered in narrative form.

TABLE 25

DATA ELEMENTS TRANSLATION: 3-M MDS to Others

MDS	SEDS	RAM/LOG
4 digit julian	Date (YYMMDD)	4 digit julian #
Landings	# Landings	# Landings
# Passengers	N/C	# Passengers
AWM Reason	Delay Reason	Delay Reason
Acft Status	Acft Status	Acft Status
Acft Status Change-date/time	N/C N/C	Acft Status Change-date/time
Action Org	Activity ID	Unit ID Code
Action Taken	Action Taken	Maint Task Functn
Bureau #	Acft Ser #	Acft #
Cargo Weight	N/C	Cargo Weight
Corrective Action*	Corrective Action*	Corrective Action *
Crew Names *	Pilot's Name *	Crew Data (coded)
Discrepancy *	Discrepancy *	Discrepancy *
Eng Operating Hrs	Engine Start/Stop	Eng Recorder Reading
Failed Material	Failed Item	Maint Subject Fault
Isolation	BITE Indication	BITE Codes
Maint Level (OID)	Maint Level (OID)	Maint Level (OID)
Maintainer's Name	N/C	PIC for Maintainer
Malf'n Description	How Malfunction	Failure Codes
Man Hours (SAF)	Task Time (service)	Service Time
Manufacturer *	Manufacturer *	Manufacturer *
Misn Reqmnt Codes	Misn Objective *	Profile Codes
Misn Requirement	Type Mission	Profile
Mission Hours	Take-off time	Hours Flown
Noun of Item *	Noun of Item *	Noun of Item *
Part # & NSN	Part # & NSN	Part # & NSN
Position Codes	Engine Posn No.	Position Codes
Requisition #	Requisition #	Requisition #
Service WUC	Service WUC's	Type Service
Test Peculiar-Flags	Test Peculiar-Questions	Test Peculiar Fields Time
Prefix Codes	Time to Fail	Time since ...
Type Equipmnt Code	Acft Type	N/C
Type Equipmnt Code	Item Identification	N/C
Type Maintenance	Type Maint	Maint Task Interval
When Disc (date)	When Disc (date)	When Disc (date)
When Discovered	When Discovered	When Discovered
Work Center	Work Center	N/C
Work Unit Codes	Work Unit Codes	Work Unit Codes *

* This element is entered in Narrative form
N/C Not Collected

TABLE 26

DATA ITEMS TRANSLATION: 3-M MDS to Others

3-M MDS	SEDS	RAM/LOG
Delay Codes	Delay Codes	Delay Codes
Action Taken Codes	Action Taken Codes	Maint Funct Codes
Fed Supply Codes	Fed Supply Codes	Fed Supply Codes
Maint Level Codes	Maint Level Codes	Maint Level Codes
Mal DescriptionCodes	How Mal Codes	Failure Codes
Msn Codes	Type Msn Codes	Profile Codes
Part #'s and NSN	Part #'s and NSN	Part #'s and NSN
Position Codes	N/C	Position Codes
Type Maint Codes	Type Maint Codes	Maint Task Interval
When Discovered	When Discovered	When Discovered
Work Unit Codes	Work Unit Codes	Work Unit Codes

Additionally, any codes which were in compatible data elements which were entered in narrative form.

Differences in Data System Methodologies

The preponderance of the effort that went into this thesis was learning the data components of each of the R & M data bases. In accomplishing this task, it was also necessary to learn the procedures and methodologies of collecting and analyzing the data. In fact, in the early stages of this research, the author was concentrating on the differences in R & M reports between the services (even on the same type/models of equipment). As the research progressed, it became obvious that it would be impractical if

not impossible to get the services to agree on system R & M characteristics and capabilities on the output side (reports and analyses) if there was not agreement on what goes into (data elements/items) the data bases, or even how it gets there (collection methodology).

The biggest difference in the collection methodologies that was discovered during this study was the Army's use of separate data collectors. These separate data collectors (whether they be contract hired or "green suiters" performing collection as their primary job) relieve the maintainers of the responsibility of recording test event data after maintenance is finished. These collectors are able to record events in "real time" and are not recording in a post-facto manner (characteristic of the maintainer doing the work being required to fill out the forms). The use of separate collectors also promotes job specialization allowing the collection of many more data elements and items and improving the accuracy of data collected during a test and evaluation program.

The second biggest difference is the Air Force's use of models for availability calculations. By taking demonstrated reliability and maintainability data and adding certain environmental factors, the Air Force models system availability versus the meticulous status tracking procedures used by the Army. The judgement of the interchangeability

and accuracy of models versus observed data certainly could be the subject for another thesis. However, the prime concern here is if the Air Force is the collecting service for a joint test in which the Army is interested, then the Army program office should expect a shortage of detailed availability data.

V. Conclusions and Recommendations

Conclusions

This study began as an attempt to improve the communications between the three services (especially when involved in joint programs) on R & M characteristics. It was quickly discovered, however, that communication was difficult because the "languages" were dissimilar. How could agreement on the outputs of analyses be obtained when the inputs were so different? In an attempt to improve the commonality of the languages, this study concentrated on the definitions of input terms of R & M data bases.

At the beginning of this study there was no single source document available which compared the terms or methods used to collect R & M data between the services. It is hoped that this document will become only the first step to improved communications among test and evaluation personnel involved in joint weapons system acquisitions.

Here are two quotes from a document which I found to be invaluable during this research that I feel best state the environment and need for improved communications of R & M terms.

> ... As a first and complete work, the volume contains terms that are frequently defined quite differently by reliability engineers working in various product environments. Also included are terms not in standard Dictionaries. Although the definitions and, in some cases the words, as proposed here will be controversial, over time we can all help to improve this collection. In this way we may some day arrive at a consensus beneficial to all (20:v)
>
> This RAM Dictionary first appears at a time when assurance technology seems somewhat incoherent and confused. Industry is far from any consensus about what techniques to use to assure its products. The unsettled dust of new ideas stirred up by this whirlwind of furious activity has cluttered and confused the language of other engineering professionals as well. It is little wonder that, between engineering disciplines, engineers do still have trouble speaking the same language despite all the advancements of telecommunications technology.
>
> To match a world class pace of competition in such an environment of revolutionary change, we must finally understand and adapt the fundamental terminology which controls competitiveness itself. If the primary concepts which appear here as defined terms do not become everyday language, then our ignorance may be the single greatest obstacle to our correctly achieving the greatest product reliability, availability, and maintainability.
>
> The primary objective of this work is to be a comprehensive list of reliability, availability, and maintainability definitions assembled, for the first time, into a single document. A secondary objective is frankly to provoke controversy, stimulate new thinking, and call for greater communication and unity in the assurance community. (20:vii)

Recommendations

Since it is possible for the three services to agree on the most voluminous coded data item (failure codes (999 different possibilities)), it would seem possible that a conference or committee could convene to improve the interoperability of the three R & M data bases.

Until then, however, here are a couple of recommendations which could immediately improve compatibility:

1. The Army should adopt the Work Unit Code structure used by the Air Force and the Navy and defined in MIL SPEC MIL-M-38769C.

2. The three services should agree on the length of the Work Unit Code (Air Force collects 5 digits, Navy 7, and Army up to 13). This way the number of digits (and thus the level of subsystem data) collected would not be a problem on joint tests.

3. The services should establish a set of minimum agreed upon data elements. The fact that the Navy does not collect skill identifier codes could cause serious problems for manpower and life cycle costing studies for the Army and the Air Force.

4. The services could develop a joint services agreement on R & M data elements and item (input) terms, similar to the agreement on the output terms found in Memorandum of Agreement on Multiservice Operational Test and Evaluation (15).

Appendix A: SEDS Data Item Codes

FOR USE WITH AFFTC FORM 300

TYPE MISSION CODES

01	Transition Training
02	Test Support
03	Other Support
04	System Test
05	Performance Test
06	Stability and Control Test
07	Reliability Demonstration
08	Functional Check Flight

MISSION EFFECTIVENESS CODES

1	Flown as Briefed
2	Mission Deviated
3	Air Abort
4	Ground Abort
5	Flown as briefed and additional evaluation performed

NOTE: Missions changed for other than maintenance are coded 1.

RELIABILITY CODES

1	Operated satisfactory
2	Degraded Operation-New Discrepancy
3	Failed But No Abort-New Discrepancy
4	Failed Causing Abort-New Discrepancy
5	Used But Degraded-Uncleared Discrepancy
6	Used But Degraded-Uncleared Discrepancy
7	Unuseable-Uncleared Discrepancy
8	Unuseable-Engineering Deficiency
Blank	Not Used

WHEN DISCOVERED CODES (used by the pilot on the AFFTC 300 see also WHEN DISCOVERED CODES Used on AFSC 258)

1 Start and Taxi
2 Taxi
3 Take-off and Acceleration
4 Climb
5 Cruise
6 Combat and Weapons Delivery
7 Return
8 Traffic Pattern and Landing
9 Taxi and Shutdown

FOR USE WITH AFSC FORM 258

WHEN DISCOVERED CODES

These codes are taken from the appropriate weapon system -06 T.O.. They are somewhat homogeneous between weapon system, however variations do exist. There are approximately 30 different one character alpha/numeric codes to identify when a discrepancy is discovered. A representative sample of when discovered codes follow.

A Before Flight-Abort-Aircrew
B Before Flight-No Abort-Aircrew
C In-Flight-Abort
D In-Flight-No Abort
E After Flight-Aircrew
F Between Flights-Ground Crew (not assoc. w/inspection)
G Ground Alert Not Degraded
H Basic Post-flight
J Pre-flight inspection
L During Training or Maintenance on equipment used in training
M Phased Inspection
N Ground Alert Degraded
P Functional Check Flight
Q Special Inspection
R Quality Control Check
S Depot Level Maintenance
T During Scheduled Calibration
U Oil Analysis
V During Unscheduled Calibration
W In-Shop Repair/Disassembly for Maintenance
X Engine Test Stand Operation
Y Upon Receipt or Withdrawal from Supply
0 Eddy Current
1 Magnetic Particle

WHEN DISCOVERED CODES FOR AFSC FORM 258 (cont)

2 During Operation or Malfunction Analysis and Recording Equipment or Subsequent Data Analysis
3 Home Station Check
4 Corrosion Control Inspection
5 Aircraft Interior Refurbishment
6 All Other NDI
7 X-Ray
8 Ultrasonic
9 Fluoreacent Penetrant

TYPE MAINTENANCE CODES

These codes, taken from the weapon system's -06 T.O. describe the general maintenance event being undertaken. There are two categories; a general category and one for engine shop work or removed engines.

A. Service
B. Unscheduled Maintenance
C. Basic Post or Thru Flight Inspection
D. Preflight Inspection
E. Minor Inspection
H. Home Station Check
J. Scheduled Calibration
M. Interior Refurbishment
P. Major Inspection
Q. Forward Support Spares
R. Depot Maintenance
S. Special Inspection
T. Time Compliance Technical Order
Y. Aircraft Transient Maintenance

TYPE MAINTENANCE FOR ENGINES

A. Engine Scheduled Inspection
B. Engine Field Maintenance
C. Engine Build-up
D. Tear-Down and Prep for shipment
E. Unscheduled Test Cell Operations
Q. Forward Support Spares
R. Depot Maintenance
S. Special Inspection
T. Time Compliance Technical Order
W. Minor Maintenance
Y. Transient Engine Maintenance

WORK UNIT CODES (WUC) (see also MILSPEC MIL-M-38769C)

These codes are weapon system specific after the second digit. SEDS WUC's are 5 digit alpha/numeric codes which can describe the support service/task or inspection being conducted, or the aircraft subsystem being worked on. The first two digits of the WUC are standardized across weapon systems (and identical to Navy WUC's). The WUC Outline follows.

01	Ground Handling, Servicing, and Related Tasks
02	Aircraft Cleaning
03	"Look" Phase of Scheduled Inspections
04	Special Inspections
05	Preservation, Depreservation, and Storage
06	Arming and Disarming
07	Preparation and Maintenance of Records
09	Shop Support General
11	Airframe Exterior
12	Cockpit and Fuselage Compartments
13	Landing Gear
14	Flight Control
15	Helicopter Rotor System
22	Turboshaft Power Plant Engine Assembly
24	APU (airborne)
26	Helicopter Rotary Wing Drive System Main Transmission
27	Turbofan Engine Assembly
29	Power Plant Installation
41	Air Conditioning, Pressurization, and Ice Control
42	Electrical Power Supply
44	Lighting System
45	Hydraulic/Pneumatics
46	Fuel Systems
47	Oxygen Systems
49	Misc. Utilities
51	Instruments
56	Flight Reference
57	Integrated Guidance/Flight Control
58	In-Flight Test Equipment
62	VHF Communications
63	UHF Communications
64	Intercomm
65	IFF Systems
66	Emergency Communications
67	Secure Communications
69	Misc. Communications
71	Radio Navigation
72	Radar Navigation
73	Bombing Navigation

Work Unit Codes (cont)

74 Weapons Control
75 Weapons Delivery
76 Electronic Counter-Measures
77 Photo/Recon
91 Emergency Equipment
93 Deceleration Equipment
96 Misc Equipment
97 Explosive Devices

DELAY CODES

These codes are used to identify the reason for delaying active maintenance events. They are single alphabetic characters and are given on the back of the AFSC Form 258.

S Awaiting Supplies/Parts
C Delay Due to Conflicting Maintenance
A Work Stoppage-Nonpowered AGE or RPIE
E Work Stoppage-Powered AGE or RPIE
F Flying
P Awaiting Personnel Assistance
R Engine Run-up
T Awaiting Transportation
X Delay for Weather
K Delay for Special Test Equipment
M Preplanned Maintenance Delay

ACTION TAKEN CODES

These codes are used to categorize the corrective action taken for a discrepancy. They are one character alpha/numeric codes which are given in the appropriate weapon system -06 T.O. and are standardized.

A Bench Checked and Repaired
B Bench Checked Serviceable (no repair required)
C Bench Checked Repair Deferred
D Bench Checked Transferred to another Base/Unit
1 Bench Checked Not Repairable This Station (NRTS)-Repair Not Authorized
2 Bench Checked NRTS-Lack of Equipment, Tools, Facilities
3 Bench Checked NRTS-Lack of Technical Skills
4 Bench Checked NRTS-Lack of Parts
5 Bench Checked NRTS-Shop Backlog
6 Bench Checked NRTS-Lack of Technical Data
7 Bench Checked NRTS-Multiple Causes
8 Bench Checked NRTS-Sent to Depot
9 Bench Checked NRTS-Condemned

ACTION TAKEN CODES (cont)

E Initial Installation
F Repair
G Repair/Replacement Minor Parts, Hardware, Soft Goods
H Equipment Checked-No Repair Required
J Calibration-No Adjustment Required
K Calibration-Adjustment Required
L Adjust
M Disassembled
N Assembled
P Removed
Q Installed
R Remove and Replaced
S Remove and Reinstalled (same item)
T Removed for Calibration
U Replaced for Calibration
V Cleaned
X Test-Inspect-Service
Y Troubleshoot
Z Corrosion Repair

HOW MALFUNCTION CODES

These codes are three digit numeric codes which describe how the item malfunctioned. These codes are compatible with the RAM/LOG Failure Codes and with the 3-M Malfunction Description Codes.

AFSC CODES

These are Skill Identifier Codes for the maintainer performing the task.

T.O. PROCEDURE CODES

These codes are used to evaluate the sufficiency of the procedures as given in Technical Orders. They are listed on the back of the AFSC Form 258.

1 Adequate
2 Inadequate
3 Incomplete
4 Misidentified
5 Not Available
6 Incorrect Information
7 Other

TOOLS/AGE EQUIPMENT CODES

These codes are used to evaluate the sufficiency of tools and test equipment used during the action taken. They are listed on the back of the AFSC Form 258.

1 Tools Adequate
2 Tools Inadequate
3 Tools Not Available
4 Test Equipment Adequate
5 Test Equipment Inadequate
6 Test Equipment Not Available
7 Tools and Test Equipment Adequate
8 Tools and Test Equipment Inadequate
9 Tools and Test Equipment Not Available

Appendix B: RAM/LOG Data Item Codes

FOR USE WITH 100 CARD

LOCATION CODES

These 2 character codes are test specific and can be as simple as the 2 character state code used by post office, to elaborate codes used to denote test sights.

AIRCRAFT CONFIGURATION

These single character codes are test specific and are used to depict the configuration of the aircraft and its systems. For instance aircraft configuration could be for attack (rocket systems installed) or ferry (long range fuel tanks installed). The weapons, avionics, and visionics codes identify which optional packages were installed on the aircraft at the time the form was completed.

PROFILE CODES

These three digit codes are test specific and are used to identify the planned mission the pilot is expected to execute for the days flight. The profiles come from the test and evaluation flight briefing books and are designed to subject the aircraft to environments which it is expected to see throughout its life cycle.

CREW CODES

The aircraft crew and passengers are identified through the use of Personnel Identifier Codes. These codes help identify the man-hours associated with certain skills such as maintenance test pilots and technical inspectors.

CLIMATIC CONDITION CODES

These two character codes are test specific and are used to identify the general meteorological environments which the aircraft was subjected to such as Hot Day, High Altitude and icing conditions (often associated with specifications).

FLIGHT RESULT CODES

These single character codes are test specific and are used to identify the successfulness of the planned flight. These results are used to compute the mission reliability of the airframe and its non-mission related subsystems. Typical codes address flights which are: completed as briefed, completed with reduced performance, precautionary or forced landings, and delayed or cancelled departures.

PROFILE RESULT CODES

These single character codes are test specific and are used to identify the successfulness of the planned mission. These results are used to compute the mission reliability of mission oriented subsytems. Mission Reliability being defined as "the probability that a system will perform mission essential functions for a specified period of time under conditions stated in the mission profile"(10:2-2). Typical codes address mission profiles which were: completed as briefed, completed with reduced capability, profile abort-flight continued, profile abort-flight discontinued, and missions which were delayed or cancelled because of mission equipment.

TEST PECULIAR QUESTION RESULTS

These free form (unspecified length and form) blocks are used to record the results of specific questions which are determined applicable to the evaluation of the system. Typical questions are: The number of times a non-metered system is used, different pilots opinions about system performance, and other questions deemed appropriate by the personnel involved with evaluation of the weapon system.

FOR USE WITH 100 CARD SERVICE ENTRIES

SERVICE ACTION CODES

1 Replenishment
2 Drained/defueled
3 Flushed
4 Greased
5 Rearmed
6 On Load (non-armament)
7 Off Load
8 Cleaned
9 Secured

GENERAL SERVICE ITEMS CODES

A Fuel
B Oil
C Grease
D Hydraulic Fluid
E Ammunition
F Nitrogen
G Air
H Personnel
J Cargo
K Coolant
M Solvent

TYPE SERVICE ITEM CODES

These two character numeric codes are test specific and are used to identify exactly the type/grade of consumable used during the service process.

QUANTITY CODES

These single digit numeric codes identify the unit of measure used to indicate the amount of consumable used during the service.

SYSTEM CODES

These two digit weapons system specific numeric codes identify the aircraft system which was serviced. These codes are typically the first two digits of the Work Unit Code of the system being serviced.

HOW DONE CODES

These single character codes are test specific and are used to identify the use of particular pieces of support equipment or technique used to service aircraft (such as hydraulic carts or hot refuelling).

FOR USE WITH 200 CARD

MALFUNCTION EFFECT CODES These single digit numeric codes are combined to create a 3 digit code to indicate the effect that a particular malfunction had on overall system performance, profile completion, and flight completion. It is similar to the mission and profile result codes used on the 100 card except more specifically referenced to a particular malfunction on flights where there were more than one malfunction.

HOW RECOGNIZED CODES

These codes are used to help determine the effectiveness of test equipment (built in, ground support, or bench sets).

- A Aerodynamic/vibration
- B Audio
- C Standard Cockpit Indicators
- D Specialized Diagnostic (aircraft peculiar BITE)
- E Test Equipment Instrumentation (airborne, i.e. VIBREX)
- F Test Equipment Instrumentation (on-grounded, i.e. mobile test sets)

HOW RECOGNIZED CODES (cont)

G Visual
H Odor
J Other
K-Z aircraft peculiar testing equipment

WHEN DISCOVERED CODES

These codes are used to indicate when a malfunction was discovered and assist in evaluating the effectiveness of inspection intervals and other maintenance factors.

01 Scheduled Maintenance
02 Unscheduled Maintenance
03 Maintenance Operational Check
04 Functional Test Flight
05 Final Technical Inspection
06 Calibration
07 Diagnostic Test/Oil Analysis
08 Servicing
09 Handling
10 Storage
11 Rearm
12 Reconfiguration
13 Ground Crew Preflight
14 Air Crew Preflight
15 Engine Start
16 Taxi
17 Hover In-Ground-Effect
18 Hover Out-of-Ground-Effect
19 Takeoff
20 Normal Climb
21 Max Performance Maneuver
22 Cruise
23 Maneuver
24 Descent
25 Landing
26 Engine Shutdown
27 Crew Post Flight
28 Hit Check
29 Acceptance Inspection
30 Engine Run-up
31 Daily/10 hour inspection
32 Intermediate Inspection
33 Phase or PMP inspection
34 Special Inspection
35 Telemetry
36 Enroute Inspection (through-flight)
37 Special Event (Demo, teardown, etc)
38 Other

MAINTENANCE TASK CODES

This combination of three separate codes, identifies manhours used performing maintenance tasks, at what frequency, and at which maintenance unit level.

FUNCTION CODES

This code describes the maintenance task being performed.

A	Inspect (visual)
B	Test (nonvisual inspections)
C	Service
D	Adjust
E	Align
F	Calibrate
G	Install
H	Remove/Replace
J	Repair
K	Overhaul
L	Rebuild
M	Mission Configuration Change
N	Fault Isolation/Troubleshooting
P	Paint
Q	Disassemble/Assemble
R	Remove
S	Modification Work Order
T	Air Transportability
V	Oil Analysis
W	Safety Wire
X	Cannibalization
Y	Clean/Wash
Z	Ground Handling

INTERVAL

This code identifies frequency that manhours are devoted to this task.

A Preflight
B Scheduled (Other)
C Daily
D Intermediate
E Periodic/Phase
F Special
G Unscheduled
H Postflight
J Emergency
K Normal
L Weekly
M Quarterly
N Semiannually
P Monthly
Q Calendar (Other)
R Overhaul Cycle (Scheduled)
S Through Flight

LEVEL

This code indicates the level of maintenance being performed during this task and is used to identify manhours required for different levels of organizations.

A Organizational with Intermediate Assist
B Intermediate with Organizational Assist
C Operator/Crew
D Depot
F Intermediate
H Intermediate with Depot Support
L Specialized Repair Activity
O Organizational
R Organizational with Contractor Assist
T Intermediate with Contractor Assist
X Not Applicable
Y Contractor at Organizational Level
Z Contractor at Intermediate Level

AIRCRAFT OPERABILITY

This code identifies the impact the maintenance event has upon the availability of the aircraft.

A Aircraft not available for scheduling
B Aircraft available for scheduling during event
M Event for Mission Reconfiguration
T Servicing Task
Y Off Equipment Maintenance (no effect on Availability)

MAINTENANCE LOCATION (See location codes on 100 Card)

WORK UNIT CODE

These codes can be up to 13 characters in length. They are weapon system specific and are published in weapon system maintenance and supply manuals. The Army WUC's do not follow the outline used by the Air Force and Navy and are not used to indicate events, only components. The WUC outline used for the AH-64 is provided as "typical".

00 Whole Aircraft
02 Airframe Structure
03 Landing Gear
05 Rotor System
06 Drive System
07 Hydraulic System
08 Instrument System
09 Electrical System
10 Fuel System
11 Controls Installation Mechanical
12 Utility Systems
13 Environmental Control
14 Armor Installation
15 APU (airborne)
18 External Stores
19 Avionics
24 Engine
30 Armament Subsystem
31 Fire Control Subsystem
32 HELLFIRE Subsystem
33 TADS
34 PNVS
35 Other Weapon Systems
38 Symbol Generation Subsystem
39 IHADSS
43 Peculiar Ground Support Equipment

POSITION CODES

These 2 digit numeric codes are weapon system peculiar and typically divide the aircraft into as many as 99 different top, bottom, left, right, sections and compartments.

FAILURE CODES

These 3 digit numeric codes are compatible with the Air Force's HOW MALFUNCTION CODES and the NAVY'S MALFUNCTION DESCRIPTION CODES.

MOS CODES

These 3 digit codes identify the skill identifier of the person performing the work.

TASK ELEMENT CODES

These 2 digit codes identify the task being times into categories of direct and indirect labor groups.

10 Unscheduled Actions
11 Preparations (set-up)
12 Fault Isolation
13 Obtain Time (time required to obtain parts, etc)
14 Fault Correction
15 Adjust/Calibrate
16 Checkout (operational checks)
17 Technical Inspection
18 Clean-up
20 Scheduled Actions
21 Preparations (set-up)
22 Performance of operational checks (Preflights, HIT checks, Postflights, etc)
23 Cockpit Procedures (Run-up)
24 Performance of Scheduled Non-operational checks
25 Performance of Scheduled Adjustments/Calibrations
26 Checkout of Scheduled Maintenance Events
27 Technical Inspection of Scheduled Events
28 Clean-up
30 On Condition Maintenance Actions
32 Fault Isolation
34 Fault Correction
35 Adjust/Calibrate
36 Checkout
37 Technical Inspection

TASK ACTION CODES (See Function Codes above)

DELAY CODES

1 Supply
2 Administrative
3 Weather
4 Other Military Duties
5 Personnel
6 Support/Test Equipment
7 Deferred
8 Tools
9 Improper Diagnosis

SUPPORT EQUIPMENT CODES

These codes are test specific and are used to indicate the use of tools and equipment in the accomplishment of the task.

EVALUATON CODES

These codes are test specific and are used to indicate the sufficiency of: Training received, Accuracy of Technical Data, Proper Level of Assigned Task to Skill Level, Proper Task for MOS, Procedures as given in Technical Data, and APU/Ground Support Equipment.

FOR USE WITH 300 CARD

ITEM CLASSIFICATION CODES

These single digit codes are test specific and are used to identify major end-item components (typically by contractor) such as Airframe, Engine, Support Equipment from which components are removed.

WORK UNIT CODES (See WORK UNIT CODES on 200 Card)

POSITION CODES (See POSITION CODES on 200 Card)

FAILURE CODES (See FAILURE CODES on 200 Card)

PART CONDITION CODES

These single digit codes are test specific and are used to show the condition of a removed part. Used to distinguish between parts removed for failure or other test causes.

PART DISPOSITION CODES

These single digit codes are test specific and are used to track the disposition of the removed part. This code helps identify disposable parts, parts sent to contractor for repair/analysis, etc.

FOR USE WITH 400 CARD

PROFILE CODE (See PROFILE CODE on 100 Card)

LOCATION CODE (See LOCATION CODE on 100 Card)

WORK UNIT CODES (See WORK UNIT CODES on 200 Card)

POSITION CODES (See POSITION CODES on 200 Card)

DATA SOURCE CODES
These 2 character codes are test specific and are used to indicate the source of Diagnostic/recorded data.

FOR USE WITH 500 CARD

The 500 card is the Narrative card for use with any other card and does not use any coded data items.

FOR USE WITH 600 CARD

LOCATION CODES (See LOCATION CODE on 100 Card)

READINESS CODES
These 4 character codes are Army standardized codes used to indicate the readiness of equipment.

NMCS	Not Mission Capable Supply
NMCM	Not Mission Capable Maintenance
PMC	Partly Mission Capable
FMC	Fully Mission Capable

Appendix C: 3-M Data Item Codes

FOR USE WITH SAF

SUPPORT ACTION CODES

010	Operational Support of Flight Operations
011	Ground Handling
012	Servicing
013	Mission Configuration
014	Ground Safety
015	Troubleshoot Launch Aircraft
016	FOD Prevention
030	Maintenance Inspections
031	Preflight/Postflight/Turnaround Inspections
032	Daily Inspections
040	Corrosion Inspections
041	Airframes
042	Engines
043	Propeller/Rotor Dynamic Components
044	Support Equipment
045	Electronics
046	Photographic
047	Armament
048	Safety/Survival
049	Preservation/Depreservation
050	General Functions
051	Wheel and Tire Build-up/Teardown
052	Check/Test/Service
060	Propulsion System Support
061	Quick Engine Change Kit Build-up/Teardown
062	Propeller/Rotor Head Build-up/Teardown
063	Engine Test Stand Operation
070	Mission Shop Support
071	Processing of Armament
072	Sonobuoys/Chaff, etc
073	Tape/Film
080	Inspection of Aviators Equipment
081	Check/Test/Repack Parachutes
082	Check/Test/ Service Flotation Equipment
083	Check/Test/Service Personal Equipment
084	Check/Test/Service Oxygen Equipment
090	Nonaeronautical Work

FOR USE WITH VIDS/MAF

ACTION TAKEN CODES

1-9 BEYOND CAPABILITY OF MAINTENANCE (BCM)
There are 9 codes which are used to indicate why work was not performed.

A Checked No Repair Required
B Repair of Item Without WUC
C Repair
D Work Stoppage
F Failure of Item Undergoing Check/Test
J Calibrated No Adjustment Required
K Calibrated Adjustment Required
L Work Stoppage Awaiting Parts
P Removed
Q Installed
R Remove and Replace
S Remove and Reinstalled
T Removed and Replaced for Cannibalization
Y Troubleshooting
Z Corrosion Treatment
Ø (zero) Visual Inspection

TIME/CYCLE PREFIX CODES

These single character alphabetic codes are used to prefix entries which describe the operating life of a component or end item. (Where SEDS or RAM/LOG would use separate blocks for hours or rounds fired, 3-M would use the same block just different prefixes).

TYPE MAINTENANCE CODES

A General Support (used on SAF only)
B Unscheduled Maintenance
C Preoperational/Prelaunch Inspections (SAF only)
D Daily, Preflight
E Acceptance/Transfer Inspections
F Transient Maintenance
G Phase Inspection
J Major Engine Inspection
K Special Engine Inspection
L Local Manufacture/Fabrications for nonaero material
M Hourly Special Inspections
N Cycle/Event Special Inspections
P Calendar based Inspections
Q Calendar based "Even" Inspections
S Conditional Inspection
T Supply Support
U Reclamation and Salvage

MALFUNCTION DESCRIPTION CODES

These three digit codes are compatible with the SEDS HOW MALFUNCTION CODES and the RAM/LOG FAILURE CODES.

WORK UNIT CODES

These 7 digit codes are used to identify aircraft system components and follow the same outline (first 2 digits) as the SEDS WUC's.

AWAITING MAINTENANCE REASON CODES

These single digit codes are similar to the DELAY codes used by SEDS and RAM/LOG.

1 Lack of Support Equipment
2 Lack of Facilities
3 Backlog
4 Off-Shift Hours
5 Other
6 Awaiting Intermediate Maintenance Support
7 Flight Operations conflict
8 Awaiting Other Shops or Support

TYPE EQUIPMENT CODES

These 4 character codes identify Navy end-items by category/type/model/series designations (see Appendix Q of OPNAVINST 4790.2E for code matrix.

WHEN DISCOVERED CODES

A Before Flight-Abort-Aircrew
B Before Flight-No Abort-Aircrew
C In Flight-Abort
D In Flight-No Abort
E After Flight/Between Flights
F Weekly Inspection
G Acceptance/Transfer Inspection
H Between Flights Ground Crew
J Daily Inspection
K Preflight, Daily, Postflight, Turnaround
L Special Inspection
M Calendar Odd/Phase Inspection
N Calendar Even Inspection
O Administrative
P Functional Checkflight
Q Conditional Inspection
R Quality Assurance Inspection
S Oil Analysis
U Modification/Standard Depot Level Maintenance
V Related Maintenance Action

WHEN DISCOVERED CODES (cont)

W In-Shop Repair/Disassembly for Maintenance
X Test Bench/Engine Test Stand Operation
Y Receipt or Withdrawal from Supply

Appendix D: Technical Review Letters

The following letter was sent as a cover letter to a person involved with test and evaluation, R & M data from each service. The cover letter is then followed by each of the service's representatives responses.

Cpt Donald L. Scantlan 10 Apr 91
Air Force Institute of Technology
AFIT/LSG
Wright-Patterson Air Force Base, OH 45433

Subject: Technical Review of thesis comparing SEDS, RAM/Log, and 3-M MDS.

To: Representatives of each service.

1. Per our recent phone conversation your assistance is requested in reviewing the enclosed thesis.

2. The purpose of the thesis is to create a single source document for use by weapon system acquisition personnel to assist them in reading test and evaluation reliability and maintainability data as collected by other services.

3. The methodology of the thesis compares the data elements and data items as defined in each of the services' official publications and classifies them as compatible, incompatible, unique to, or not collected by one service.

4. Your comments are solicited in three areas:

a. Accuracy: Are the tables, which classify the data elements and items, accurate in your opinion and from your point of view as someone familiar with your services R & M data? The standard of compatibility is whether the test data, as collected by other than your service, is sufficient to use with the normal algorithms and logistical analysis methods which you would use in weapons system evaluation. The prime concern is whether the test data as collected by another service is sufficiently compatible to prevent additional testing from being required by your service.

b. Utility: If you were placed in a position of having to make program decisions/recommendations based on R & M data collected by other services, would this document be of use to you?

c. Distribution Recommendations: In what publication(s) would you like to see these tables published?

5. To document your recommended changes, please make pen and ink changes to the thesis as you suggest the change should read, and attach reference/justification supporting the recommendation, if appropriate. It is only necessary that you return those pages on which you recommend changes.

6. Please return the recommendations along with a letter stating your current job title, job responsibilities, office address and office phone no. before 17 May 1991.

7. Again, thank you for your assistance.

Donald L. Scantlan
CPT, AV
Author

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AERONAUTICAL SYSTEMS DIVISION (AFSC)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-6503

ASD/VXES

REPLY TO ATTN OF

SUBJECT Review Of CPT Donald Scantlan's Thesis Comparing Government Flight Test Data Collection Systems

TO Captain Donald Scantlan
Air Force Institute of Technology
AFIT/LSG
Wright Patterson AFB, Oh 45433

1. I found the draft of your thesis to be very informative and useful. I have taken a copy of the draft to my Home Office at their request after discussing it with them. They are reviewing our Air Force SEDS system and see your thesis as a potential source of information. We in the Special Operation Forces SPO are in the process of trying to convert Navy R&M requirements into Air Force R&M requirements. I have not found any direct relationship between the Navy output and Air Force output. As a result, I am planning on having a program written to take the raw Navy data and to get Air Force output. Your cross-reference tables are just what I have been looking for to complete this job.

2. As far as I can tell, the SEDS information is correct and accurate. It will be interesting to see if we can use the Navy raw data as I hope to get my Air Force results. I assume that I may need to make some assumptions to fill in the blanks.

3. I don't have any suggestions on what publication or which office to pass this thesis to other than your AFIT thesis advisor and the staff personnel for the three services.

4. Thank you for letting me review your thesis, and it is particularly timely for the CV-22 program. If I can be of further assistance, call me at (513) 255-4551 or DSN 785-4551.

James A Strohm
Lead R&M Engineer
SOF SPO

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY AVIATION SYSTEMS COMMAND
4300 GOODFELLOW BOULEVARD, ST. LOUIS, MO 63120-1798

REPLY TO
ATTENTION OF

15 May 1991

AMSAV-QR (750)

SUBJECT: Technical Review of Thesis Comparing SEDS, RAM/LOG, and 3-M MDS

Captain Donald L. Scantlan
Air Force Institute of Technology
AFIT/LSG
Wright-Patterson Air Force Base
Ohio 45433

1. Reference letter, AFIT-LSG, Wright-Patterson AFB, 10 Apr 91, SAB.

2. I have reviewed subject thesis and have made several notes, most of which concern man-hour definitions. I have just went through a major effort justifying MMHR/FHR requirements for LH because the OSD analysts (ex-Air Force) were accustomed to time card man-hours vs our direct hands-on and they liked the big numbers generated by the contractor time card system at Fort Rucker rather than Sample Data Collection (SDC) man-hours.

3. Air Force and Navy personnel have told me they do not use man-hour data, because it is more of a total manpower accounting system rather than representative of hardware maintenance requirements.

4. I was somewhat surprised that the Navy and Air Force use SEDS and 3-M for T&E data collection. I thought they would have specialized test data collection programs.

5. Your cross references on data elements could be very helpful when using another services data.

6. I have been on a subcommittee of the Joint Propulsion Coordinating Committee looking at sharing of engine maintenance data. We have recommended that the Joint Logistics Commanders (JLC) sponsor further efforts and develop a simple users guide for each service's data base. Also, the G-11 Reliability Subcommittee of the Society of Automative Engineers (SAE) are working on common RAM definitions. Your thesis would be helpful to both these efforts.

7. Additional information can be obtained from Mr. Roger P. Hoffman, Chief, RAM Division, AMSAV-QR, DSN 693-1758 or commercial 314-263-1758.

Encl

ROGER P. HOFFMAN
Chief, RAM Division
Directorate for Product Assurance

TABLE 15

COMPATIBLE DATA ELEMENTS

SEDO	ROMALOG	3-M MDS
# Landings	# Landings	# Landings
Acft Ser #	Acft #	Bureau #
Acft Status	Acft Status	Acft Status
Action Taken	Maint Task Functn	Action Taken
Activity ID	Unit ID Code	Action Org
BITE Indication	BITE Codes	Fault Isolation
Corrective Action *	Corrective Action *	Corrective Action*
Date (YYMMDD)	4 digit julian	4 digit julian
Delay Reason	Delay Reason	AWM Reason
Discrepancy *	*Discrepancy	Discrepancy *
Engine Posn No.	Position Codes	Position Codes
Engine Start/Stop	Eng Recorder Reading	Eng Operating Hrs
Failed Item	Maint Subject	Failed Material
How Malfunction	Failure Codes	Malf'n Description
Maint Level (O,I,D)	Maint Level (O,I,D)	Maint Level(O,I,D)
Manufacturer *	Manufacturer *	Manufacturer *
Misn Objective *	Profile Codes	Misn Reqmnt Codes
Noun of Item *	Noun of Item *	Noun of Item *
Part # & NSN	Part # & NSN	Part # & NSN
Pilot's Name *	Crew Data (coded)	Crew Names *
Requisition #	Requisition #	Requisition #
Service WUC's	Type Service	Service WUC
Subsystem Name *	thru WUC	thru WUC
Take off time	Hours Flown	Mission Hours
Task Time (service)	Service Time	Man Hours (SMF)
Test Peculiar-ities Questions	Test Peculiar-ities Fields	Test Peculiar-ities Flags
Time to Fail	Time since ...	Time Prefix Codes
Type Maint	Maint Task Interval	Type Maintenance
Type Mission	Profile	Misn Requirement
When Disc (date)	When Disc (date)	When Disc (date)
When Discovered	When Discovered	When Discovered
Work Unit Codes	Work Unit Codes	Work Unit Codes

* This element is entered in Narrative form

Block 18 Ramlog Form 1249 Rec Take off time Block 15 Hobs Hrs. flown

Not the same take off time & landing time could yield Hrs flown

Block 35 Form 1249 Service time gives clock hours - Combined with Block 34 will yield Man hours

TABLE 16

DATA ELEMENTS NOT COLLECTED BY ONE SERVICE

SEDS	RAM/LOG	3-M MDS
Acft Type	N/C	Type Equipmnt Code
Msn Effectiveness	Profile Result	N/C
Reliability Code	Malfunction Effect	N/C
Discrepancy #	Control #	N/C
Altitude	Altitude	N/C
Work Center	N/C	Work Center
Item Identification	N/C	Type Equipmnt Code
AFSC	MOS	N/C
Task Strt/Stop Time	Task Strt/Stop Time	N/C
Tech Order Data	Tech Manual Data	N/C
Tools/AGE Safety	Tools, GSE Evaluation	N/C
N/C	PIC for Maintainer	Maintainer
N/C	Acft Status Change-date/time	Acft Status Change date/time
N/C	# Passengers	# Passengers
N/C	Cargo Weight	Cargo Weight

TABLE 17

DATA ELEMENTS UNIQUE TO ONE SERVICE.

Data Elements Unique to SEDS:

When Discovered (time)
Federal Supply Classification: (this code is common to all services but only the Air Force enters it into the data base)
Category of Labor
Circuit Symbol

Data Elements Unique to RAM/LOG:

Acft Status Change: (by event)
Acft Status start/stop time (detailed by event)
Test Location (by event)
Maintenance Location (by event)
Climatic Condition
Temperature
# of Engine Starts
Hours Run-up
Consumables Used

WHEN DISCOVERED CODES (used by the pilot on the AFFTC 300 see also WHEN DISCOVERED CODES Used on AFSC 258)

1 Start and Taxi
2 Taxi
3 Take-off and Acceleration
4 Climb
5 Cruise
6 Combat and Weapons Delivery
7 Return
8 Traffic Pattern and Landing
9 Taxi and Shutdown

FOR USE WITH AFSC TURN 258

WHEN DISCOVERED CODES

These codes are taken from the appropriate weapon system -06 T.O.. They are somewhat homogeneous between weapon system, however variations do exist. There are approximately 30 different one character alpha/numeric codes to identify when a discrepancy is discovered. A representative sample of when discovered codes follow.

A Before Flight-Abort-Aircrew
B Before Flight-No Abort-Aircrew
C In-Flight-Abort
D In-Flight-No Abort
E After Flight-Aircrew
F Between Flights-Ground Crew (not assoc. w/inspection)
G Ground Alert Not Degraded
H Basic Post-Flight
J Pre-Flight inspection
L During Training or Maintenance on equipment used in training
M Phased Inspection
N Ground Alert Degraded
P Functional Check Flight
Q Special Inspection
R Quality Control Check
S Depot Level Maintenance
T During Scheduled Calibration
U Oil Analysis
V During Unscheduled Calibration
W In-Shop Repair/Disassembly for Maintenance
X Engine Test Stand Operation
Y Upon Receipt or Withdrawal From Supply
Z Eddy Current
1 Magnetic Particle

15 May 1991

From: R. Fuller RW81B
To: CPT D. Scantlan

Subj: Technical Review of Thesis

1. Mr. Don Williams of V-22 R&M asked me to look at your thesis due to my involvement with developing a "Tri-Service" maintenance data base. This data base was developed for use as a trending and "quick look" tool for the V-22 logistics community. In developing the data base I looked at the various maintenance data collection systems used by the U.S. Army, USAF, and the Navy's 3M system.

2. In general I agree completely with your arguments and findings, especially in the recommendation that the three services should use the same WUC and related items. The information presented is, to the best of my knowledge accurate. However, there are a few points that I feel should be investigated further.

a. Table 14, Compatible Data Elements, identifies numerous data elements that are in fact totally compatible. It also identifies other elements that are comparable but not compatible. Specifically, When Discovered codes, Malfunction codes and Action Taken codes. These codes are all used the same but the specific codes are not the same for the same noun action. A when discovered code of A in the USAF system does not always (or actually very often) mean the same thing as an A code in the Army or Navy. The same is true with the other data elements that I mentioned above. This causes great difficulty for translating the findings of one service into the language of another service. This was, I think, one of the problems involved in the cost and time required by CPT Jackson with using the V-22 data.

b. At a recent meeting of the Joint Propulsion Coordinating Committee, Maintenance Data Collection subcommittee, here at NATC a brief was presented on a new publication that the SAE will soon have out that deals with terms and definitions. The number is SAE ARD50010 and it has 325 preferred terms and 44 parameters most of which deal with R&M issues. This could be of interest to you if it is available in time.

3. The document would, by virtue of the tables provided by of high utility for me if I had to perform R&M analyses based on other services input data.

4. Distribution: The tables, following review of the recommendations

above, should be made part of the NAVAIR R&M guides and the other services equivilant.

3. I am sorry that this will not reach you by the deadline that you requested.

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Vita

Captain Donald L. Scantlan was born on 7 November 1956 in Ft. Smith Arkansas. He graduated from New Caney High School in New Caney, Texas in 1974. He enlisted in the U. S. Army in January 1975. He graduated Officer Candidate School in 1982. He received the Bachelor's Degree in Professional Aeronautics from Embry Riddle Aeronautical University in 1987. He is a graduate of the Army's Transportation Officer Basic and Advanced Courses, Aviation Officers Advanced Course, Combined Arms Services Staff School, Command and General Staff Course, and holds a certificate in Research, Development, Test, and Evaluation Management from the Army Logistics Management College/Association for Systems Management. His officer assignments include two assignments to the Army's Special Operations Aviation Group as both a tactical pilot and as a maintenance test pilot. He has also served as a Test and Evaluation Project Officer with the Aviation Development Test Activity where he managed several developmental tests and a special study of Army Aviation Maintenance procedures. While assigned to the 160th Special Operations Aviation Group, he was involved with operations "Prime Chance" and "Just Cause".

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13. ABSTRACT (Maximum 200 words) This study was conducted to create a single source document which could be used by test and evaluation personnel involved in joint programs for translating reliability and maintainability terms. The comparison begins by describing the forms, data elements, and data items, as collected by the Air Force's System Effectiveness Data System, The Army's Reliability, Availability, Maintainability/Logistics System, and the Navy's Maintenance and Material Management, Maintenance Data System. The "Findings" paragraph is a stand-alone document which could serve as a translating dictionary for reliability and maintainability data elements between the different services' data systems. Upon conclusion of this study several recommendations were made. 1. The Army should adopt the Work Unit Code structure of MILSPEC MIL-M-38769C. 2. The services need to agree upon the length of the Work Unit Code. 3. The services should establish a minimum set of collected data elements and items. 4. The services should publish an agreement on reliability, availability, and maintainability data elements and items for test and evaluation. Additionally, it was noted that the major differences in data collection methodology is the Army's use of independent data collectors for improved data accuracy.

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