

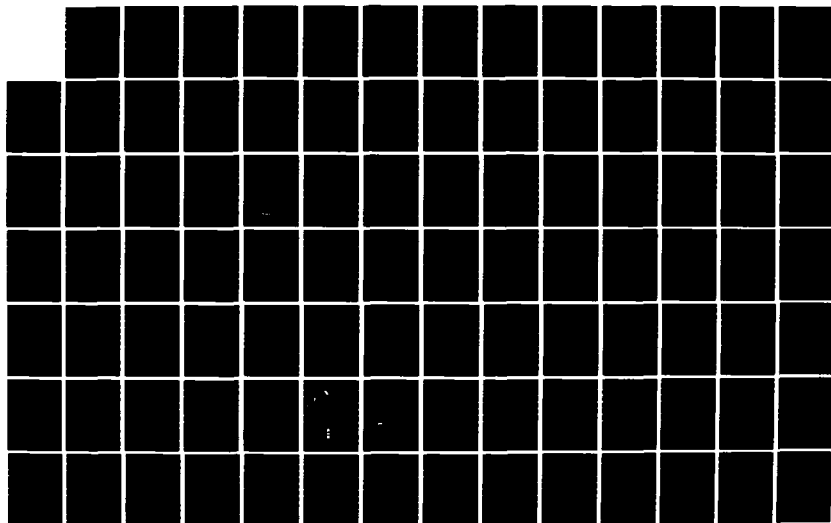
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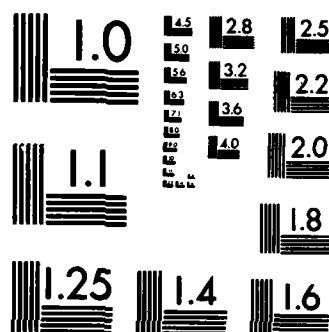
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TR-8402-1

**SKILL TRAINING ANALYSIS:
AN EXAMINATION OF DOD-WIDE TRAINING
AND MAINTENANCE DATA SYSTEMS**

By:

Rodney D. McConnell
Carolyn G. Jones

15 July 1985

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Prepared For:

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Contract Number: MDA903-84-C-0166

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PREFACE

Management Consulting & Research Inc. (MCR) is providing support to the Office of the Assistant Secretary of Defense (OASD) for Manpower, Installations and Logistics under contract number MDA903-82-C-0166 for the examination of skill training. MCR reports in this area will assist in the evaluation and support of Service training programs.

This technical report is a contract deliverable that documents Service training and maintenance data systems. This report provides descriptions of system data elements and sources of data, examines data utility for analyses of training and maintenance, and identifies areas where improvements could be made to assist in the analysis of training. The intent of the research documented in this report is to assist the Defense Training Data and Analysis Center (TDAC), under the auspices of the OASD for Manpower, Installations and Logistics.

We would like to acknowledge the continuing guidance and assistance of Mr. Gary Boycan of the Training Policy Directorate. Also, the review of our work by members of the TDAC has been particularly helpful. The assistance and cooperation of members of the Service staffs, subordinate commands, and unit-level personnel is greatly appreciated.

EXECUTIVE SUMMARY

This summary includes the study purpose, organization of this report, conclusions and recommendations.

A. STUDY PURPOSE AND REPORT ORGANIZATION

The purpose of this study was to analyze DoD-wide unit-level training and maintenance data systems. We examined the operation of the Military Services' systems that document individual skill training and maintenance performance. Our study included three tasks:

- analyze unit-level Navy aviation training and maintenance data systems,
- analyze unit-level Marine Corps aviation training and maintenance data systems, and
- analyze Army and Air Force unit-level training and maintenance data systems.

This report contains five sections. Section I, Introduction, describes the purpose, background, approach, and organization of this report. Section II, Air Force Data Systems, describes Air Force training and maintenance data systems. Section III, Army Data Systems, describes Army training and maintenance data systems. Section IV, Navy and Marine Corps Data Systems, describes Navy and Marine Corps training and maintenance data systems. Section V, Conclusions and Recommendations, describes the conclusions we reached concerning each Service's data systems and contains some recommendations for improvement.

Exhibit ES-1 is a summary of the data systems we examined. It lists each system by name, acronym, control point, and general attributes.

<u>SYSTEM TITLE (SERVICE)</u>	<u>ACRONYM</u>	<u>CONTROL POINT</u>	<u>GENERAL ATTRIBUTES</u>
The Army Maintenance Management System (Army)	TAMMS	Logistic Management Center	Maintains Army Maintenance Data
Army Training Requirements and Resources System (Army)	ATRS	Training Directorate, ODCSOPS, HQ DA	Maintains Army Course Level Training Information
Maintenance Performance System (Army)	MPS	Army Research Institute	Provides Training Needs Information at Unit Level (test system)
Maintenance Data Collection System (Air Force)	MDC	Air Force Data Systems Design Center	Maintains Air Force Base Level Maintenance Data
Maintenance Management Information and Control System: Training Management Subsystem (Air Force)	MMICS	Air Force Data Systems Design Center	Maintains Air Force Base Level Training Information
Air Force Pipeline Management System (Air Force)	PMS	Air Training Command	Maintains Air Force Course Level Training Information
Aviation Maintenance Material Management System (Navy)	Aviation 3-M	Naval Air Systems Command and Navy Maintenance Support Office	Maintains Navy and Marine Corps Aviation Maintenance Data
Navy Integrated Training Resources and Administration System (Navy)	NITRAS	Chief of Naval Education and Training	Maintains Navy Course Level Training Information

Exhibit ES-1. SUMMARY OF SERVICE TRAINING AND MAINTENANCE
DATA SYSTEMS EXAMINED

B. CONCLUSIONS AND RECOMMENDATIONS

Our study of Service training and maintenance data systems examined each Service's training system(s) and maintenance system(s). We endeavored to look at the systems used at the unit level as well as overall Service systems; generally, these were the same. We documented sources of data, data elements, and sample reports for use in analytical efforts. We also described some of our analytical approaches and utility of Service data systems for analyses. The following are the conclusions and recommendations we made concerning the use of Service systems for analytical purposes.

Our conclusion concerning Air Force training and maintenance data systems is that they lend themselves readily to the analysis of maintenance-related training. We developed linkages between training and maintenance and showed how such analyses could be performed. We recommend improvements to maintenance data collection that could benefit the current system and assist analysis at the wing level. The first would be the entry of employee number for all maintenance crew personnel in the maintenance data collection system. This would allow direct and precise measurements of training and productivity for individuals and work centers. A second improvement would be a greater use of component level designation for maintenance reporting rather than system or subsystem designation. This would allow more refined analyses to be performed and would more precisely define that work is being done.

Our conclusion concerning Army training and maintenance data systems is that they do not support analyses of maintenance-related training as currently configured. However, the Army central training data system, the Army Training Requirements and Resources System (ATRRS) does provide some information which is useful for other analytical purposes. For example, The Army Program for Individual Training (ARPRINT), which specifies detailed course and class information, can be used for comparison with available resources by Army staff agencies. The Military Manpower Training Report (MMTR) input report is a particularly useful report since it provides summary detail, by category of training, including inputs, outputs, and training loads. The MMTR input report can also be used for comparative purposes with available training resources at a higher level of aggregation, such as total Army initial skill training. The current maintenance data base, The Army Maintenance Management System (TAMMS), does not provide information useful for evaluating maintenance performance related to individual skill training. Because the ability to identify and track individuals is central to any methodology for relating maintenance performance to training, TAMMS data are not appropriate for training analysis. The upcoming Standard Army Maintenance System (SAMS) is also not designed for training analysis purposes; no information that identifies individuals is included in this system. The system, however, is still in preliminary implementation stages. Data elements could be added to the system. The possible inclusion of

the Army Research Institute (ARI) developed Maintenance Performance System (MPS) within SAMS would allow training/productivity analyses to be developed. Even if individual identification were not included in the system, the improvements in accuracy and level of detail over the TAMMS data base could be of benefit for training/productivity analyses.

We do not have any specific recommendations concerning Army data bases. Our general observation is that current Army efforts may provide analytical benefits in the future.

Our conclusions concerning Navy and Marine Corps data are as follows:

- Navy and Marine Corps maintenance data is centrally maintained, is easily accessible, and can be requested in usable, standard formats in support of analytical efforts.
- Navy training data is maintained centrally on all course data; it is easily accessible, and can be requested in standard report formats. The files are particularly useful in providing workload data for examination of resource levels (e.g., instructors). The central training files do not provide individual training data--this must be obtained at the installation level, similar to the Air Force but with one main difference--it is not automated.
- Marine Corps training data is maintained centrally by the Office of the DCS Training, Headquarters USMC. The Training Input Plan (TIP) contains overall training loads by skill area. "Training Tracks" or "pipeline" information is similarly maintained.
- A difficulty with examination of Navy individual training status is a lack of consolidated "pipeline" information on specific skills. MCR developed the pipeline for aviation electronic technicians. Others would have to be developed similarly for any skill level analyses.

We recommend that specific efforts be undertaken in order to improve the use of these data for analytical purposes. These efforts should include the following:

- Establish linkages between specified skills and related maintenance actions for Navy aviation. Once these linkages are established, the resulting information can be used to support resources for individual training and can be used to measure effectiveness of training.
- Build resource models for examination of requirements in support of workload for training. Navy data is readily available to support this effort. It would support the analytical work and related budgetary impact for OSD and the TDAC.
- Develop "pipelines" for Navy maintenance skills similar to the example developed by MCR. These pipelines are needed for any analyses of resources for maintenance or non-maintenance skills. Also, the assessment of maintenance and training linkages requires this same information. The necessary information is available.

C. OBSERVATIONS

Our study effort brought us into close contact with Service users of the systems we describe as well as made us aware of the intricacies of the data systems themselves. The following comments are directly related to our work and are included here as observations with no conclusions or recommendations made concerning them.

- The reporting accuracy of the data in Service maintenance data bases has been questioned by some analysts. This comment is primarily directed at the Air Force and Navy systems since they allow for "time" to be documented in terms of workhours expended for specified maintenance tasks. Also, both systems account for maintenance actions by category as well as on what subsystem/component work was performed. This latter data element is also open to question as to accuracy in documentation. No attempt was made in our

research to ascertain the general accuracy of data reporting. However, this matter is of concern since it affects the use to which the data can be put. A general observation is that there appears to be considerable pressure at the installation level to account for each job performed both in terms of what was done and how long it took to do it. Similarly, gross errors are easily detected and usually are found and corrected. Small errors in time accounting are unlikely to be detected since there is no method for doing so. Errors in component documentation would be detected and are unlikely to occur since supervisors use these entries for a variety of management reports such as the "high 10" and "high 20"--these are component listing reports for those components most prone to repair. Consequently, the highest error rate is probably found where exact repair time is desired for data analysis. Repair time is usually an approximation based on start and finish time, but delays due to awaiting parts, etc. are not noted. Where the research uses a large number of work actions, as in our analyses, the average time of repair is presumed to be a fair approximation. In summation, the issue of whether the data files accurately represent what actually occurs during maintenance is not easily answered. In general, it appears they do but it is fairly certain that not all entries are correct. Future analytical work might focus on this aspect of the system data. Short of a physical survey of relevant work centers it is doubtful if any other observation can be made.

- The relationship of maintenance productivity to training is a research subject that is addressed in several previous reports and to a lesser extent in this report. Broadly speaking, we defined productivity as measured by the amount of time in workhours needed to complete a specific maintenance action. This was an easy way to approach the problem since the data systems specifically provide that information. Other, more difficult to obtain, measures or ones for which the data appeared to be less useful were the use of pass/fail indicators on quality assurance inspections and the used of "retest okay" (RETOK) data--parts returned as faulty that upon further test (at depot level) were found to be without fault.

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I. INTRODUCTION

This section discusses the following:

- Purpose,
- Background,
- Approach, and
- Organization of this Report.

A. PURPOSE

The purpose of this study was to analyze DoD-wide unit-level training and maintenance data systems. Specifically, we have documented selected Air Force, Army, Navy, and Marine Corps training and maintenance data systems. The study consisted of three tasks:

- analyze unit-level Navy aviation training and maintenance data systems,
- analyze unit-level Marine Corps aviation training and maintenance data systems, and
- analyze Army and Air Force unit-level training and maintenance data systems.

These tasks were completed by accomplishing the following research:

- choosing appropriate organizations for examination of supporting data systems,
- examining maintenance and training system data elements and system operation,
- describing the data elements and sources of information,
- analyzing data availability and utility, and
- identifying those areas where changes should be made to provide better or improved analytical support for both Service and DoD-wide usage.

B. BACKGROUND

The Office of the Secretary of Defense (OSD) has issued policy guidance that manpower impacts will be considered in system design and operation. This consideration requires both OSD and the Services to develop improved methods for evaluating manpower, personnel, and training. The analysis of critical skills, particularly the impact of required levels of maintenance skills on quality of maintenance, is a key factor in these evaluations. Individuals required to operate and maintain weapon systems reach the journeyman level through individual training conducted at the installation level.

Due to a growing concern for the problems in maintaining and operating existing weapon systems, a comprehensive review of training was initiated by the OSD Training Directorate. Some initial work has been completed concerning how weapon system support can be improved with better training. In an earlier report,^{1/} OSD described existing on-the-job training (OJT) programs and proposed ways to enhance training, especially OJT, in order to improve equipment maintenance. Subsequently,^{2/} OSD provided an overview of the systems developed to train individuals in selected maintenance skills. The latter report

^{1/} Report on the OJT Study Task: On the Job Training in the Department of Defense, OASD(MRA&L) under the auspices of the Defense Education and Training Executive Committee, January 1981.

^{2/} Report on Individual Skill Training: Maintenance Training in the Department of Defense, OASD(MRA&L), May 1982.

covers the entire training plan, from initial skill training in formal schools to individual skill training received at the unit level. Based on these study efforts, and in support of the OSD Training Directorate, MCR completed an analysis to develop a linkage between individual training conducted at the installation level and unit productivity.^{3/} Additional research concentrated on Air Force F-16 unit level training, maintenance productivity, and use of maintenance simulators.^{4/} The research accomplished in our previous studies provided a firm basis for our current research.

C. APPROACH

MCR studies have developed information concerning maintenance and training systems. This current project expands on our previous work by examining and documenting Air Force, Army, Navy, and Marine Corps:

- training data systems,
- maintenance data collection systems,

^{3/} Rodney D. McConnell et al., Skill Training Analysis: The Linkage of Unit Level Skill Training and Unit Productivity, TR-8202-1, Volume I, and Skill Training Analysis: An Examination of the Navy Pipeline Management System, TR-8202-1, Volume II, Management Consulting & Research, Inc., 14 June 1983.

^{4/} Rodney D. McConnell and Stuart C. Johnson, Skill Training Analysis--Phase II: The Linkage of Unit Level Skill Training and Maintenance Productivity in Air Force F-16 Units, TR-8302-1, Management Consulting & Research, Inc., 13 April 1984.

- data element availability and utility, and
- areas for improvement.

D. ORGANIZATION OF THIS REPORT

Following this introduction are four other sections of the report:

- Air Force Data Systems,
- Army Data Systems,
- Navy and Marine Corps Data Systems, and
- Conclusions and Recommendations.

Section II, Air Force Data Systems, discusses the Air Force training data systems and the Air Force Maintenance Data Collection system. Section III, Army Data Systems, discusses Army training data systems and the Army maintenance data system. Section IV, Navy and Marine Corps Data Systems, discusses the Navy and Marine Corps systems for maintaining training information and aviation maintenance information. Section V, Conclusions and Recommendations, discusses the utility for analyses of Service data systems and recommends specific efforts for improvement that would assist DoD analytical efforts. References are provided in Appendix A and Abbreviations in Appendix B.

II. AIR FORCE DATA SYSTEMS

This section discusses Air Force data systems that can provide information for analyses of training and related maintenance effects. The topics addressed are the following:

- Air Force Training Data Systems,
- Air Force Maintenance Data Collection System, and
- Summary of Analysis.

A. AIR FORCE TRAINING DATA SYSTEMS

The Air Force has two systems for accounting for Air Force training, both of which are discussed in this subsection. The Maintenance Management Information and Control System (MMICS) training subsystem is used at the unit level. The Pipeline Management System (PMS) is used at Air Training Command (ATC) for keeping track of all Air Force training.

1. Unit-Level Training Data System

The Air Force conducts a significant amount of formal individual technical training at the unit level. This training is provided by ATC through the means of Field Training Detachments (FTDs) located at most Air Force installations where major units (wings) are stationed. Information on courses conducted, individual training status, and scheduled training are contained in the training subsystem of the MMICS. The MMICS is operated and maintained at the wing level. Higher headquarters (Major Command and HQ USAF) do not have access to the system. The data are very useful at the wing level for determining the type of

individual training that is needed, and for programming the training. Wing-prepared monthly reports are provided to the Major Command (MAJCOM) that include courses, number of attendees, and training backlog.

The wing-level training provides skill-specific maintenance courses that are capable of upgrading basic skills taught in technical schools to a higher skill level. The training also provides training for maintenance personnel familiar with one aircraft type, (e.g., F-4), who are transitioning to a different aircraft type, (e.g., F-16). The wing-level training information for each person assigned is basically a personal training history file that shows courses attended (and dates) and scheduled training for each person. The MMICS contains individual training history files and course files that are used to generate reports of aggregate training status by course, skill, work center, and squadron. The system is very flexible and is able to furnish supervisors and analysts with the information needed to manage and examine individual training.

The data elements contained in the training subsystem of MMICS are:

- personnel identification:
 - organization, (e.g., Aircraft Generation Squadron);
 - work center code (standard within MAJCOM);
 - name;
 - employee number (assigned by wing);
 - grade;

- Duty Air Force Specialty Code (DAFSC); and
- Primary Air Force Specialty Code (PAFSC); and
- training data:
 - course title (ATC assigned);
 - course code (ATC assigned);
 - course status, (i.e., qualified, scheduled, awaiting completion of training--AWACT, overdue);
 - date due; and
 - date completed.

The training subsystem is described in detail in Air Force Manual (AFM) 66-278.^{5/} The most commonly-used report is the course status report, an example of which is shown at Exhibit II-1. The course status report shows, by work center, the training status of individuals for specified courses. The report is quite useful in determining the overall training status of specified work centers. Each maintenance Air Force Specialty Code (AFSC) has specific courses required for certification at each skill level. An analyst or manager can quickly determine which individuals in a work center are trained to meet their AFSC requirements using this report. Analyses of maintenance productivity must begin by determining individual work center training status. An indication of work center training status can be obtained using the MMICS data. The training status of other groups (e.g., squadrons), can also be determined using MMICS data.

^{5/} Equipment Maintenance: Maintenance Management Information and Control System (MMICS), Maintenance Personnel and Training Management Users Manual, AFM 66-278, Headquarters, Department of the Air Force, 1 February 1979.

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COURSE STATUS REPORT (PA)

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In previous analyses by MCR, the MMICS training subsystem was used to gather data, by work center, on specified AFSCs. The data were then used to calculate work center training status (i.e., percentage of fully qualified or trained personnel) for a specified period. The training status was then used to compare like work centers (e.g., jet engine repair) for the purpose of seeing what effect training had on productivity. The utility of this system for intra-wing and inter-wing comparisons of productivity and the impact of training is quite useful.

A typical analysis that was performed for the purpose of showing the linkage of training and productivity is provided below. The full analysis is documented in a previous report.^{6/} The example provided is for the AFSC 426X4, jet engine technician, and the related work unit code (system worked on) 23000, F-16 turbofan power plant. The training and productivity data collected are displayed on Exhibit II-2. A graph of training effects is shown on Exhibit II-3. Tests using statistical methods were used to calculate the significance of these effects. However, the purpose of these exhibits is to show the type of graphics that can be developed using the MMICS.

2. Pipeline Management System

The Air Force PMS is operated by ATC and is used to maintain training information on Air Force schools and on personnel attending those schools. The PMS is both:

^{6/} Rodney D. McConnell and Stuart C. Johnson, Op. Cit.

AVERAGE WORKHOURS PER OBSERVATION (FREQUENCY) ^{2/}
23000

BASE AND WORK CENTER	NO. OF WORKERS (# TRAINED)	ACTION CODES ^{1/}					TOTAL
		P	Q	X	R	Y	
HILL AFB TG 12J TG 12P TH 12C TH 12T	63 (61) 19 (56) 9 (40) 17 (57) 18 (71)	17.7 (216) 19.6 (70) 16.1 (80) 18.6 (42) 16.0 (24)	19.0 (238) 19.4 (70) 19.1 (79) 20.1 (58) 16.0 (31)	8.8 (277) 5.7 (67) 12.2 (9) 9.9 (181) 8.1 (20)	17.0 (258) 18.7 (91) 11.6 (16) 17.6 (84) 15.2 (67)	13.0 (100) 13.6 (15) 14.6 (6) 14.0 (51) 10.5 (28)	15.1 (1089)
MACDILL AFB EG 123 EG 125 EG 127 ER 210	67 (79) 8 (81) 9 (76) 8 (89) 42 (69)	12.6 (126) 13.3 (27) 20.5 (4) 9.6 (30) 13.3 (65)	10.5 (74) 12.1 (14) 14.0 (2) 8.6 (28) 11.4 (30)	8.2 (75) 6.0 (58) 24.3 (2) 8.3 (2) 15.3 (13)	14.2 (9) 15.7 (3) 21.0 (3) 6.0 (3) --	9.4 (8) 16.0 (2) 24.0 (1) 3.9 (5) --	10.9 (292)
NELLIS AFB NG 121 NG 123 NG 125	36 (72) 12 (73) 11 (70) 13 (72)	16.3 (108) 22.8 (25) 11.3 (48) 18.5 (35)	17.5 (84) 24.0 (25) 9.8 (22) 17.6 (37)	13.9 (96) 15.5 (36) 10.0 (9) 13.5 (51)	25.9 (6) 26.7 (3) 20.0 (1) 27.5 (2)	14.5 (10) 19.8 (6) 10.5 (1) 5.3 (3)	16.0 (304)
LUKE AFB 7G 12A 7G 120	13 (93) 7 (86) 6 (100)	4.0 (59) 4.0 (59) --	4.9 (57) 4.8 (56) 12.0 (1)	5.0 (43) 3.4 (35) 11.8 (8)	9.0 (3) 9.0 (3) --	-- -- --	12.1 (162)
SHAW AFB 2G 12H 2G 12J	27 (85) 13 (69) 14 (93)	17.4 (23) 17.4 (23) --	17.3 (24) 17.5 (23) 12.0 (1)	10.6 (1) 8.3 (4) 11.8 (8)	-- -- --	-- -- --	15.9 (59)
TOTAL	206 (74)	14.7 (532)	15.6 (477)	9.4 (503)	17.0 (276)	12.9 (118)	14.3 (1906)

^{1/} P - Removed
Q - Installed
X - Test-Inspection-Service
R - Removed and Replaced
Y - Trouble

^{2/} Average workhours is listed under action codes and total followed by number of observations in parenthesis.

Exhibit II-2. DATA COLLECTED

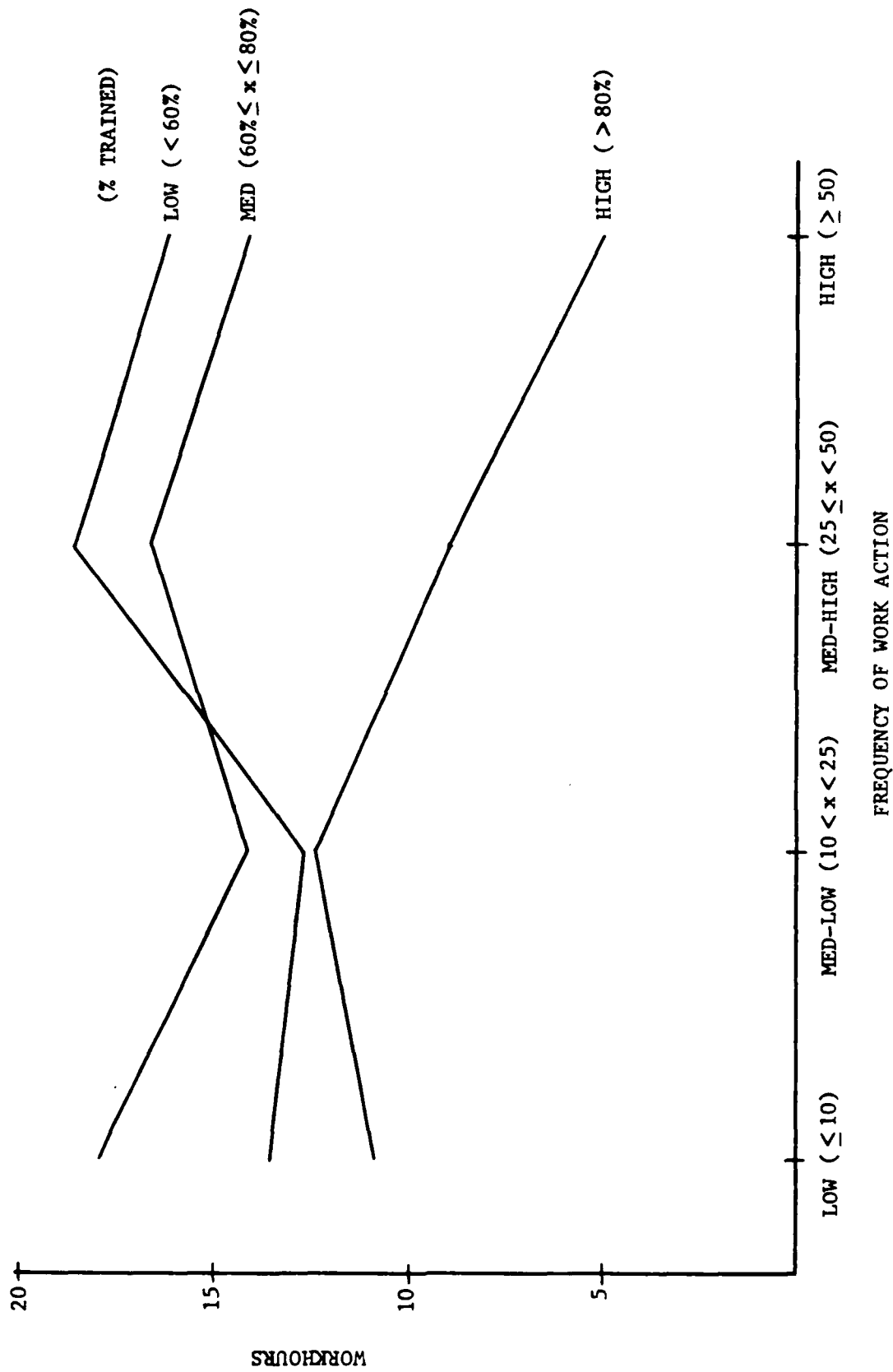


Exhibit II-3. AGGREGATE TRAINING EFFECTS (WUC 23000)

- a data system that:
 - converts training requirements into school seats,
 - allows names to be placed against seats, and
 - provides accounting of students who fill the seats; and
- a management system that:
 - provides for management control over critical processes, and
 - integrates the total training process and allows management decisions based on a single data base.

The Air Force uses the PMS to provide:

- measurable comparisons necessary to check the capability of:
 - the training program to meet requirements,
 - the procurement function to fill the training program,
 - the training centers to handle incoming students, and
 - the personnel assignments to meet utilization requirements;
- a capability to identify cost trade-offs within and between the functions of:
 - training requirements,
 - training programs,
 - procurement functions,
 - training resources, and
 - assignment utilization;
- a tracking capability which will show the actual status of the pipeline functions;
- a single training requirements quota bank against which incoming students and new recruits may be confirmed; and

- an integrated skills management system with feedback to management so that management can effect adjustment and control over pipeline activity.

The total PMS data base contains 700 million characters of training-related data elements, and supports the system functions. AFR 300-4, Data Automation: Air Force Data Dictionary, contains detailed descriptions of the data elements. A list of the data elements contained in the PMS data base was documented in a previous report.^{7/} PMS system functions are:

- Requirements, the automated capability of identifying future training requirements for individual training;
- Planning, the scheduling of school seats for future classes;
- Allocation/Confirmation, the notification to training requestors of class seats assigned to them and the by-name confirmation of students selected to attend training, including placing quota records on the student accounting data base; and
- Student Accounting, the actual data on student loads by class and date for present and future time periods.

When information is needed by the Air Staff, they contact ATC and request whatever data are required. The PMS fully integrates requirements, scheduling, allocation, and distribution. The system allows for management of initial entry training, skill progression training, and other career development training. Real-time reports show what seats have been allocated by course, how many have been filled to date, and how many are

^{7/} Rodney D. McConnell and Carolyn G. Jones, Skill Training Analysis: An Examination of DoD-Wide Training and Maintenance Data Systems, WN-8402-1, Management Consulting & Research, Inc., 27 July 1984.

available. PMS provides an efficient way to smooth out fluctuations in training flows, reduce waiting time, and permit faster, more precise response to changing requirements. Terminals at the Technical Training Centers (TTCs), ATC, and MAJCOMs allow system access. Air Force training information for schools is obtained from the ATC-operated PMS. User interface with the PMS is shown on Exhibit II-4.

In addition to Air Force Major Commands, ATC allocates class seats for technical training courses to the Air National Guard and Air Force Reserve, other Services, non-DoD agencies, and foreign governments. Civilians, as well as military personnel, receive this training.

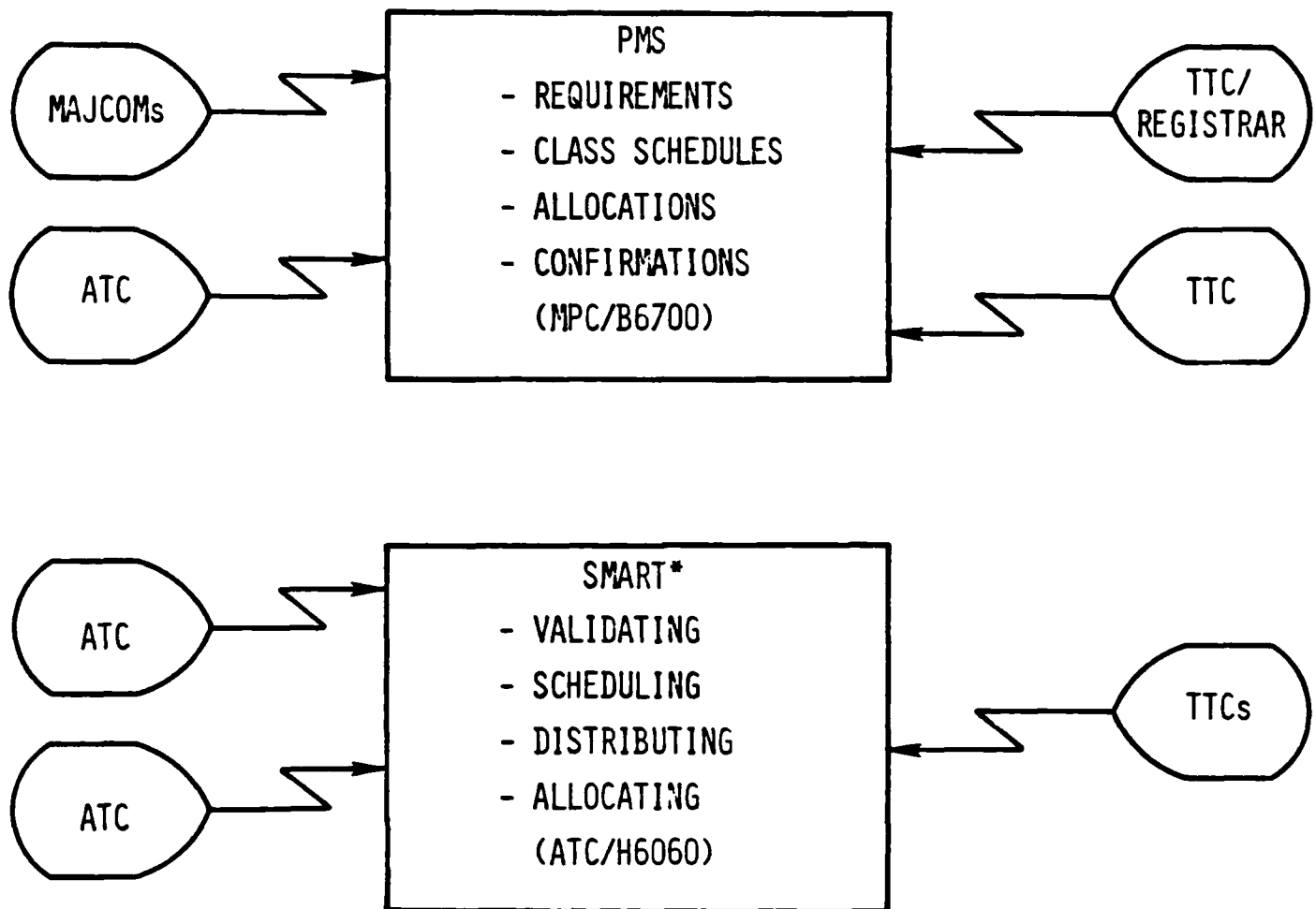
B. AIR FORCE MAINTENANCE DATA COLLECTION SYSTEM

This subsection discusses the Air Force Maintenance Data Collection (MDC) system by providing:

- description, and
- data elements.

1. Description

The Air Force Maintenance Data Collection (MDC) system contains maintenance data submitted by work centers for each job performed. Output information is sorted by work center, component serviced (i.e., work unit code), and work action taken. Aggregate data may be furnished by work center, component serviced, total work actions, and total hours. Maintenance productivity is measured using the number of man-hours needed to



*SIMULATION MODEL FOR THE ALLOCATION
OF RESOURCE TRAINING

Exhibit II-4. PIPELINE MANAGEMENT SYSTEM

successfully complete a maintenance action, (i.e., the performance of one procedure on one item of equipment).

2. Data Elements

The supervisor or mechanic prepares a Maintenance Data Collection Record, AFTO Form 349, which is used to record data for the MDC system. An example of this form is shown on Exhibit II-5. "Equipment being maintained is identified by the values of the work unit code (WUC) ④ (Code numbers used here refer to the item identifiers in Exhibit II-5) and the Standard Reporting Designator (SRD) ② , a three-character code that denotes the type of equipment end-item. What is wrong with the equipment is given by the how-malfunction code ⑥ . What was done in the course of maintenance is contained in the type-maintenance ③ and action-taken ⑤ codes. Who performed the maintenance task is identified through the combination of work center ① and the maintenance organization containing the work center, where the identification of the organization is provided by the processing routines that transfer the hardcopy information to MDC records. Man-hours expended are calculated during ADP processing from the start-hour, stop-hour, and crew size values ⑦ . A separate line of information is recorded each time there is a change in any of the columns A through N, including changes in crew size or composition, and each line results in a distinct record. Employee number ⑧ typically names a shop supervisor or lead technician and should not be a reliable guide to identifying

individuals actually performing maintenance. In addition, this information is not transferred to MDC records."^{8/}

The MDC system is described in AFR 66-1 and documents a sufficient amount of information to ascertain what was worked on (WUC), what was wrong, what was done (action taken code), how many workhours were used, and who did the work (work center).^{9/} System outputs that are useful for analyses are work unit code (equipment code) reports that provide the necessary productivity data by work center. An example is shown on Exhibit II-6. The acronyms used are:

PWC - primary work center	TM - team	WD - where
WUC - work unit code	CS - crew size	determined
AT - action taken code	JCN - job control number	code
DAY - Julian date	HRS - hours worked	

C. SUMMARY OF ANALYSIS

The current MDC system is useful for analyses of training effectiveness since it provides a means of measuring work center productivity. However, it cannot precisely identify which workers did a particular job. This does not preclude analytical comparisons, but it does limit the precision of the analysis.

^{8/} Jesse Orlansky and Joseph String, Evaluating the Effectiveness of Maintenance Training by Using Currently Available Maintenance Data, IDA Paper P-1574, Institute for Defense Analyses, August 1981.

^{9/} Equipment Maintenance: Maintenance Management, Air Force Regulation (AFR) 66-1, Headquarters, U.S. Air Force, 2 July 1980.

MUC REPORT FOR MCR, INC.

PWC	MJC	AT	DAY	TM	CS	JCN	MRS	MD
IG12M	14A00	L	251	0	3	2519770	3.0	D
IG12M	14A00	G	156	0	4	1559420	31.7	D
IM12S	14A00	X	107	0	5	1079622	5.0	D
IG12M	14A00	M	159	0	2	1559775	1.0	D
IG12M	14A00	X	181	0	3	1819768	3.0	C
IG12M	14A00	Y	168	0	3	1689770	7.5	C
IM12S	14A00	Y	195	0	4	1956814	16.0	A
IM12S	14A00	X	223	0	3	2229620	6.0	F
IG12M	14A00	R	252	0	4	2529754	22.0	D
IG12M	14A00	M	224	0	4	2246251	16.0	A
IG12M	14A00	X	251	0	3	2519770	3.0	D
IG12M	14A00	X	238	0	2	2386350	2.0	A
IM11S	14A00	X	236	0	2	235527	1.3	F
IM12S	14A00	X	277	0	3	2776310	1.5	B
IG12M	14A00	X	251	0	5	2516265	5.0	A
IM12S	14A00	Y	195	0	4	1956814	16.0	A
IM12S	14A00	X	236	0	3	2369642	3.0	F
IG12M	14A00	Y	238	0	5	2316265	2.0	A
IM12S	14A00	Y	195	0	4	1956814	15.0	A
IM12S	14A00	Y	195	0	4	1956314	15.0	A
IM12B	14A00	G	223	0	3	2239539	16.0	A
IM12T	14A00	G	237	0	3	2289642	3.0	D
IM12T	14A00	G	235	0	9	2289642	9.0	D
IM12T	14A00	G	238	0	9	2289642	19.0	D
IM12T	14A00	G	235	0	9	2289642	29.0	D
IM12T	14A00	G	239	0	9	2289642	72.0	D
IM12T	14A00	G	236	0	9	2289642	16.0	D
IM12T	14A00	G	237	0	9	2289642	24.8	D
IM12B	14A00	G	218	0	3	2289642	3.0	D
IM12T	14A00	G	236	0	3	21-A147	24.0	F
IM12T	14A00	G	237	0	2	2289542	9.0	D
IM12T	14A00	G	236	0	2	2289642	4.0	D
IM12S	14A00	G	219	0	2	2289642	16.0	D
IM12B	14A00	M	222	0	2	2166307	4.0	F
IM12B	14A00	G	223	0	3	222A505	3.0	A
IG12M	14A00	G	242	0	3	2239539	12.0	D
IG12M	14A00	M	217	0	4	2289642	11.0	D
IM12S	14A00	X	219	0	4	2176250	3.7	A
IM12B	14A00	H	222	0	4	2079636	7.7	F
IM12S	14A00	H	218	0	2	2226118	9.0	F
IM12S	14A00	X	218	0	4	2076810	22.0	F
IM12S	14A00	X	242	0	4	2079635	24.0	F
IM12S	14A00	X	233	0	4	24J3001	8.0	F
IM12S	14A00	X	220	0	2	2329616	7.0	D
IM12S	14A00	X	239	0	2	2159658	6.0	F
IM12B	14A00	X	232	0	5	2396817	5.0	F
IM12S	14A00	X	219	0	4	226A101	3.0	M
IM11S	14A00	X	211	0	2	2159651	4.0	F
						2116801	3.8	F

In order to benefit the current system and assist in the analysis of training and related maintenance productivity at wing-level and above, two improvements have been suggested in our previous work.^{10/} The first is the entry of the employee numbers of all maintenance personnel in the applicable work crew. This would allow more direct and precise measurement of the effect of training on productivity for both individuals and work centers. Productivity as measured in this analysis is speed of performance. Productivity can include quality of performance such as improved identification of faults, better use of spare parts, and similar indices of interest. The second suggestion is greater use of component-level designation for maintenance reporting, rather than system or subsystem designation. This would more precisely define the work-to-training information and make time-to-repair a more accurate figure.

ATC can predict future training loads based on PMS data and furnishes this information to the Air Staff for PPBS purposes. Consolidated training information on formal schooling is obtainable from ATC by means of PMS data. Installation-level individual training data are not easily obtained since each wing must be contacted separately and no central data base is in-being.

^{10/} Rodney D. McConnell and Stuart C. Johnson, Op. Cit.

III. ARMY DATA SYSTEMS

This section discusses Army data systems, including those used for unit-level training, all-Army training, and maintenance. The topics addressed are:

- Army Training Data Systems,
- Army Maintenance Data System, and
- Summary of Analysis.

A. ARMY TRAINING DATA SYSTEMS

There is only one official Army training data system--the Army Training Requirements and Resources System (ATRRS). Currently there is no official unit-level system, although one is under test. This subsection discusses Army unit-level training data sources and ATRRS.

1. Unit-Level Training Data Sources

Army installation-level training differs significantly from Air Force installation-level training. The training is conducted in the Army by an installation-level school or a contractor. It is funded from installation resources and not by centrally-funded Army training resources controlled by the Training and Doctrine Command (TRADOC). The function of Army installation-level training includes:

- supplementing training received in formal Army schools with equipment-specific instruction,
- providing transition training for personnel with experience on other models of equipment, and
- providing upgrade or refresher training.

There is no standard Army system for maintaining installation-level training data on individual training. The closest approximation is the Maintenance Performance System (MPS) that has been developed by the Army Research Institute (ARI). The MPS is a training needs information system for use at unit level (battalion) that is currently under test as a part of a research program in an Army-wide effort to improve maintenance. The MPS has been tested in both direct support (DS) and organizational maintenance. The DS test encompassed two units at Ft. Polk and Ft. Carson. The organizational maintenance test similarly encompassed two operational units at the same installations. MPS data include information on specific maintenance tasks performed and individual training status. The MPS allows for analyses of individual performance, although the current data bases are very small and do not allow for any analysis of training or maintenance performance in the aggregate.

The MPS was designed for use in a divisional maintenance battalion for the DS level system, and in division operational battalions for the organizational level system. Currently the system is completing a test phase. Plans are to incorporate the organizational level MPS into the newly-emerging Unit-Level Logistics System (ULLS) which is being tested as a battalion-level logistics reporting system. Once ULLS is completed (completion date unknown at this time), the MPS will provide both training and maintenance information for analyses at the operational unit level. The DS level MPS will be incorporated in the

Standard Army Maintenance System (SAMS) when it becomes operational. SAMS is still under development, with a completion date several years in the future. Thus, both MPS systems (DS and organizational) will not be available for the near term. Details of the type of data available from MPS are available from ARI in the user's manual.^{11/} The system uses nine forms to collect data for input to the data base, and has nine standard output tables. The input forms are:

- MPS-1 Job Order Status,
- MPS-2 Job Task Performance,
- MPS-3 Daily Man-Hour Availability,
- MPS-4 Roster Update,
- MPS-5 Training/Performance Demonstration,
- MPS-6 Task Experience History,
- MPS-7 Special Priority Flag,
- MPS-8 Interpretation Comments, and
- MPS-9 Training Requirement Priority Threshold.

The output tables are:

- Table 1 Man-hour Availability and Use,
- Table 2 Average Direct Man-Hours Per Job,
- Table 3 Average Direct Man-Hours Per Job by Equipment and Task,
- Table 4 Average Job Throughput Time in Days,
- Table 5 Average Days Spent in Each Job Status,

^{11/} Maintenance Performance System: User's Reference Manual, U.S. Army Research Institute for the Behavioral and Social Sciences, January 1981.

- Table 6 Skill and Growth Indexes,
- Table 7 Skill Development Summary,
- Table 8 Individual Skill History, and
- Table 9 Training Requirements Summary.

In summary, analyses of Army training at the installation level and its effect on maintenance productivity is not possible using currently available data. The best source in the future will be the MPS when it is continued and expanded. However, it is in a test mode and is designed to help the small unit improve maintenance, not support higher-level analyses. As MPS expands, and is possibly included as part of the upcoming Standard Army Maintenance System (SAMS), it would certainly provide data on both individual training status, as well as related work performance, and thus provide useful data on training/maintenance productivity.

2. Army Training Requirements and Resources System

The ATRRS is discussed under the following headings:

- description, and
- data elements.

a. Description

The ATRRS contains information for schools and training centers. Information is drawn from and provided to the HQ DA staff, the Military Personnel Center (MILPERCEN), the Reserve Component Personnel and Administration Center (RCPAC), the National Guard Bureau (NGB), TRADOC, Office of The Surgeon

General (OTSG), Office of the Chief of Engineers (OCOE), The Adjutant General's Office (TAGO), and Army schools and training centers. The major product of the ATRRS is the Army Program for Individual Training (ARPRINT), which provides guidance on trainee and student inputs, and detailed training seat information by class and course. The ARPRINT serves as a major resourcing document to be executed by TRADOC, OTSG, DoD schools, and other agencies. The ARPRINT is provided to U.S. Army reception stations, training centers, and Service schools to meet requirements for trained manpower over time.

Training requirements are maintained in the ATRRS data base by course and fiscal year. A large variety of summary-type reports, such as ARPRINT, may be requested that provide required information on specific types of training conducted by schools. The ATRRS contains data on all DoD schools that Army personnel attend. There is very little formal training outside the Army school system and no data base for informal schools conducted by installations and units throughout the Army.

ATRRS supports institutional training missions by determining requirements, objectives, manpower, and costs, and allows managers to maintain the force structure of the Army by scheduling classes, filling seats, and training soldiers. Data are broken out at the course level of detail for all courses concerning Army personnel. ATRRS produces reports, graphs, analyses, and selected data displays pertaining to requirements, entrants, graduates, training loads, and associated information.

The Mobilization Training Planning System (MTPS), a subsystem of ATRRS, is a peacetime planning system for mobilization training. During mobilization, either full or partial, data from MTPS are fed into the ATRRS operational subsystem for individual training management. MOB ARPRINT provides individual training requirements, by course and by week, for the 52-week period beginning with mobilization and a time-phased plan for expanding inputs to training.

ATRRS is a source of accurate, timely, and responsive training input data which provides information to the Army staff for response to OSD, Office of Management and Budget (OMB), and Congressional inquiries.

Another key ATRRS document is the input for the Military Manpower Training Report (MMTR). The MMTR supports the DoD request for Congressional authorization of student training loads in individual training.

ATRRS calculates projected training inputs and loads used as a basis for providing resources for the Army's school system and is the mechanism through which HQ DA correlates training requirements to the Army's recruiting objectives.

b. Data Elements

The ATRRS data base consists of the following six integrated interactive files:

- Administrative File (ADMIN),
- Requirements File (RQR),
- Class File (CLS),

- Reservations File (RES),
- Course Catalog File (CRSCAT), and
- Verification Tables File (VER).

Data elements contained in these files are listed and described in alphabetical order regardless of which file contains the element. This list was documented in a previous report.^{12/}

ARPRINTs, the key reports produced by ATRRS, are shown on the following three exhibits. These reports provide training managers with the flexibility to have reports at the MOS/Course/Class level of detail, by a variety of time periods and levels of summarization. In addition to the key ARPRINT reports, ATRRS produces:

- Attrition Reports;
- Army Pipeline System (APS) Reports;
- The ARPRINT Class Schedule (TACS) Reports;
- Budget Reports; and
- Other ATRRS reports, such as input data for the MMTR.

The Draft ARPRINT is shown on Exhibit III-1. A multi-page report, the Draft ARPRINT shows detailed new training requirements by course for five fiscal years as of a specific month, Exhibit III-1 is a partial listing for three years. The new requirements are assigned to training programs in the Final ARPRINT as shown in Exhibit III-2. The annual training require-

^{12/} Rodney D. McConnell and Carolyn G. Jones, Op. Cit.

PLAN DATE: 04/14/83

ARMY PROGRAMS FOR INDIVIDUAL TRAINING (A R P R I N T)
TRAINING REQUIREMENTS AND PROGRAM AS OF APR 1983

PAGE 1

SCHOOL FOR COURSE NUMBER
CODE
009 1101 010-11010

COURSE TITLE
LIGHT WEAPONS INFANTRYMAN

COURSE TYPE
ARMY 000
00 CIA 014731
BUDGET CODE
000000
COSTAND CODE
Y
ACCESSION CODE
N

USATC, FT. BENNING/70TH 0

***** 100A *****
PHASE ANNUAL CAP CLASS FREQ MAX SIZE/OPT SIZE/MIN SIZE LENGTH: MRS DAYS
000000 000 000 / 000 / 000 000 3.0

-----ACTIVE ARMY-----				-----DC-TRAINEES-----				-----INR-----		-----PCS STUDENTS-----				
TRAINEE (	MEMPH)	(	CONORT)	ARMG (	MEMPH)	(	BLDPLT)	USAR (	MEMPH)	TOTAL (	MEMPH)	C/O	M/O	ENL
MEM ROR	0 (	01 (	01	0 (	01 (	01 (	01	0 (	01	0 (	01	0	0	0
-----TDY/M/PCS-----				-----TDY & RETURN-----				-----AST-ARMG-----		-----AST-USAR-----		-----USN-----		
C/O	M/O	ENL		C/O	M/O	ENL		C/O	M/O	ENL		C/O	M/O	ENL
MEM ROR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-----USMC-----				-----USAF-----				-----USCG-----		-----CABET-----		-----CIV-----		
C/O	M/O	ENL		C/O	ENL	C/O	M/O	ENL	USMA	DOTC	P	C	C/O	ENL
MEM ROR	0	0	0	0	0	0	0	0	0	0	0	0	0	TOTAL

***** 100B *****
PHASE ANNUAL CAP CLASS FREQ MAX SIZE/OPT SIZE/MIN SIZE LENGTH: MRS DAYS
000000 000 000 / 000 / 000 000 3.0

-----ACTIVE ARMY-----				-----DC-TRAINEES-----				-----INR-----		-----PCS STUDENTS-----				
TRAINEE (	MEMPH)	(	CONORT)	ARMG (	MEMPH)	(	BLDPLT)	USAR (	MEMPH)	TOTAL (	MEMPH)	C/O	M/O	ENL
MEM ROR	0 (	01 (	01	0 (	01 (	01 (	01	0 (	01	0 (	01	0	0	0
-----TDY/M/PCS-----				-----TDY & RETURN-----				-----AST-ARMG-----		-----AST-USAR-----		-----USN-----		
C/O	M/O	ENL		C/O	M/O	ENL		C/O	M/O	ENL		C/O	M/O	ENL
MEM ROR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-----USMC-----				-----USAF-----				-----USCG-----		-----CABET-----		-----CIV-----		
C/O	M/O	ENL		C/O	ENL	C/O	M/O	ENL	USMA	DOTC	P	C	C/O	ENL
MEM ROR	0	0	0	0	0	0	0	0	0	0	0	0	0	TOTAL

***** 100C *****
PHASE ANNUAL CAP CLASS FREQ MAX SIZE/OPT SIZE/MIN SIZE LENGTH: MRS DAYS
000000 000 000 / 000 / 000 000 3.0

-----ACTIVE ARMY-----				-----DC-TRAINEES-----				-----INR-----		-----PCS STUDENTS-----				
TRAINEE (	MEMPH)	(	CONORT)	ARMG (	MEMPH)	(	BLDPLT)	USAR (	MEMPH)	TOTAL (	MEMPH)	C/O	M/O	ENL
MEM ROR	0 (	01 (	01	0 (	01 (	01 (	01	0 (	01	0 (	01	0	0	0
-----TDY/M/PCS-----				-----TDY & RETURN-----				-----AST-ARMG-----		-----AST-USAR-----		-----USN-----		
C/O	M/O	ENL		C/O	M/O	ENL		C/O	M/O	ENL		C/O	M/O	ENL
MEM ROR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-----USMC-----				-----USAF-----				-----USCG-----		-----CABET-----		-----CIV-----		
C/O	M/O	ENL		C/O	ENL	C/O	M/O	ENL	USMA	DOTC	P	C	C/O	ENL
MEM ROR	0	0	0	0	0	0	0	0	0	0	0	0	0	TOTAL

Exhibit III-1. DRAFT ARPRINT

ment is distributed by week over a specified fiscal year. The distribution is based on seasonality factors supplied by the Office of the Deputy Chief of Staff for Personnel (ODCSPER). The factors used are listed on the first page of the report, which is shown on Exhibit III-3.

B. ARMY MAINTENANCE DATA SYSTEM

This subsection discusses the Army maintenance data system in the following order:

- description, and
- data elements.

1. Description

Army maintenance data are generated by records produced for all maintenance actions performed. Data are incorporated in The Army Maintenance Management System (TAMMS). TAMMS is automated at the installation-level and includes information on unit records needed to manage the maintenance of equipment, principally the use of parts and what equipment was repaired. Data on time to repair, who accomplished the work, and similar productivity data are not recorded. Hence, the system does not allow for linkage of training and productivity.

PAGE 1

COURSE TYPE	BUDGET	DEMAND	ACCESSION
AF:IV CSD	CODE	CODE	CODE
06 FIA	014731	J	M

```

***** 1984 *****
PHASE    ANNUAL CAP  CLASS  PRIQ  MAX SIZE/OPT SIZE/MIN SIZE  LENGTH:  MKS  DATS
          000000    000    000    /  000 /  000

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```
***** IODE *****
```

PHASE	AVERAGE CAP	CLASS PRIQ	MAX SIZE/OPT	SIZE/KI	SIZE	LENGTH	NVS	DAYS
000000	000	000	/ 000	/ 000		000	1.0	

PHASE	ANNUAL CAP	CLASS	FREQ	MAX SIZE/DT	SIZE/MIN SIZE	LENGTH: LOS DAYS
000000	000	000	000	000	000	000 1.0

ACTIVE ARMY				SC-TRAINEES				ISR		PCS STUDENTS		
THE 800	THE 800	THE 800	THE 800	THE 800	THE 800	THE 800	THE 800	THE 800	THE 800	THE 800	THE 800	THE 800
TRAINER	MEMBER	EXHIBIT	MEMBER	MEMBER	MEMBER	MEMBER	MEMBER	TOTAL	MEMBER	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PCS				TOTAL RETURN				TOTAL ABT-ABT		TOTAL ABT-ABT		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0	0	0	0	0	0	0	0	0	0	0
USAF				USAF				USAF		USAF		
THE 800	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL	C/O	M/D	ENL
THE 800	0	0										

An improved system, the Standard Army Maintenance System (SAMS), is in progress, will eventually replace TAMMS, and will encompass all levels of Army materiel maintenance. SAMS will improve upon the present TAMMS system in that a maintenance job will be "tracked" on an in-shop computer as it progresses through work stages, and each different stage of work will be explicitly noted in the job record. Therefore, the records should be more accurate than those in TAMMS (which is automated at a much higher level) and include more detailed data on particular actions performed.

2. Data Elements

In TAMMS, all maintenance data are recorded on DA Form 2407, Maintenance Request, Exhibit III-4. What was wrong is indicated by the Failure Code ⑥ (code numbers used here refer to the item identifiers in Exhibit III-4). What was done is indicated by the Action Code ⑤. Total manhours expended are recorded in ⑨. One Maintenance Request form can be used to document a complete maintenance action, but each change in action or failure codes, or in components/parts involved in the maintenance, is documented on a separate line of these fields.

The unit performing the maintenance is identified by its Unit Identification Code (UIC), a code assigned to all Army units. For maintenance accomplished at the intermediate level, the UIC is entered in ④. At the organizational level, the UIC is entered at ①; ④ is left blank.

MAINTENANCE REQUEST				* See reverse of form for copy for codes and additional data		PAGE NO. NO. OF PAGES		REPORTS CONTROL SYMBOL CSGLD-1047/R11	
SECTION I									
☐ WORK REQUEST ☐ WORK ☐ CR ☐ ORGANIZATION CONTROL NUMBER 1. A. ORGANIZATION 2. LOCATION 3. UNIT IDEN CODE 1									
4. SERIAL NUMBER 5. HOUR NOMENCLATURE 6. LINE NUMBER 7. REPAIR 8. ORAL STOCK NUMBER 2									
9. MAINTENANCE ACTIVITY 10. UTILIZATION CODE* 11. SELECTED ITEM 12. HOUR 13. MINUTE 14. SECOND 15. STARTS									
16. FAILURE DETECTED DURING (Scribe one way of X) ☐ SCHEDULED MAINTENANCE ☐ TEST ☐ STORAGE ☐ FLIGHT ☐ INSPECTION ☐ OTHER ☐ HANDLING ☐ NORMAL ☐ INSPECTION ☐ OTHER ☐ INOPERATIVE ☐ OVERHEATING ☐ OUT OF ADJUSTMENT ☐ LOW PERFORMANCE ☐ OTHER									
17. DESCRIBE DEFICIENCIES OR SYMPTOMS ON THE BASIS OF COMPLETE CHECKOUT AND DIAGNOSTIC PROCEDURE IN EQUIPMENT "B" DO NOT PREPARE REPORT									
SECTION II. WORK ACCOMPLISHED									
18. REPAIR ORGANIZATION/ACTIVITY 19. UNIT IDEN CODE 4 20. TYPE ORGANIZATION/ACTIVITY ACCOMPLISHED (Scribe one way of X) ☐ YES ☐ NO ☐ CONTRACTOR 21. AMB ACT CODE									
22. LOCATION									
23. FAILURE CODE* 24. COMPONENT/PART HOUR SERVICE OR MRO NO 25. PARTS COST 26. NATIONAL STOCK NUMBER 27. QUANTITY 28. PARTS COST									
29. TOTAL MANHOURS 30. TOTAL MANHOURS COST 31. TOTAL PARTS COST									
32. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.									
SECTION III. EQUIPMENT IMPROVEMENT RECOMMENDATION									
39. NORMAL RECOMMENDATION 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.									
39. NATIONAL STOCK NUMBER 40. HOUR NOMENCLATURE 41. OPINION OR REMARKS DESCRIBE CONDITIONS UNDER WHICH FAILURE OCCURRED ATTACH PHOTOS OR SKETCHES IF AVAILABLE									

DA FORM 2407

EDITION OF 1 JAN 66 WILL BE USED UNTIL EXHAUSTED

CONTROL COPY

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8-20-61-0

Exhibit III-4. DA FORM 2407, MAINTENANCE REQUEST

The way in which the equipment being maintained is identified differs, depending on whether off-equipment or on-equipment maintenance is performed. For off-equipment maintenance, the National Stock Number (NSN) of the system removed from an end-item is recorded at ③ and the model name and NSN of the actual component being maintained is recorded at ②. The NSN is the basic cataloging system used by all Services to refer to unique configurations of end-items, major systems, subsystems, and assemblies, and to components/parts with unique characteristics. For individual maintenance tasks on the assembly as a whole, such as adjustment or inspection, ⑧ and ⑩ show the NSN of the assembly.

The way in which on-equipment work is identified differs, depending on whether aircraft or ground equipment is being maintained. For maintenance of aircraft, the model number and NSN of the end-item is recorded in ② and the subsystem requiring maintenance is identified by the Component Breakdown (CB) code at

⑦. Individual maintenance tasks are described at ⑧. Replaced parts are identified by NSN at ⑩. For ground equipment, the model number and NSN of the end-item are contained in ②. The system, assembly, or part being repaired or replaced is identified at ⑧. The NSN of the part replaced is contained at ⑩.

C. SUMMARY OF ANALYSIS

The ATRRS system provides a great deal of information to managers and analysts which is useful for analytical purposes.

tion, can be used for comparison with available resources by Army staff agencies. The MMTR input report is a particularly useful report since it provides summary detail, by category of training, including inputs, outputs, and training loads. The MMTR input report can also be used for comparative purposes with available training resources at a higher level of aggregation, such as total Army initial skill training.

A previous study has documented the inadequacies of TAMMS data for analyzing training effectiveness.^{13/} TAMMS was designed to provide information for purposes of maintenance and logistics, not for the purpose of evaluating maintenance performance by individuals. The biggest problem with this data base, for evaluating training, is that the names of individuals who perform maintenance actions are not maintained in the central data files. The Army practices both team and cross-skill maintenance in peacetime, since that is the manner in which Army units will operate under combat conditions. Further, many Army maintenance units are not structured into work centers, so there is no way to identify the skill areas of personnel performing the maintenance. The maintenance reporting format also has no provision for noting where team maintenance occurs. Because the ability to identify and track individuals is central to any methodology for relating maintenance performance to training, TAMMS data are not appropriate for training analysis.

^{13/} Jesse Orlansky and Joseph String, Op. Cit.

The upcoming SAMS system is also not designed for training analysis purposes; no information that identifies individuals is included in this system. The system, however, is still in preliminary implementation stages. Data elements could be added to the system. The possible inclusion of the ARI-developed Maintenance Performance System (MPS) within SAMS would allow training/productivity analyses to be developed. Discussion of MPS is contained in Section III.A.1. above. Even if individual identification were not included in the system, the improvements in accuracy and level of detail over the TAMMS data base could be of benefit for training/productivity analyses.

IV. NAVY AND MARINE CORPS DATA SYSTEMS

This section discusses Navy and Marine Corps data systems that can provide information for analyses of training and related maintenance. The topics addressed are the following:

- Training Data Systems, which discusses the
 - Navy Integrated Training Resources and Administration System, and the
 - Marine Corps Training System;
- Maintenance Data System, which discusses the Navy Aviation 3-M system that maintains data for both the Navy and Marine Corps; and
- Summary of Analysis.

A. TRAINING DATA SYSTEMS

This subsection provides information on the Navy and Marine Corps training data systems. The Navy system is operated by the Chief of Naval Education and Training (CNET) and the Marine Corps System is operated by Headquarters, Marine Corps. The following topics are addressed:

- Navy Integrated Training Resources and Administration System, and the
- Marine Corps Training System.

1. Navy Integrated Training Resources and Administration System

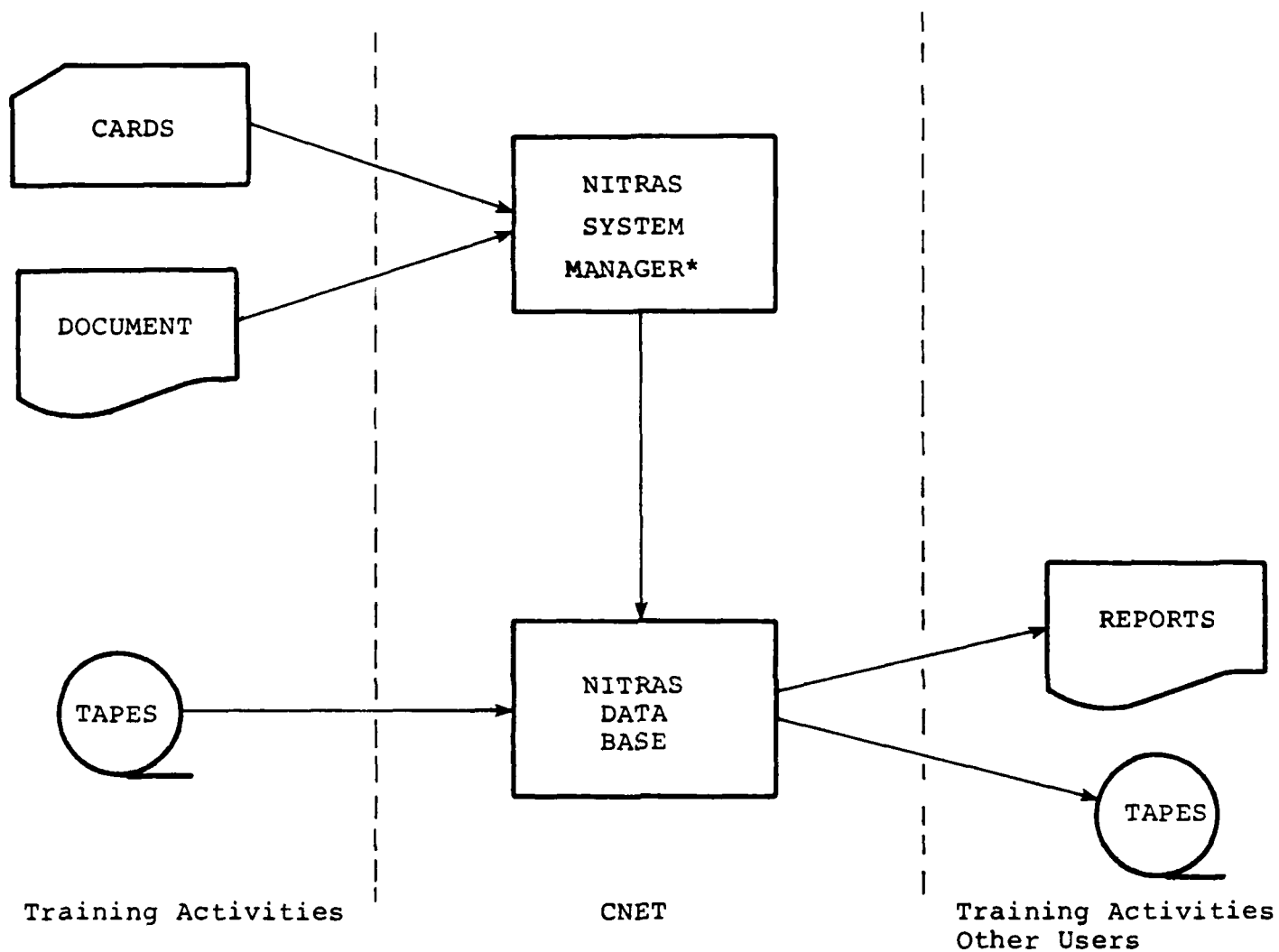
The all-Navy data system that provides information on training is operated by the Chief of Naval Education and Training (CNET) located in Pensacola, Florida. It is called the Navy

Integrated Training Resources and Administration System (NITRAS). There is no local training data system. The system contains information on all Navy training. Our research was directed toward Navy aviation units and we visited the Navy Maintenance Training Detachment (NAMTRADET) at the Moffett Naval Air Station (NAS), California. NITRAS receives information from the local level (e.g., NAMTRADET) and incorporates it into the data base. Local stations receive copies of the system-generated reports based on their inputs.

NITRAS is an automated system that provides training information to training managers throughout the Navy. NITRAS also provides direct support to the Chief of Naval Personnel and the Commander, Navy Recruiting Command. Information summaries are often required by top levels of Navy training management to justify resource requirements in the Program Objective Memorandum and during the budget process. NITRAS provides CNET with the automated capability to manage and support the total Navy training effort.

Exhibit IV-1 portrays the NITRAS reporting flow. CNET input forms are originated at the training activity level and sent to the NITRAS management office, where they are reviewed for errors and invalid transactions. The forms are then input into the monthly update of the system and the reports, interfaces, and extracts are produced as required.

The NITRAS has three principal files that are described below:



*Management Information and Instructional Systems Activity (MIISA)

Exhibit IV-1. NITRAS REPORTING FLOW

- Master Course Reference File,
- Student Master File, and
- Training Summary File.

a. Master Course Reference File

The Master Course Reference File (MCRF) corrects and standardizes course data elements and class schedules of all formal course training at a central point. MCRF functions include:

- serving as a common data base for all files constituting NITRAS, preventing duplication in reporting and file maintenance;
- supporting the Recruiting Command's Personalized Recruiting for Immediate and Delayed Enlistments (PRIDE) and the detailers at the Navy Military Personnel Center (NMPC) detailers by providing class quotas and convening dates;
- interfacing between NITRAS and the Catalog of Navy Training Courses (CANTRAC), contributing to CANTRAC publication;
- compiling training requirements and training operations plan information by course for past, current, and six future years; and
- compiling student statistics at class level, providing management with the capability to monitor class utilization and student performance in general and training quota management in particular.

MCRF consists of three records: the Course Record, the Class Schedule and Quota Record, and the Training Plans Record.

- The Course Record is identified on form CNET GEN 1510/17 which contains general descriptive data of the course. This record also includes the course data processing (CDP) code assigned by the NITRAS manager. Required ASVAB scores are identified by CNET GEN 1517/17D.

- The Class Schedule and Quota Record is identified on form CNET GEN 1510/17A and on form CNET GEN 1510/17E. Specific data on class quotas are listed on form CNET GEN 1510/17C. Class schedules for Naval Air Maintenance Training Detachment (NAMTRADET) courses need not be submitted since they are often included in the Fleet Replacement Aviation Maintenance Program (FRAMP) pipeline. Class schedules are generated for NAMTRADET as a result of students being reported to the Student Master File. Schedules for FRAMP courses are required to be submitted for personnel detailing and planning purposes.
- The Training Plans Record is identified by form CNET GEN 1510/17B. This record controls the Training Operations and Training Requirements Plan. This applies to all courses except those controlled by the Training Requirements and Planning Subsystem (TRAPS).

Courses are reported to MCRF as follows:

- all formal training courses listed in CANTRAC are reported and maintained by the appropriate MCRF coordinator and training activity according to the Course Identification Number (CIN), as follows:
 - A Chief of Naval Technical Training
 - B Chief, Bureau of Medicine and Surgery
 - C Chief of Naval Technical Training (Aviation Skill Courses)
 - D Commander, Naval Air Force, U.S. Atlantic Fleet
 - E Commander, Naval Air Force, U.S. Pacific Fleet
 - F Commander, Submarine Force, U.S. Atlantic Fleet
 - G Commander, Naval Surface Force, U.S. Atlantic Fleet
 - H Commander, Naval Surface Force, U.S. Pacific Fleet
 - J Commander, Training Command, U.S. Atlantic Fleet
 - K Commander, Training Command, U.S. Pacific Fleet
 - L Commander, Submarine Force, U.S. Pacific Fleet
 - M Commanding Officer, NASC Representative, U.S. Atlantic Fleet

N Commanding Officer, NASC Representative, U.S.
Pacific Fleet

(M&N scheduled to merge into one command)

P Chief of Naval Education and Training

Q Chief of Naval Air Training

R Chief of Naval Reserves

S Other Commands not assigned above

X X-777-777X--Chief of Naval Technical Training
only. Other X CIN's may be utilized by any MCRF
coordinator.

- Recruit training and other formal or informal training not contained in CANTRAC are reported to ensure complete student and workload accountability and to identify the different categories for management reporting purposes:

X-444-4440	Activity Student Indoctrination
X-555-5550	Student Transients (Awaiting transfer)
X-666-6660	Sea Cadet Training
X-777-7770	Basic Recruit Training
X-777-7771	Airman Apprenticeship
X-777-7772	Seaman Apprenticeship
X-777-7773	Fireman Apprenticeship
X-777-7774	Constructionman Apprenticeship
X-888-8880	Specialized Brief/Training
X-999-9990	Naval Reserve Training/Drills

Programmed Instruction, Self-Paced, or other courses not adhering to established convening or graduating dates are reported and identified.

- All PRIDE courses (courses that support Recruiting Command's reservations for new accessions) are entered into the MCRF data base. Once entered, changes to class schedules, training operations plans, and class quotas for PRIDE courses are kept to a minimum. Any changes must be coordinated with the Chief of Naval Personnel

(CHNAVPERS) and the Commander, Navy Recruiting Command. PRIDE includes training operations plans and class quotas for all active and reserve inputs.

Close coordination is required between CHNAVPERS, the Commander, Naval Recruiting Command (COMNAVCRUITCOM), and the Chief of Naval Reserves (CNAVRES) and must be maintained when submitting changes to any class schedules or quotas for students detailed by CHNAVPERS.

Course data and associated class data are reported whenever:

- a new course is established,
- a new fiscal year schedule of classes is added to an existing course contained in the MCRF,
- a new class is added to an existing class schedule (NOTE: new classes inserted within an existing class schedule will disrupt the existing class number sequence. Subsequent classes will be reported with new class numbers automatically),
- a course is relocated to a command with a different Unit Identification Code (UIC) (NOTE: forms are submitted to establish the relocated course as a new course. The excess class schedule of the old course is deleted and, when enrolled students have been graduated, the old course is deleted. There are two exceptions:
 - when the entire training activity is relocating, the MCRF requires only a change to student and staff UICs;
 - when the individual course is under Naval Air Maintenance Training Group (NAMTRAGRU) responsibility, the relocation requires only a change to student UIC.

Submissions to NITRAS for relocation of PRIDE courses are accomplished sixteen months before the convening of the first class at the new location. For non-PRIDE courses, submissions are accomplished five months before the convening date.

- a revision to course data is required,
- an existing class needs revision,
- a course is deleted, or
- a class is deleted from an existing course schedule.

MCRF forms are submitted to the Chief of Naval Technical Training (CNTECHTRA), the Commander of Training, U.S. Pacific Fleet (COMTRAPAC), or the Commander of Training, U.S. Atlantic Fleet (COMTRALANT) as directed by the MCRF coordinator. Instructions for completion of these forms are documented in a previous report.^{14/}

b. Student Master File

The Student Master File (SMF) provides three major functions:

- acting as the central point of collection and dissemination of training-related information about individual students in the majority of formal Navy schools,
- maintaining a complete history of actions for reported students in order to support statistical analyses and special studies and to resolve future training and information needs, and
- summarizing reported student actions to support the Training Summary File (TSF) and other management information systems.

Students are reported and accounted for to SMF or TSF, but not both, from the time that they arrive on board the training activity until the day that they leave or become part of

^{14/} Rodney D. McConnell and Carolyn G. Jones, Skill Training Analysis: An Examination of Unit-Level Navy Aviation Training and Maintenance Data Systems, WN-8402-2, Management Consulting & Research, Inc., 31 October 1984.

the command's staff. For the purposes of SMF, "student" is defined as any individual reporting to a training activity for the purpose of receiving instruction in any course contained in MCRF which meets the following criteria:

- the course, regardless of length, awards a Navy Enlisted Classification (NEC);
- the course does not award a NEC code but is twelve calendar days or more in length ("calendar days" are defined as the number of days, including holidays and weekends, that expire from the convening date to the graduation date. Both the convening date and the graduation date must be included in the calendar day count.);
- the course is less than twelve calendar days in length but, when combined with other courses, awards an NEC;
- the course includes foreign students; or
- the course is identified by an Officer Course Code.

Also included are those individuals enrolled in recruit and apprenticeship training and in officer candidate acquisition courses, which report to the Officer Candidate Acquisition Reporting System (OCARS).

Students enrolled in programmed instruction, self-paced, or other courses of variable length that do not adhere to set convening or graduation dates are treated independently and may be "classed-up" on a weekly basis. To allow for flexibility in this "classing-up" of students, a leeway of seven days before or after the convening or graduation dates is authorized. The set convening and graduation dates listed in MCRF are entered on CNET GEN 1510/2. As students become eligible for graduation, changes are submitted. This procedure may be followed for up to

thirty days after the set graduation date on MCRF for courses designated as self-paced or Computer Managed Instruction (CMI). To support the automatic availability system, exception graduation dates are reported as soon as they are determined.

In the event that an individual reports to a course under official CHNAVPERS orders, but is ineligible for enrollment in the course, the error is immediately reported to CHNAVPERS under Article 12.26 of the Enlisted Transfer Manual. Course entrance requirements are listed in Chapter 12 of the Enlisted Transfer Manual and in the Catalog of Navy Training Courses (CANTRAC). The student who does not meet these eligibility requirements is enrolled in the class, as ordered, but with a Student Action Code of "C" until further instructions are received from CHNAVPERS.

The accuracy, completeness, and timeliness of the data of the SMF:

- provide timely information by social security number of all personnel receiving training in Navy or "Other Service" courses which:
 - are twelve calendar days or more in length,
 - award an NEC code in combination with other courses,
 - are identified by an Officer Course Code, or
 - include foreign students;
- establish an automated method for providing training history codes or NEC's to the CHNAVPERS for updating the New Enlisted System (NES);
- contribute to the enlisted personnel availability system by transferring availability dates to the NES;

- supply MCRF and TSF with summarized student statistics;
- provide management with the capability:
 - to measure course and quota utilization,
 - to monitor attrition and setback reasons, and
 - to compare trainee input with established Basic Test Battery (BTB) and Armed Services Vocational Battery (ASVAB) score entrance requirements; and
- provide course completion information for selected officer courses to CHNAVPERS.

Instructions for completion of the SMF form are documented in a previous report.^{15/}

c. Training Summary File

The Training Summary File (TSF) collects statistical summary data on students attending courses not otherwise reported to the Student Master File (SMF). For NITRAS purposes, "student" is defined as any individual reporting to a training activity for the purpose of receiving instruction in one of the courses contained in MCRF. TSF reports training statistics for all NITRAS courses by interfacing with SMF, which collects training-related information on each student by name, social security number (SSN), and service category and by every student action that may arise. Specifically, TSF provides the capability to monitor the average on board (AOB) congressional training requirement. The CNET GEN 1510/4 forms are used to update the TSF.

^{15/} Rodney D. McConnell and Carolyn G. Jones, WN-8402-2, Op. Cit.

An example of a TSF output is shown at Exhibit IV-2, NITRAS Course Summary. The CNET Report 1500.1208, Course Summary by Type Course, displays student enrollment and attrition and set back percentages by each course offered at the time of the report. Courses are identified by type, listed at Exhibit IV-3, Course Types, by course identifying number (CIN), by course data processing (CDP) code, and by course title.

Instructions for completion of the TSF form are documented in a previous report.^{16/}

2. Marine Corps Training System

The Marine Corps manages training at the headquarters level and does not have a training command as do the other Services. The Marine Corps uses other Services' training for a considerable amount of individual skill training. The Navy provides most of the aviation training and the Army a substantial portion of combat arms training, (e.g., armor and artillery training). The Deputy Chief of Staff (DCS) for Training at Headquarters Marine Corps is responsible for all Marine Corps training.

Training guidance is prepared and issued to Marine Corps commands and schools by the DCS Training. Exhibit IV-4 is a schematic of major Marine Corps individual training facilities. One or more schools is located at each location shown.

^{16/} Rodney D. McConnell and Carolyn G. Jones, WN-8402-2, Op. Cit.

-----STUDENTS-----										---12 MONTH PERCENTAGES---									
INPUT		CUMULATIVE FYTD..		CURRENT MONTH		AOR----		ATTRITION.....		SETBACK									
PLAN	TOTAL	PLAN	INPUT	UI	AI	II	AT	STD	ACTUAL...	T	S/D ACT								
COURSE TITLE		CDP		CIN		ACTIVITY		A		NA TOT									
A1	SERVSCOLCOM	GLMS	A-041-0010	6115	474	153	109	89	34	16	2	10	2	2	5	10	2		
A1	SERVSCOLCOM	GLMS	A-041-0010	6370	273	94	58	52	16	4	1	10	1	1	2	5	10	1	
A1	SERVSCOLCOM	GLMS	A-041-0010	6400	1134	368	287	204	85	28	5	10	2	2	2	5	10	3	
A1	SERVSCOLCOM	GLMS	A-041-0016	607V	214	62	35	35	19	2	2	1	3	3	3	5	1	3	
A1	SERVSCOLCOM	GLMS	A-041-0016	607W	875	283	101	88	51	6	3	1	1	1	1	1	1	4	
A1	SERVSCOLCOM	GLMS	A-041-0016	607X	362	117	41	43	16	3	1	1	1	1	1	1	1	3	
A1	SERVSCOLCOM	ORLA	A-061-0012	6001	728	198	197	186	64	11	3	6	10	6	8	14	5	12	
A1	SERVSCOLCOM	ORLA	A-061-0012	609J	260	71	37	11	19	2	1	10	4	8	12	U	12	3	
A1	SERVSCOLCOM	ORLA	A-061-0018	609Y	60	40	14	7	5	4	1	5	24	11	35	S	0	2	
A1	SERVSCOLCOM	ORLA	A-061-0018	6126	192	80	71	54	13	4	7	7	6	3	8	U	0	2	
A1	SERVSCOLCOM	GLMS	A-100-0062	603V	1929	617	700	380	1091	67	124	21	15	15	15	30	S	40	
A1	SERVSCOLCOM	GLMS	A-100-0062	603W	15	6	1	2	2	1	1	15	6	19	26	D	40	65	
A1	SERVSCOLCOM	GLMS	A-100-0062	603X	41	13	8	4	11	1	1	15	13	14	26	S	40	23	
A1	SERVSCOLCOM	GLMS	A-100-0063	6032	184	61	22	15	24	3	2	15	13	14	26	S	40	43	
A1	SERVSCOLCOM	GLMS	A-100-0064	604E	1278	409	302	238	322	29	31	3	15	2	20	21	D	40	39
A1	SERVSCOLCOM	GLMS	A-100-0066	604L	160	32	91	35	61	5	7	2	15	1	5	6	U	40	33
A1	SERVSCOLCOM	GLMS	A-100-0068	606X	150	48	29	31	27	3	3	2	15	8	30	38	S	40	53
A1	NAVSCOLCOM	NLOND	A-101-0190	605K	300	96	101	92	14	3	3	10	3	3	5	10	25	8	8
A1	NAVSCOLCOM	NLOND	A-101-0191	605M	285	88	81	81	7	7	7	10	2	2	5	10	10	8	8
A1	NAVSCOLCOM	NLOND	A-101-0192	605G	280	93	82	81	7	2	1	10	2	2	5	10	12	2	2
A1	NAVSCOLCOM	NLOND	A-101-0193	605F	277	89	87	86	7	2	1	10	4	4	5	D	10	7	7
A1	NAVSCOLCOM	NLOND	A-101-0194	605E	272	91	85	81	10	1	1	10	1	1	5	10	1	1	1
A1	NAVSCOLCOM	NLOND	A-101-0195	605L	270	83	86	86	10	1	1	10	1	1	2	5	10	4	4
A1	NAVSCOLCOM	NLOND	A-101-0196	604Y	267	89	86	80	9	1	1	10	1	1	1	5	10	10	10
A1	NAVSCOLCOM	NLOND	A-101-0197	604Z	264	81	83	83	8	1	1	10	1	1	2	5	10	2	2
A1	NAVSCOLCOM	NLOND	A-101-0198	605D	260	87	83	80	10	1	1	10	1	1	5	10	1	1	1
A1	NAVSCOLCOM	NLOND	A-101-0199	605M	260	80	81	81	10	1	1	10	1	1	5	10	1	1	1
A1	NAVSCOLCOM	NLOND	A-101-0200	605N	260	87	79	79	7	7	7	10	1	1	5	10	1	1	1
A1	NAVSCOLCOM	NLOND	A-101-0201	605P	260	80	77	77	6	1	1	10	1	1	5	10	1	1	1
A1	NITC	CORRY	ST	EM	619	200	218	208	130	37	15	3	10	3	3	6	5	28	24
A1	NITC	CORRY	ST	EM	557	183	197	175	22	4	15	1	1	1	1	5	10	4	4
A1	NITC	CORRY	ST	EM	550	175	203	181	75	27	7	2	2	2	2	5	10	4	4
A1	NITC	CORRY	ST	EM	238	78	118	114	29	5	1	1	3	1	1	5	15	12	12
A1	NITC	CORRY	ST	EM	229	78	108	104	26	4	3	1	1	1	1	5	15	10	10
A1	NITC	CORRY	ST	EM	150	48	56	38	35	13	3	1	5	2	2	5	20	15	15
A1	NITC	CORRY	ST	EM	149	48	44	39	10	1	1	2	1	1	1	2	5	15	25
A1	NITC	CORRY	ST	EM	144	45	45	45	3	1	1	1	1	1	1	5	5	1	1
A1	NITC	CORRY	ST	EM	148	48	44	44	6	1	1	1	1	1	2	5	6	11	11
A1	NITC	CORRY	ST	EM	332	105	114	83	63	22	6	5	3	4	7	U	28	22	22
A1	NITC	CORRY	ST	EM	308	98	89	85	10	2	1	1	3	1	1	5	9	11	11
A1	NITC	CORRY	ST	EM	308	98	87	77	19	3	1	1	2	1	1	5	15	14	14
A1	SEDPV-CULCOM	GLMS	A-113-0010	609W	868	239	168	104	230	23	17	4	0	10	6	15	U	0	40
A1	SEDPV-CULCOM	GLMS	A-113-0010	609X	873	242	248	113	325	26	24	5	0	10	3	13	U	0	40
A1	SEDPV-CULCOM	GLMS	A-113-0019	6108															

Exhibit IV-2. NITRAS COURSE SUMMARY

TYPE COURSE

Class "A" - Provide the basic technical knowledge and skills required to prepare for job entry level performance and further specialized training. Includes apprenticeship training. An NEC, NOBC, MOS, or AFSC may be awarded to identify the skill achieved. Also includes some officer courses such as Communication Officer, ASW Officer, etc.

- AA Apprenticeship Training
- A0 Officer Preparatory Schools not associated with professional development programs.
- AP Enlisted Preparatory Schools.
- A1 Initial Skill Training - Enlisted.
- A2 Initial Skill Training - Officer.
- A3 Initial Skill Training - Enlisted Communications Program 3.
- A4 Initial Skill Training - Officer Communications Program 3.
- A5 Initial Skill Training - Enlisted Medical.
- A6 Initial Skill Training - Officer Medical.

Class "C" - Provide the advanced knowledge, skills and techniques to perform a particular job in a billet and/or any course which awards or is a pre-requisite to a skill awarding course; i.e., NEC, NOBC, MOS or AFSC, or is thirteen calendar days or longer and does not conform to the definition of a Class "A" course.

- C1 Skill Progression Training - Enlisted.
- C2 Skill Progression Training - Officer.
- C3 Skill Progression Training - Enlisted Communications Program 3.
- C4 Skill Progression Training - Officer Communications Program 3.
- C5 Skill Progression Training - Enlisted Medical.
- C6 Skill Progression Training - Officer Medical.
- CX Skill Progression Training - Officer Medical (Residency Only)

Exhibit IV-3. COURSE TYPES

C7 Specialized Progression Training for advanced paygrades: Enlisted personnel normally paygrade E-5 and above.

Class "E" - Programs designed to provide formal professional educational instruction in a general or particular field of study which may lead to an academic degree.

- E1 Professional Development Education - Senior Service College.
- E2 Professional Development Education - Intermediate Service School.
- E3 Graduate Education for Sub-specialty, full time, funded - Degree Program.
- E4 Undergraduate Education - Degree Program.
- E5 Postgraduate Education (not fully funded) - Degree Program.
- E6 Non-degree Educational Programs.
- E7 Health Education Programs.
- E8 Other Education Programs.

Class "F" - Provide team training to fleet personnel. Officers and enlisted, who normally are, or are enroute to duty as members of ship's companies and/or individual training such as refresher, operator, maintenance and technical training of less than 13 calendar days established to meet the needs of the fleet or type commanders. A NEC, NOBC, MOS or AFSC will not be awarded.

- F1 Functional Training - Enlisted.
- F2 Functional Training - Officer.

Class "P" - Officer acquisition programs designed to provide undergraduate education and/or indoctrination and basic training in fundamentals, preliminaries, or principles to midshipmen, officer candidates, and other newly commissioned officers (except those acquired through Class "V" programs).

- PA NESEP
- PB Health Profession Acquisition Military Programs.
- PC Other Programs.

- PD Preparatory School.
- P1 Officer Acquisition Training (Academy).
- P2 NROTC.
- P3 JNROTC.
- P4 AVROC II.
- P5 ROC.
- P6 OCS.
- P7 AOC (Pre-commissioning).
- P8 NFOL (Pre-commissioning).
- P9 NUPOC-S

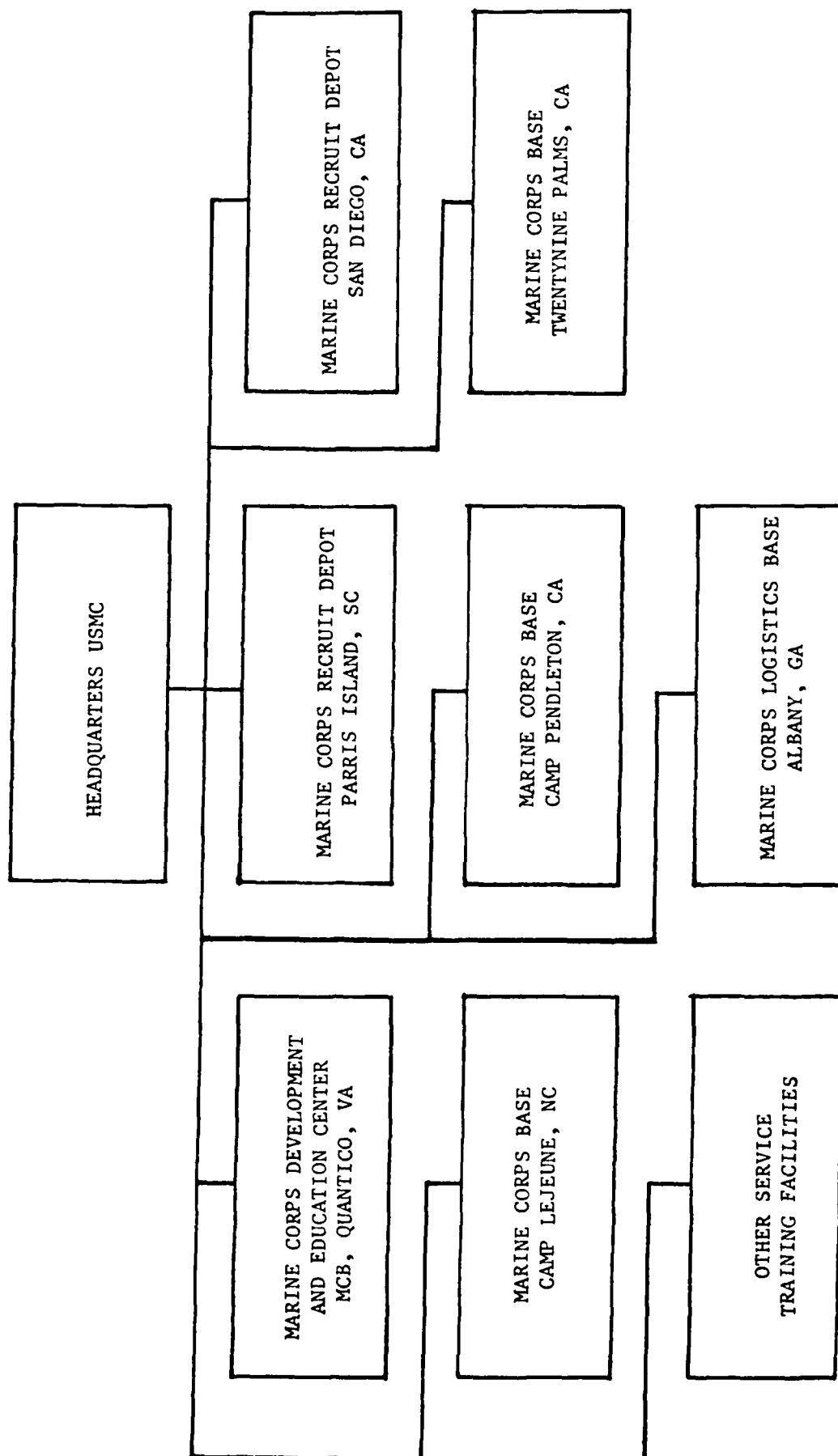
Class "R" - Training upon initial enlistment or induction which provides the general indoctrination and prepares the recruit for early adjustment to military life by providing skill and knowledge in basic military subjects.
NOTE: DOES NOT INCLUDE APPRENTICESHIP TRAINING.

- R1 Recruit Training.

Class "V" - Provide the skills which lead to the designation of Naval Aviator or Naval Flight Officer.

- V1 Undergraduate NASC/PRIM Flight Training.
- V2 Undergraduate Flight Training - PROP.
- V3 Undergraduate Flight Training - JET.
- V4 Undergraduate Flight Training - HELO.
- V5 Undergraduate NFO Training.

Exhibit IV-3. COURSE TYPES (CONT'D)



Source: HQ USMC-MPP

Exhibit IV-4. PRINCIPAL MARINE CORPS INDIVIDUAL TRAINING FACILITIES

Marine Corps Individual Skill Training requirements are prepared as part of the annual Training Input Plan (TIP). The TIP is a compilation of formal school requirements within Specialized Skill Training for Active and Reserve Marine Corps officers and enlisted personnel. It includes all formal Initial Skill, Skill Progression, and Functional Training. The TIP lists all school courses and programmed officer and enlisted quotas by source: Active, Reserve, Other Service, and lateral move (requiring retraining from overage skills).

Initially, Marine Corps training requirements are developed by use of the Enlisted Force Management System (EFMS)^{17/} which, using a program called Training Output Plan (TOP), constructs a profile for each Military Occupational Specialty (MOS) within each Occupational Field (OCC FLD). The program determines the optimal training output required to sustain each MOS and OCC FLD and, subsequently, the total Marine Corps on the basis of first and second year manning requirements. The primary inputs to the TOP subroutine are career force MOS requirements taken from the Grade Adjusted Recapitulation (GAR). The GAR is produced by the Simulator for Total Requirements Authorization Forecast and Evaluation (STRAFE) model.^{18/} The principal output is the "Yearly Training Output" necessary to support GAR requirements. This output is then factored using the

^{17/} Enlisted Force Management System Enhanced Functional Specification, DCS Manpower, Headquarters USMC, 17 October 1980.

^{18/} STRAFE User's Guide, DCS Manpower, Headquarters USMC, June 1980.

constraint of total new accessions and first year attrition. The Training Output Plan is then given to the OCC FLD and MOS specialists for a comparison with actual inventory versus manpower requirements. Manpower requirements are based on authorized table of organization positions plus or minus known changes due to modernization, activations, inactivations, and any other actions in process. This is a judgemental process assisted by computerized personnel and manpower files. Officer training is ascertained in the same manner. Reserve Component training requirements are prepared by the DCS Reserve Affairs by comparing expected inventory with manpower requirements.

The DCS Training translates these output requirements into input requirements in the TIP. To assist in this process detailed "training tracks" have been developed for every OCC FLD and MOS which are updated yearly for preparation of the TIP. Another related document is the Field Budget Guidance. This is a list of Marine Corps school and course requirements that is sent to the several Marine Corps commanders who operate the USMC schools. The Field Budget Guidance requests the schools' recommended class schedules based on the TIP projections and asks for identification of any training needs that require additional resources. The receipt of the proposed class schedules from the schools is the basis for issuance of the Training Quota Memorandum (TQM), which is a series of class and quota issuances that satisfy the Marine Corps training requirements.

Marine Corps training is characterized by centralized control and decentralized execution. Headquarters Marine Corps provides the control in terms of establishing what schooling will be accomplished. The commanders of the various Marine Corps schools and bases are responsible for the curriculum and staffing of the schools within allowable resources.

B. MAINTENANCE DATA SYSTEM

The Navy and Marine Corps both maintain aviation maintenance information on the same system. This system, which is the Aviation Maintenance Material Management (3-M) system, is maintained by the Navy Ship Parts Control Center (SPCC). The Navy Aviation 3-M system is described in detail in this section. The system is very similar to the Air Force MDC system that was described in Section II of this report. The Aviation 3-M system has an advantage to the analyst over the Air Force MDC system in that the automated data is centrally processed. Data can be accessed for any number of units or work centers by submitting a request to the central agency, the Navy Maintenance Support Office (NAMSOC) Department of SPCC.

The type of data reported by the Aviation 3-M system provides the potential for assessing maintenance performance in a manner that reflects on training effectiveness. That is, the data address the questions of what equipment was maintained, what was wrong, what was done, how long did it take, and who did the work.

The equipment on which maintenance is performed is identified through the combination of the weapon end-item (e.g., P-3 Aircraft) and the work unit code (WUC) structure defined for that end-item. The detail embodied in the WUC structure typically can be identified with a narrow skill area related to specific training programs.

Describing what was done in the maintenance of equipment is documented by type maintenance and action taken. This combination, performed by each work center involved in a maintenance action, comprises a maintenance task. The documentation of the maintenance task identifies the organization performing the work to include the work center.

This section has two subsections:

- Aviation 3-M Systems Operations, and
- Maintenance Data Reports.

1. Aviation 3-M System Operation

On 12 November 1982, NAMS0 became part of the SPCC. All Aviation Maintenance and Material Management (3-M) Information System functions assigned to the former NAMS0 are still performed by NAMS0 Department of SPCC. The 3-M system is sponsored by the Chief of Naval Operations (CNO) and administered through the operating chain of command. Technical support is provided by the Chief of Naval Material (CNM) and the Naval Air Systems Command (NAVAIR) for both Navy and Marine Corps aircraft.

NAMSO maintains the central data bank for aviation 3-M data and produces the Management Information Reports distributed throughout the Naval establishment. These reports are available to any Navy activity upon request through the proper channels. To discuss data requirements, direct liaison is encouraged by NAMSO, Code 8611, Autovon 430-2031; commercial (717) 790-2031. Reports are available in hardcopy, microfilm, or microfiche. Most recurring reports are in hardcopy form. If a microfilm or microfiche medium is requested, the entire report is given. On special request, NAMSO may prepare extracts in other formats, such as magnetic tapes or machine cards. End users are to telephone before submitting requests for information in any format other than hardcopy, microfilm, or microfiche.

The Maintenance Data System (MDS) has been developed as an integral part of the 3-M system for purposes of data collection and reporting. Basic data generated by maintenance personnel are documented and distributed to interested activities. Data are processed according to the following categories.

- Maintenance Data System (MDS):
 - Maintenance Data Reporting (MDR);
 - Subsystem Capability Impact Reporting (SCIR);
 - Material Reporting (MR);
 - Aircraft Utilization (AU); and
 - Training Device Utilization (TDU);
- Depot Data:
 - Technical Directive Compliance (TDC) Data; and
 - Summary Maintenance Action and Cost Data on Aircraft and Engines.

Standardized procedures simplify maintenance management functions, reporting procedures, and training of personnel. Standardized forms, administrative paperwork, organizational work center codes, reports, and control documents make documentation efforts much less time-consuming and demanding at all levels. Data elements are standardized within the MDS in a common, understandable language readily adaptable to electronic data processing techniques. This allows activities to conduct inspections peculiar to the assigned mission as the result of equipment configuration, operating requirements, or environmental conditions.

Data flow through three distinct but related cycles:

- the local cycle, organizational and intermediate levels of maintenance;
- the local-central cycle, between the local activity and NAMS0; and
- the central-external cycle, between NAMS0 and the various systems commands, offices, and commands other than the originating command.

These cycles are depicted by Exhibit IV-5, Aviation 3-M Data Flow.

In the local cycle, the best source of information is the individual worker. When the maintenance task is completed, the worker submits a completed Visual Information Display System/Maintenance Action Form (VIDS/MAF), shown at Exhibit IV-6, to his supervisor. The supervisor, the petty officer or non-commissioned officer responsible for the shop or work center, reviews the form for accuracy and completeness. The source documents are

AVIATION 3-M DATA FLOW

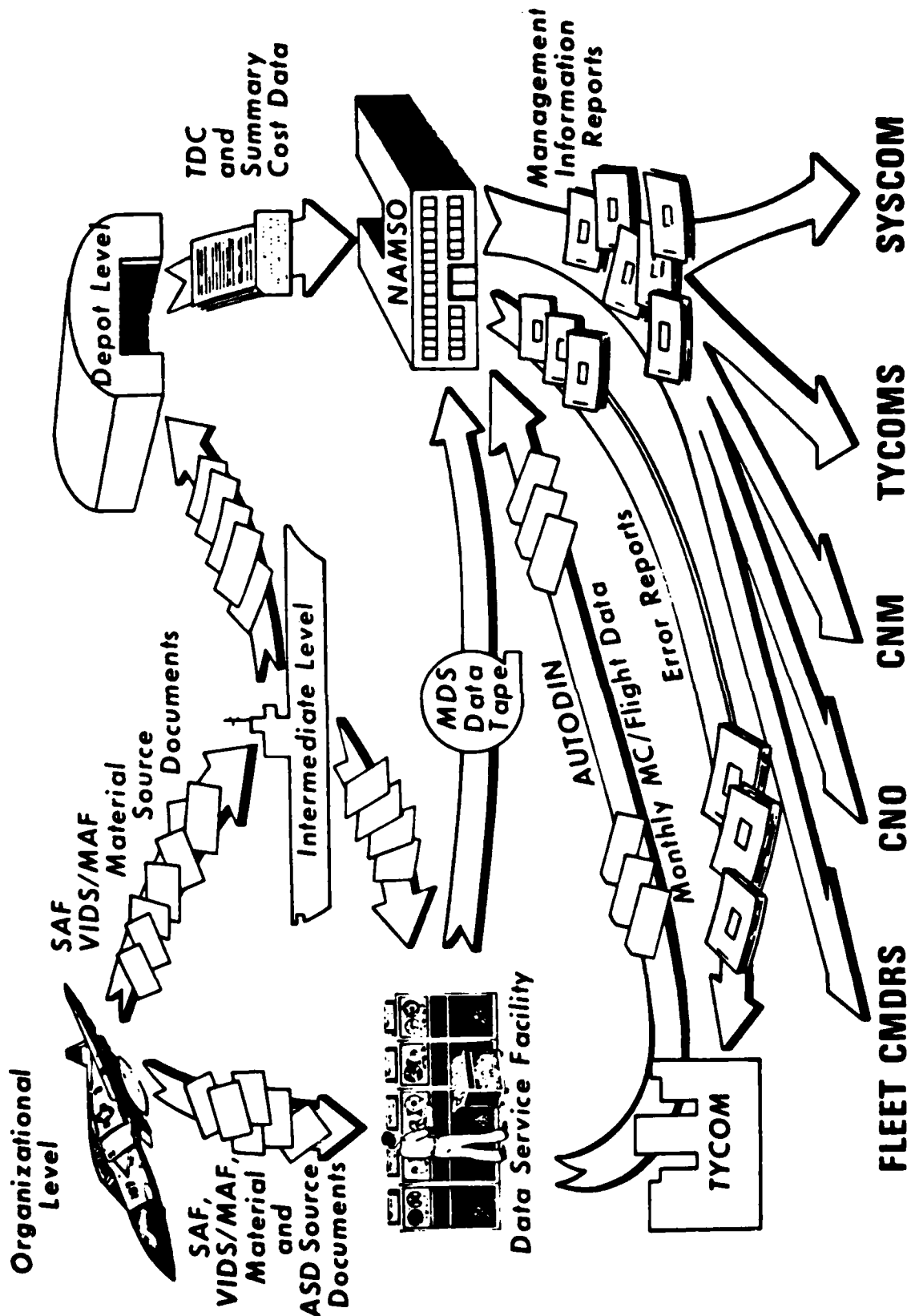


Exhibit IV-5. AVIATION 3-M DATA FLOW

COPY 1

5 PART FORM

ENTRIES REQUIRED SIGNATURE

WORK CENTER REGISTER, CONTROL AND PROCESSING COPY

USE BALL-POINT PEN PRESS HARD

INDONE LOGS REC

VIDS/MAF OPNAV 4790-60 (REV 2-82) S/N 0107-LF-047-9304

☐ ☐ ☐[illegible][illegible]

-FOLD

FOLD										TECHNICAL DIRECTIVE IDENTIFICATION					
A32 WORK UNIT CODE	A39 ACTION ONE	A32 TRANS	A34 BENT/L	A35 ACT TAKEN	A36 BAL CODE	A37 ITEMS/P	A41 BAR HOURS	A45 SLAPED SL/T	P28 SYSTEM	P09 CODE	P11 BASIC NO	P18 RV	P16 AM	P17 PART	P19 KIT
									☐						
A49 TYPE EQUIP	A52 BALT-SP NUMBER	A50 DISCO	A59 T/B	A60 POST	A62 PID	A65 SAFETY/L- SER	A69 METER	SE MFGN	A74	P21	INVENTORY P22 PERM UNIT CODE		P26		
										☐					

REPAIR CYCLE				REMOVED/OLD ITEM			INSTALLED/NEW ITEM		
	DATE	TIME	EOC	EOB MFG#	E13 SERIAL NUMBER		GOB MFG#	G13 SERIAL NUMBER	
RECEIVED	B08	B12	B16						
IN WORK	B18	B23	B27	E23 PART NUMBER		E38 DATE REMOVED	G23 PART NUMBER		
COMPLETED	B30	B34		E42 TIME/CYCLES	E47 TIME/CYCLES	E52 TIME/CYCLES	G38 TIME/CYCLES	G43 TIME/CYCLES	
AWAITING MAINTENANCE									

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				A15 WORK CENTER
A08 ORG	A11 DAY	A14 SER	A17 SUP	

DISCREPANCY									
								PILOT/INITIATOR	
CORRECTIVE ACTION									
								CF REQ ☐ BF ☐	
								QA REQ ☐ BCN ☐	
CORRECTED BY			INSPECTED BY			SUPERVISOR		MAINT CONTROL	
UP ☐	MODEX	PRI	TURN-IN DOCUMENT			SYSTEM/REASON		MCN	
DOWN ☐									

then forwarded to Maintenance Control for screening. An analyst corrects all of the source documents from Maintenance Control and delivers them to the Data Services Facility (DSF) of the supporting ship or station. The DSF converts the data from the source documents to a machine-sensible medium such as punched cards, discs, or tapes. Any questionable data are returned to the originating unit for correction or clarification. Machine listings of data are printed on a daily or as-specified frequency for the use of the originating units. Machine-sensible data are retained by the DSF; source documents are returned to the originating units.

In the local-central cycle, local data services units mail duplicate record files to NAMSO, where the data are combined with those of all other reporting units. Machine runs identify discrepancies, which are then returned to the originating units for correction.

In the central-external cycle, the central data processing activity is responsible for providing data to agencies higher in the command management chain. These include CNO, Fleet and Type Commanders, Systems Commands, System Command field agencies, contractors, and others depending on factual, comprehensive maintenance data as a basis for sound command or management decisions. Report requirements are established by mutual decisions made by NAMSO and the agency concerned.

2. Maintenance Data Reports

Maintenance Data Reports (MDR's) are designed to process variable data sequences and to display any combination of Visual Information Display System/Maintenance Action Form (VIDS/MAF) functional segments. This permits the generation of reports tailored to the needs of the individual users. The data elements are collected from:

- the VIDS/MAF form, OPNAV 4790/60, shown at Exhibit IV-6, and
- the Support Action Form, OPNAV 4790/42, shown at Exhibit IV-7.

The selection parameters are specified by the intended user, for example:

- type equipment,
- organizations,
- work unit code (WUC),
- data range, and
- record types.

A sample page from an MDR is shown at Exhibit IV-8. The data were developed using the following parameters:

- P-3 aircraft,
- Action Organizations whose first positions are A (Atlantic) or P (Pacific),
- WUCs beginning with 14 (flight controls).

The data elements that comprise the MDR are discussed in the order in which they appear on the form:

DATE - 11 JUL 84
RPT-ID - SA-417

DETAILED MAINTENANCE DATA REPORT #MDR#
FOR THE PERIOD MAR 84 THRU MAR 84

NAMSO 4790 A7371-01
PAGE 717

TYPE	EQPT	BU/SER	ORG	WC	L	Y	DD	WUC	D	M	T	A	W	T	A	TDC	OR	SER	NR/	REF	SYM	PI	DATE	NBR	DATE	DPC	IP	HOURS	EMT	TR
-----JCN-----																														
P714067124	APBD	159891	P71	220	1	84070	1426F00	O	B	T	799	12511	DL1326M40-3	10015	A6088	4063	P8P	1	2.0	2.0	18									
P714067124																														
P714067124																														
P714067124																														
P714070116	APBD	159891	P71	220	1	84074	1426F00	Y	B	R	374	12511	DL1326M40-3	81016M	A6100	4070	P8P	1	2.8	2.8	23									
P714070116																														
P714070116																														
P714070116																														
P714070116																														
P714070116																														
P714070116																														
AT24065793	APBD	158935	AT2	120	1	84085	1431A00	D	B	C	135																			
AT24065793																														
P444065427	APBD	159503	PA4	120	1	84085	1431A00	H	B	C	128																			
P444065427																														
P724065299	APBD	158207	P72	120	1	84085	1431A00	B	B	C	127																			
P724065299																														
PW54089092	APBD	158226	P9G	51A	2	84089	1431D00	O	L	A	000	36659	933137-111	1551	A9427	4089	P8G	1	12.0	6.0	30									
PW54089092																														
A554082908	APBD	161009	AS5	120	1	84082	1431E00	R	B	C	306																			
A554082908																														
A554082908																														
A554082908																														
AT14067440	APBD	161404	AT1	120	1	84088	1431F00	K	B	C	135																			
AT14067440																														
AT34090308	APBD	160763	AT3	120	1	84090	1431F00	H	B	C	070																			
AT34090308																														
AT54072158	APBD	156518	AT5	12C	1	84075	1431F00	L	D	Z	170																			

Exhibit IV-8. SAMPLE MAINTENANCE DATA REPORT

- Job Control Number (JCN) - nine to eleven alpha/numeric characters allowing for separate identification of each maintenance action. The JCN is composed of four parts:
 - Organization Code - three alpha/numeric characters identifying the organization that originally assigns a JCN to a maintenance action. Reference: Organizational Code Master Listing Report Number NAMS0 4790.A7065-01.
 - Day - three numeric characters. Part of the Julian date specifying the day of the year that the JCN was assigned. This does not necessarily reflect the date on which work was actually begun.
 - Serial Number - three alpha/numeric characters running sequentially from 001 to 999 or from A01 to Z99. If there are more than Z99, use alpha characters in the second and third positions until ZZZ. When 999 or ZZZ has been assigned, the next number in sequence is again 001 or A01. Do not use alphabetic first characters when documenting preflight, postflight, turnaround, daily, special, conditional, corrosion, or acceptance/transfer inspections.
 - Suffix - a structured alpha/numeric code identifying a sub-assembly or sub-subassembly repair action independent of the major component repair. This is used for intermediate-level maintenance functions regardless of where the maintenance is being performed. The double-suffix logic is as follows:

<u>First Position</u>	<u>Second Position</u>	<u>Description</u>
Alpha	Blank	A reparable subassembly which contains reparable sub-subassemblies.
Alpha	Alpha	A reparable sub-subassembly removed from a reparable subassembly.
Numeric	Alpha	A reparable subassembly with no reparable assemblies.

- Type Equipment Code (TEC) - four alpha/numeric characters identifying the complete end-item or category of equipment being maintained. A complete listing may be found in all applicable WUC manuals. Reference: Aviation Type Equipment Code List, Report Number NAMS0 4790.A7210-01. For example, APBD represents the P-3.
- Bureau/Serial Number - identifies a specific end-item of component. This number is assigned by the manufacturer to differentiate between a particular end-item or component and others of the same type, model, series, or design.
- Action Organization - three alpha/numeric characters identifying the location of the maintenance organization. For example, P9G represents Moffett Naval Air Station (NAS).

Additional entries for the same JCN begin in this column. Each interval is specifically identified as:

- RCV	Received
- INW	In-Work
- JS3 through JSO	Job Status 3 through 10
- COM	Completed
- AWM	Awaiting Maintenance

Each interval consists of:

- the Job Status, indicated by "M" for Maintenance or "S" for Supply;
- the date that work was begun;
- the time that work was begun;
- the hours by the clock that the work was in process; and
- the Equipment Operational Capability (EOC).

A letter recorded before the "RCV" interval indicates:

- S Subsystem Capability and Impact Reporting (SCIR)-related maintenance action;
- V SCIR-related event containing erroneous data (invalid date-time, EOC code, etc.); or

- M SCIR-related event is invalid because the event does not begin and end within the same month.
- Work Center (WC) Code - three alpha/numeric characters identifying the work center performing the action documented, as follows:

Intermediate Level

41 L	T56 Engine Shop
51 D	Machine Shop
52 O	Hydraulics/Pneumatics Branch
62 A	Electric Shop
41 I	Jet Engine Component Repair Shop
05 A	Matricial Screening (AMSU), also at organizational level

Organizational Level

51 A	Structures Shop
51 C	Welding Shop
45 O	Test Cell Branch
53 O	Nondestructive Inspection (NDI) Branch, also at Intermediate Level

Reference: Appendix F, Volumes 2 or 3, OPNAVINST 4790.2B.

- Maintenance Level (ML) - identifies the level of maintenance actually being performed, not necessarily the level assigned to the activity. Reference: Chapter 1, Volume 1, OPNAVINST 4790.2B.
- Action Date - five numeric characters. Julian date that work actually was begun.
- Work Unit Code (WUC) - one, three, five, or seven alpha/numeric characters identifying the system, subsystem, set, major component, reparable sub-assemblies, or part of the item being maintained. These codes are assigned and controlled by the Naval Air Technical Services Facility (NAVAIRTECHSERFAC) under the direction of Naval Air Systems Command (NAVAIRSYSCOM) and published in WUC manuals for end-items in three major categories:
 - type/model/series for aircraft, drones, and missiles;
 - aircraft flight/tactical trainers; and

- aeronautical support equipment.

WUC's from these manuals are used to code maintenance actions on an end-item and its components.

- When Discovered (WD) Code - single alpha character identifying when the need for maintenance was discovered. These apply to the VIDS/MAF only. Three sets of WD codes cover the equipment categories:
 - Aircraft and Engines;
 - Ground Support Equipment; and
 - Missiles and Missile Targets.
- Type Maintenance (TM) Code - single alpha/numeric character describing the type of work being accomplished.
- Action Taken (AT) Code - single alpha/numeric character describing the action accomplished on the item identified by the WUC.
- Malfunction Description Code - three alpha/numeric characters describing the malfunction which required the maintenance action. Conditional malfunction refers to a malfunction other than material failure, for example: battle damage, improper maintenance or handling, or malfunction of associated equipment.
- Manufacturer's (MFGR) Code - five alpha/numeric characters identifying the manufacturer of the end item, component, or part. Reference: Handbooks H4-1 and H4-2 published by Defense Logistics Services Center, Battle Creek, Michigan.
- Technical Directive Code - twelve or thirteen alpha/numeric characters identifying a specific technical directive by type, number, revision, amendment, part, and kit number.
- Part Number - identifies an item of production or a range of items of production by the manufacturer controlling the design, characteristics, and production of the item by means of its engineering drawing, specifications, and inspection requirements.
- Serial Number/Reference Symbol - the serial number of the part or item actually being repaired. This number is usually assigned by the manufacturer or the Navy and identifies the specific component of a particular end-item.

- Time/Circles - identifies the Julian date and clock time that work on the item ceased.
- Removed or Received Date - identifies the Julian date that the malfunctioning part was removed from the end-item or received at the maintenance activity.
- Data Processing Center (DPC) - three alpha/numeric characters identifying the center responsible for processing the data. For example, P9G refers to Moffett NAS.
- Items Processed (IP) - identifies the number of times that the action indicated by the Action Taken Code was applied to the item identified by the WUC. For example, replacement of five fuel nozzles is documented as five IP; replacement of several transistors in an electronic assembly is documented as one IP.
- Man-hours - identifies the total number of man-hours expended by assigned personnel to complete the work described on the source document. Hours and tenths multiplied by the number of men working equals total man-hours.
- Elapsed Maintenance Time (EMT) - identifies the actual clock time in hours and tenths that maintenance was being performed.
- Transaction (TR) Code - two numeric characters identifying the type of data being reported. A second entry in this column identifies:
 - G installed item
 - E removed item
 - H-Z failed parts
(NOTE: failed parts and awaiting parts (AWP) indicators are displayed in the WD and TM columns, respectively.)

C. SUMMARY OF ANALYSIS

Currently, training effectiveness is primarily measured by student achievement at school. The ultimate effectiveness of training, however, is determined by the performance of personnel

on-the-job. Since the Navy maintains large data files for training and maintenance, it may be possible to associate the performance of organizations or individuals with different levels and methods of training. This is not done now, due to constraints on the data developed through the NITRAS and 3-M systems and due to features of the maintenance activities themselves.

The NITRAS and 3-M systems were designed to assist in the management of training and maintenance, not in the evaluation of personnel performance. An assessment of training effectiveness must be based on comparisons of performances of personnel on similar maintenance operations. Where personnel are trained in the same skill area, comparisons are made between different levels and methods of training. These conditions place a series of constraints on the data developed through the management systems, as follows:

- The data must measure the outcome of maintenance operations in terms that provide a criterion of maintenance personnel performance.
- The data must provide unambiguous (i.e., coded) answers to four questions regarding each maintenance operation:
 - What equipment was maintained?
 - Why was maintenance required (i.e., the nature of the equipment malfunction)?
 - What was done to it (i.e., the nature of maintenance performed)?
 - Who performed the maintenance?
- The data must separately document discrete and well-defined maintenance tasks that are comparable whenever they are performed on the same subsystem or assembly (black box) installed on the same model of equipment end-items.

- The data must identify the equipment maintained at a sufficiently low level (e.g., subsystem or assembly) so that it can be associated with a single skill area related to specific training programs.
- The data must encompass a sufficiently wide set of maintenance tasks to provide a representative sample of the on-the-job skill requirements of a particular skill area.
- The data must identify organizations (or individuals) performing maintenance in a way that will allow their association with skill areas that can be related to specific training programs.

Methods may be developed by which a representative sample meets all of the above requirements, but there are four features of maintenance activity that are additional constraints on the assessment of training effectiveness:

- Maintenance tasks may be performed by a group of personnel (i.e., team maintenance).
- Maintenance tasks associated with one skill area may be performed by personnel trained in a different skill area (i.e., cross-skill maintenance).
- Maintenance organizations may not be further structured into skill-related work centers.
- Not all military end-items or their installed subsystems are built to standard configurations.

Maintenance reporting systems may be modified to identify the tasks on which these constraints occur. The effectiveness of training on the maintenance tasks not associated with these constraints could then be assessed.

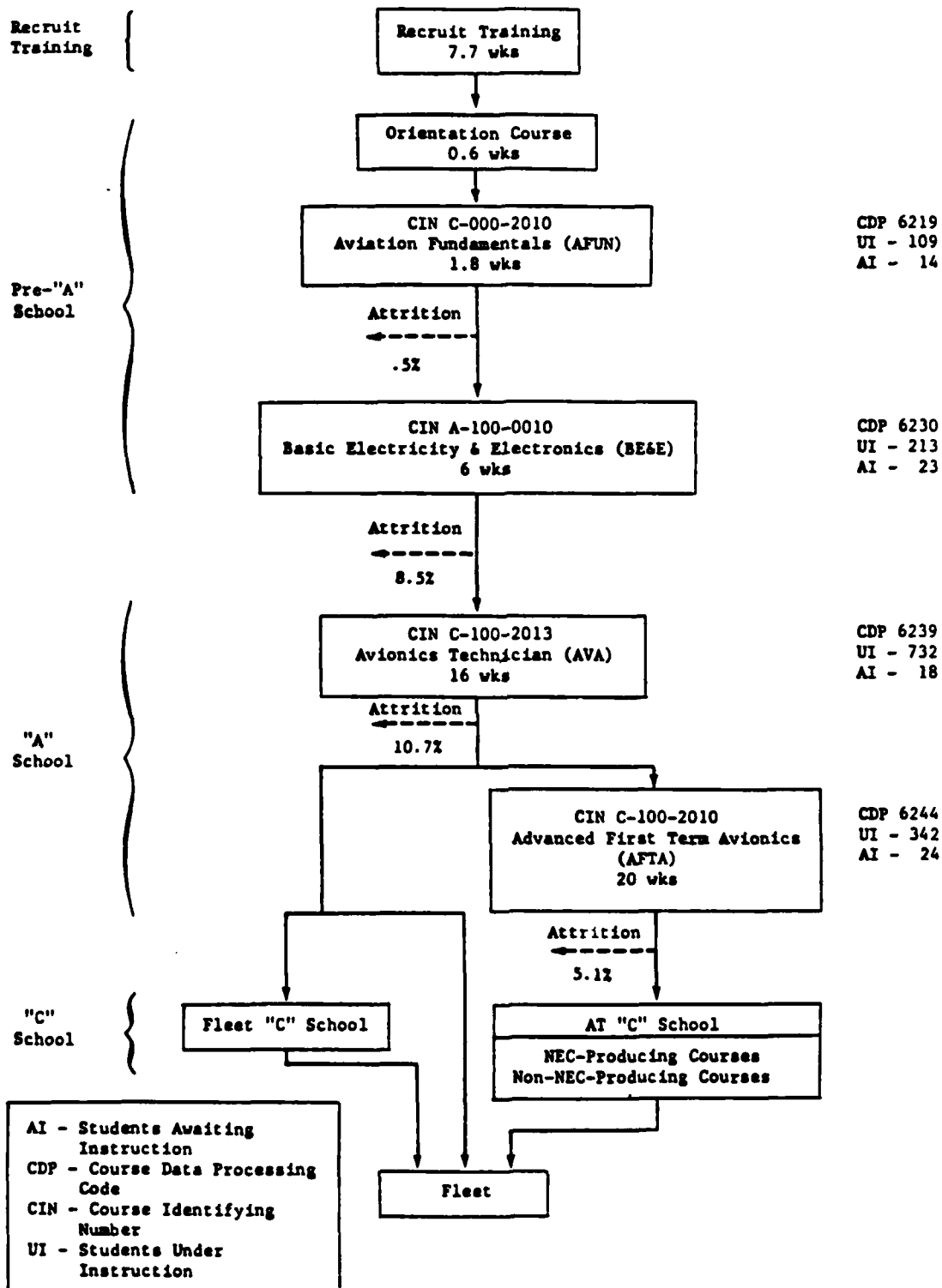
Careful screening of the maintenance and training data may leave a sample of personnel and tasks that are not affected by

the above constraints. This introduces the most important question: is the sample representative of Navy maintenance training effectiveness as a whole?

Although it is feasible to use NITRAS and 3-M system data to establish a link between training and maintenance, it would be necessary to gather information at the local level similar to what was done for the Air Force data. The following example, Exhibit IV-9, is the training pipeline for Navy Aviation Electronics Technicians (AT) and includes the following information:

- course identifying number (CIN) - identifies the command sponsoring the course, the DoD skill for which the course trains, and the sequence number of the course of instruction (which may be conducted at multiple locations);
- course title;
- length of course in weeks (wks);
- actual average attrition rate for FY82;
- course data processing (CDP) code - uniquely identifies a course at a particular training activity;
- monthly quantity of students Under Instruction (UI) - computed as the actual number of man-days represented by students UI during the month (May 1982) divided by the number of days in the month; and
- monthly quantity of students of Awaiting Instruction (AI) - computed as the actual number of man-days represented by students AI (unavoidable and excess) during the month (May 1982) divided by the numbers of days in the month.

This training pipeline was developed by interviewing detailers at the Navy Military Personnel Center and examining NITRAS reports and the Catalog of Navy Training Courses.



Sources: Interviews; CNET Report 1500.1208 NITRAS Course Summary by Type Course, as of 82/05/31; Catalog of Navy Training Courses, July 1982.

Exhibit IV-9. NAVY AVIATION ELECTRONICS TECHNICIAN (AT) RATING TRAINING PIPELINE

All courses listed in Exhibit IV-9, except Recruit Training and Class "C" School courses, are located at the Naval Aviation Technical Training Center (NATTC) in Memphis, Tennessee. Upon arrival at NATTC, all recruit graduates attend a three-day orientation course. Three of the Initial Skill Training courses are self-paced:

- two Class "A" School Preparatory courses:
 - Aviation Fundamentals (AFUN), and
 - Basic Electricity and Electronics (BE&E); and
- one Class "A" School course:
 - Avionics Technician (AVA).

Hence, the course lengths shown in Exhibit IV-9 are average figures, not actual. The AI figures indicate no serious backlogs exist at this time; the low values appear to imply unavoidable AI and minimal excess AI backlog.

Examination of local personnel and training records and comparison with appropriate training pipelines affords a picture of individual training status. Using this information, overall work center training status can be ascertained.

The linkage with work center maintenance performance requires the usage of maintenance data requested from NAMS0 for the applicable aircraft and WUC. For example, ATs perform the maintenance on avionics material (WUC 14000). Thus, requesting a listing of all WUC 14000 task performance for a specified period and work centers allows the establishment of an analytical process with the training status of the work centers. MCR requested

NAMSO maintenance data by work center for selected aircraft and WUCs for the month of April 1984. The report showed that work center data was available in a usable form for analysis of productivity. Exhibit IV-8 is an example of this output.

In this manner, a linkage may be established between training and maintenance. As there is no central data system for personnel training files, the analyst must examine individual records in the administrative section of the Aircraft Intermediate Maintenance Detachment (AIMD) or flying squadron. A typical training path must be determined for the personnel involved in the performance of a particular maintenance action and the effectiveness of the maintenance related to the effectiveness of the training. The analysis yields the training-maintenance relationship for a group of personnel performing a particular maintenance function in applicable work centers.

V. CONCLUSIONS AND RECOMMENDATIONS

This section contains conclusions and recommendations about how Service training and maintenance data systems may be used for analytical purposes. The Services are discussed separately in the following order:

- Air Force,
- Army, and the
- Navy and Marine Corps.

A. AIR FORCE

Our conclusion concerning Air Force training and maintenance data systems is that they lend themselves readily to the analysis of maintenance-related training. MCR analyses developed linkages between training and maintenance and showed how such analyses could be performed.

We recommend some improvements to maintenance data collection that could benefit the current system and assist analysis at the wing level. The first would be the entry of employee number for all maintenance crew personnel in the maintenance data collection system. This would allow direct and precise measurements of training and productivity for individuals and work centers. A second improvement would be a greater use of component level designation for maintenance reporting rather than system or subsystem designation. This would allow more refined analyses to be performed and would more precisely define what work is being done.

B. ARMY

Our conclusion concerning Army training and maintenance data systems is that they do not support analyses of maintenance-related training as currently configured. However, the Army central training data system known as ATRRS does provide some information which is useful for other analytical purposes. For example the ARPRINT, which specifies detailed course and class information, can be used for comparison with available resources by Army staff agencies. The MMTR input report is a particularly useful report since it provides summary detail, by category of training, including inputs, outputs, and training loads. The MMTR input report can also be used for comparative purposes with available training resources at a higher level of aggregation, such as total Army initial skill training.

The current maintenance data base known as TAMMS does not provide information useful for evaluating maintenance performance related to individual skill training. Because the ability to identify and track individuals is central to any methodology for relating maintenance performance to training, TAMMS data are not appropriate for training analysis.

The upcoming SAMS system is also not designed for training analysis purposes; no information that identifies individuals is included in this system. The system, however, is still in preliminary implementation stages. Data elements could be added to

the system. The possible inclusion of the ARI-developed MPS within SAMS would allow training/productivity analyses to be developed. Even if individual identification were not included in the system, the improvements in accuracy and level of detail over the TAMMS data base could be of benefit for training/productivity analyses. This improvement would make it possible to perform comparable analyses in the Army to what is currently practicable in other Services.

We do not have any specific recommendations concerning Army data bases. Our general observation is that current Army efforts may provide analytical benefits in the future.

C. NAVY AND MARINE CORPS

Our conclusions concerning Navy and Marine Corps data are as follows:

- Navy and Marine Corps maintenance data is centrally maintained by NAMSOC, is easily accessible, and can be requested in usable, standard formats in support of analytical efforts.
- Navy training data is maintained centrally on all course data; it is easily accessible, and can be requested in standard report formats. The files are particularly useful in providing workload data for examination of resource levels (e.g., instructors). The central training files do not provide individual training data--this must be obtained at the installation level, similar to the Air Force but with one main difference--it is not automated.
- Marine Corps training data is maintained centrally by the Office of the DCS Training, Headquarters USMC. The Training Input File (TIP) contains overall training loads by skill area. "Training tracks" or "pipeline" information is similarly maintained.
- A difficulty with examination of Navy individual training status is a lack of consolidated "pipeline" information on specific skills. MCR developed the pipeline for aviation electronic technicians. Others would have

to be developed similarly for any skill level analyses.

We recommend that specific efforts be undertaken in order to improve the use of these data for analytical purposes. These efforts should include the following:

- Establish linkages between specified skills and related maintenance actions for Navy aviation. Once these linkages are established, the resulting information can be used to support resources for individual training and can be used to measure effectiveness of training.
- Build resource models for examination of requirements in support of workload for training. Navy data is readily available in NITRAS to support this effort. It would support the analytical work and related budgetary impact for OSD and the TDAC.
- Develop "pipelines" for Navy maintenance skills similar to the example developed by MCR. These pipelines are needed for any analyses of resources for maintenance or non-maintenance skills. Also, the assessment of maintenance and training linkages requires this same information. The necessary information is available in the NMPC and within NITRAS.

APPENDIX A

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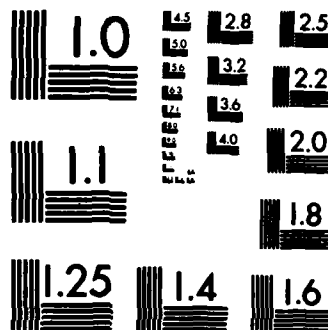
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APPENDIX B

ABBREVIATIONS

AFSC	Air Force Specialty Code
AIMD	Aircraft Intermediate Maintenance Detachment
AOB	Average on Board
ARI	Army Research Institute
ARPRINT	Army Program for Individual Training
ASVAB	Armed Services Vocational Aptitude Battery
AT	Aviation Electronics Technician
ATC	Air Training Command
ATRRS	Army Training Requirements and Resources System
BE&E	Basic Electricity and Electronics
CANTRAC	Catalog of Navy Training Courses
CHNAVPERS	Chief of Naval Personnel
CMI	Computer Managed Instruction
CNAVRES	Chief of Naval Reserves
CNET	Chief of Naval Education and Training
CNM	Chief of Naval Material
CNO	Chief of Naval Operations
CNTECHTRA	Chief of Naval Technical Training
COMNAVCRUITCOM	Commander Naval Recruiting Command
COMTRALANT	Commander of Training Atlantic
COMTRAPAC	Commander of Training Pacific
DS	Direct Support
DSF	Data Services Facility
EFMS	Enlisted Force Management System
FRAMP	Fleet Replacement Aviation Maintenance Program
FTD	Field Training Detachment
GAR	Grade Adjusted Recapitulation

JCN	Job Control Number
MAJCOM	Major Command
MDC	Maintenance Data Collection (System)
MDR	Maintenance Data Report
MDS	Maintenance Data System
MILPERCEN	Military Personnel Center
MMICS	Maintenance Management Information and Control System
MMTR	Military Manpower Training Report
MOS	Military Occupational Specialty
MPS	Maintenance Performance system
NAMSO	Navy Maintenance Support Office
NAVTRADET	Naval Air Maintenance Training Detachment
NAVTRAGRU	Naval Air Maintenance Training Group
NAS	Naval Air Station
NATTC	Naval Aviation Technical Training Center
NAVAIR	Naval Air Systems Command
NEC	Navy Enlisted Classification
NITRAS	Navy Integrated Training Resources and Administration System
NMPC	Navy Military Personnel Center
NSN	National Stock Number
OCCFLD	Occupational Field
ODCSPER	Office of the Deputy Chief of Staff for Personnel
OJT	On the Job Training
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense

PMS	Pipeline Management System
PPBS	Planning Programming and Budgeting System
PRIDE	Personalized Recruiting for Immediate and Delayed Enlistment
SAMS	Standard Army Maintenance System
SPCC	Ship Parts Control Center (Navy)
STRAFE	Simulator for Total Requirements Authorization Forecast Evaluation
TAMMS	The Army Maintenance Management System
TDAC	Training Data and Analysis Center
TIP	Training Input Plan
TOP	Training Output Plan
TQM	Training Quota Memorandum
TRADOC	Training and Doctrine Command
TTC	Technical Training Center
UIC	Unit Identification Code
ULLS	Unit Level Logistics System
VIDS/MAF	Visual Information Display System/Maintenance Action Form
WUC	Work Unit Code
3-M	Maintenance Material Management

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