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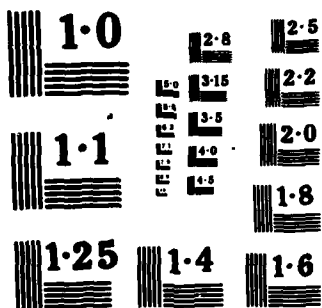
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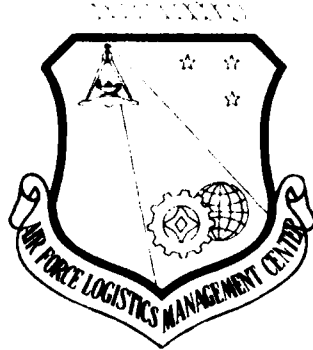


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# AIR FORCE LOGISTICS MANAGEMENT CENTER

AD-A158 917



MAINTENANCE ANALYSIS ENHANCEMENTS

BY

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AFLMC REPORT 830203  
February 1984

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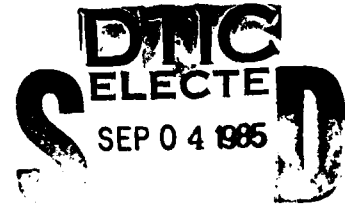
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ABSTRACT

This study was conducted to enable aircraft maintenance analysis functions to become a more productive part of the maintenance management process. The overall objective was to provide better, more relevant information to unit managers through a more effective analysis activity.

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## EXECUTIVE SUMMARY

PURPOSE: The purpose of this study was to enable unit maintenance analysis functions to become a more productive part of the maintenance management process.

BACKGROUND: HQ AF/LEY through Rivet Ready Initiative 23, Quality, tasked the AFLMC to conduct a study of the Air Force quality program at unit level and maintenance analysis is one area under the quality program. Additionally, the USAF IG Functional Management Inspection (FMI) of Aircraft Maintenance Wing Level Quality Programs indicated a general dissatisfaction with the effectiveness of maintenance analysis and pointed out issues which have affected the capabilities of maintenance analysis. A USAF Audit Agency report on maintenance analysis function in flying units also highlight maintenance analysis problem areas.

DATA: The data and information used for this study were collected through interviews with unit deputy commanders for maintenance (DCMs), their staff and, in particular, their analysis functions at several locations as well as various MAJCOM headquarters. Findings from the FMI and Audit Agency reports were discussed, root causes were determined, and conclusions and recommendations were formulated.

CONCLUSIONS: Both the USAF IG FMI on quality and the USAF Audit Agency report on Maintenance Analysis Function in Flying Units were accurate in pointing out problem areas. This study determined the underlying causes of these problem areas: selection of analysis personnel, education of assigned analysts, guidance given to the analysis functions, experience level of assigned analysts, and problems associated with data available to analysis.

RECOMMENDATIONS: Based on the findings, we recommend the following:

The Air Force should raise prerequisites for entry into the career field, upgrade training requirements, restructure the Logistics and Management Development Center's (LMDC) DCM course, sponsor intercommand analysis conferences, publish an analysis guide and DCM handbook, and ensure unit analysis requirements are included in the Core Automated Maintenance System (CAMS).

Major air commands should reevaluate familiarization course requirements, sponsor intracommand analysis workshops, review placement of unit analysis functions, review information requirement taskings and ensure adequate training and software are provided to support future microcomputer procurements.

## PREFACE

We wish to express our appreciation to the many individuals and agencies who provided outstanding guidance and support to the AFLMC during the development of this project. We also wish to thank the MAJCOMs for their inputs and responses to our many requests. Without the assistance of all the unit DCMs, supervisors and technicians contacted, the recommendations to solve unit-level maintenance analysis problems could not have been developed.

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## CHAPTER 1

### THE PROBLEM

BACKGROUND: HQ AF/LEY through Rivet Ready Initiative 23, Quality, tasked the AFLMC to conduct a study of the Air Force quality program at unit-level. Maintenance analysis is one area under the quality program. Additionally, the USAF IG's report, "Functional Management Inspection (FMI) of Aircraft Maintenance Wing Level Quality Programs (PN 82-630)," revealed dissatisfaction with the effectiveness of maintenance analysis. Similarly, the Air Force Audit Agency Project 815523, "Maintenance Analysis Function in Flying Units," pointed out the need for enhancements in Maintenance Analysis.

PROBLEM STATEMENT: Unit maintenance analysis functions have not met the primary responsibility of performing in-depth analysis to assist maintenance managers in improving the maintenance operation.

FACTORS BEARING ON THE PROBLEM: Maintenance managers are the key to effectively allocate resources to meet mission requirements. Effective use of resources depends on accurate and timely management information (analysis). Major problem areas pointed out by the FMI which have affected the capabilities of maintenance analysis include:

Maintenance analysis personnel are being used as data managers rather than analyzers. The majority of time spent by wing maintenance analysts is used in time-consuming tasks, such as gathering, monitoring and entering data on reports to higher headquarters, in lieu of supporting maintenance managers by analyzing trends in deficiency related areas.

Much of the analyst's time is spent gathering, reformatting, and compiling data, because the existing data systems neither interface with each other nor do they produce usable information. Rather, data output must be reformatted for analysis work. Much of the data analyzed by unit personnel is untimely and not relevant to unit needs. Monthly information summaries are historical and consequently are of little use in identifying current or potential problem areas. There is a need for a real-time information system.

Because interface between quality control, training management, the production workcenters and analysis is inadequate, real problems and causes are not being identified. Analysis with follow-on investigation is insufficient to isolate the underlying cause.

Leadership in wing-level management plays an important role in how the analysis function channels their efforts. Generally, there is inadequate guidance given to the analysis functions, because DCMs do not fully understand the role of analysis.

The role of analysis is often limited to collecting, charting, and reporting maintenance data. Analysts do not feel productive in identifying problems. They feel they are viewed as "bean counters" and chartmakers.

The restructuring of the 391X0 career field may have diluted analytical effectiveness. Some issues are: dropping of shredouts for aircraft and



communication/electronic analysts, combining files maintenance and analysis, and initial acquisition of analysts directly from basic training instead of lateral crosstraining.

## CHAPTER 2

### DEVELOPMENT

APPROACH: This Maintenance Analysis Enhancement project was conducted to enhance the capabilities of the maintenance analysis functions in supporting the maintenance management process. This project was limited to unit-level analysis functions and the direction provided by their MAJCOM headquarters. Problem areas pointed out by the FMI were evaluated through visits to at least two operational units from each CONUS MAJCOM to determine the root causes. Following the visits to the field units, information gathered was compiled and presented to the MAJCOMs for their review and comments.

After the visits to both, field unit and MAJCOM alternatives were analyzed to determine the best solutions. Underlying causes of the problem identified in the FMI include: criteria and selection of analysis personnel, formal education, skill level upgrade requirements, familiarization course requirements, guidance given to analysis functions, experience level, organizational placement, higher headquarters tasking, and current data sources. Discussion of these causes and solutions to them are summarized below.

CAUSE: Inadequate criteria for Selection of Analysis Personnel.

DISCUSSION: The Maintenance Systems Analysis career field (391) entry requirements are lower than entry requirements for any other analysis career field even though the complexity of both the subject matter being analyzed and the diversity of the analysis function within aircraft maintenance exceeds other analysis functions. For example, mandatory prerequisites stated in AFR 39-1 for the Cost and Management Analysis Career Field (691) are: a general aptitude score of at least 55, completion of high school or GED equivalent with courses in algebra and geometry, a secret security clearance, prior qualification in any 5-level AFSC, ability to communicate effectively in writing and the ability to speak clearly and distinctly. The only mandatory prerequisite for entry into the Maintenance Systems Analysis career field is a general aptitude score of 45.

SOLUTIONS: Requirements for input into the 391 career field need to be changed. Particular attention needs to be focused on the following areas.

Minimum AFQT requirements need to be raised from 45 to 55 in the general aptitude area. In addition, a minimum of 45, in either mechanical or electrical aptitude areas, should be required in order for analysts to better understand their maintenance analysis efforts.

Completion of high school or GED equivalent with courses in algebra or equivalent mathematics should be mandatory. This requirement will provide the analysts an understanding of the statistics used in the analysis functions where they will be assigned.

Because access to classified information is necessary at most locations, a minimum of a Secret security clearance should be mandatory to award and retain this AFSC.

The ability to communicate, both oral and written, effectively should be mandatory for personnel in this AFSC. An analysis of a known or suspected problem area is only effective if the message is communicated.

A minimum of 60 on the Air Force Electronic Data Processing Test (EDPT) should be required. An aptitude for electronic data processing (EDP) is necessary to accomplish maintenance analysis responsibilities. Maintenance analysis is the focal point for all automated data systems for the maintenance complex. This responsibility includes the control, development, maintenance and coordination of data systems and requirements. In addition, all MAJCOMs are acquiring microcomputers for use in their analysis functions. The EDPT is also an effective tool to test individuals for their ability to think logically - an essential trait for analysts.

CAUSE: Nondiscriminate selection of personnel to crosstrain into analysis.

DISCUSSION: At the present time inputs into the maintenance systems analysis career field come from both basic training and from crosstrainees from any other career field. However, prior experience is not a criteria. In the Cost and Management Analysis (691X0) and Vehicle Maintenance Control and Analysis (472X4) career fields, prior experience in a 5-level AFSC is required for entry into training. In addition, a vehicle maintenance analyst's prior experience must have been in a vehicle maintenance (47XXX) career field.

SOLUTION: The Maintenance Systems Analysis career field should remain as a basic input AFSC. However to meet manning requirements personnel must be crosstrained into the 391X0 career field. These cross trainees should come from either the 3XXXX or 4XXXX maintenance career fields. Currently, the predominate source of AFSC's to the career field are Materiel Facilities (645X1), Administration (702X0), Security (811X0) and Hospital Administrative (906X0). These cross trainees normally fill 5- and 7-level positions in a shop of 3 to 7 people. The analysis function is hampered when the middle level manager for the AFSC has no prior knowledge of maintenance, organization, forms, workflow or analysis. For small shops, the manager, by virtue of position, must be completely familiar with these basic areas.

CAUSE: Insufficient Formal Technical School Education.

DISCUSSION: The Air Force technical school for input into the analysis career field along with the career development course curricula used for upgrade training provide the necessary statistical and files maintenance skills to accomplish day-to-day analyses of maintenance data. However, formal training could be improved in the area of computer literacy. All MAJCOMs are procuring microcomputers for use by their field level analysis functions, yet the formal technical training received by analysts does not provide the instruction in computer literacy to prepare them for the use of these computers.

SOLUTION: Formal training requirements need to be upgraded to meet initiatives that have taken place within the unit maintenance complex. The basic Maintenance Systems Analysis course (C3ABR39130) should be expanded to include at least instruction in ANSI BASIC and microcomputer familiarization,

since MAJCOMs are procuring microcomputers for their unit analysis functions. This training would provide the knowledge necessary for analysts to better use these computer resources.

CAUSE: Inadequate Skill Level Upgrade Requirements.

DISCUSSION: Currently, no training requirement exists for effective writing prior to upgrade. Portrayal of analysis results must include meaningful narratives in addition to pure numbers. Summaries with mostly pure statistics and no articulation of known or suspected problem areas, are of little use to managers without the time and ability to correlate and interpret this data. This task is an inherent responsibility of analysts.

SOLUTION: Completion of an AF effective writing course should be required for upgrade to the 5-level skill. Written narratives in analysis reports and studies are imperative for communicating the results of the analysis. These written reports must reduce numbers to meaningful information for managers' use.

CAUSE: Inadequate Familiarization Course Requirements.

DISCUSSION: Maintenance analysts must have a basic understanding of the mission equipment maintained by their organization. Although most MAJCOMs require analysts to receive weapon system familiarization on the assigned aircraft, the FMI results indicated that only half of the units visited had ensured this familiarization training had been accomplished. In addition, the types of familiarization (FAM) courses analysts had received varied greatly from unit to unit. Units' representatives visited by the AFLMC felt, that while the FAM courses helped with the basic understanding of the assigned equipment, a maintenance complex orientation is needed for newly assigned analysts.

SOLUTION: MAJCOMs should review their familiarization course requirements for analysis personnel and standardize training requirements to include a maintenance complex orientation. This orientation would help familiarize assigned analysts with the different staff functions and production workcenters. Contacts made during this orientation should provide a sound background for establishing a customer relations program to resolve some of the interface problems pointed out by the FMI.

CAUSE: Inadequate Guidance Given to Analysis Functions.

DISCUSSION: The primary responsibility of analysis is to perform analyses and studies as directed by the DCM (per AFR 66-1). In order for unit DCMs to adequately direct analysis, they must have a good working knowledge of maintenance analysis, including analysis duties, responsibilities, capabilities and limitations. This coupled with the fact that few DCM's are long-term maintenance officers has caused confusion in the field over how the DCMs should use their analysis functions. The effectiveness of unit maintenance analysis functions can be improved by better guidance being given to analysis by their DCMs.

SOLUTION: Guidance provided to unit analysis functions from the DCMs can be improved by increasing the unit DCMs knowledge of how to effectively use

and manage maintenance analysis efforts. At the present time, the DCM course taught by the Leadership and Management Development Center (LMDC) has insufficient information pertaining to proper use of their analysis functions. This course needs to be expanded to more thoroughly cover the maintenance systems analysis activity. In addition, an instructional handout should be developed to improve the DCM's knowledge of how to effectively use and manage analysis efforts. This handout would be of continuing value not only in formal instruction but for future reference by incumbents.

CAUSE Experience Level of Assigned Analysts.

DISCUSSION: To provide information to improve the maintenance operation the analysis function must be experienced. The experience level of assigned analysts has decreased with the merger of the Files Maintenance and Analysis AFSCs, the deletion of shredouts for the AFSC, the effects of AF MEA/AFMPC Career Progression Group (CPG) initiatives, and the influx of crosstrainees from non-maintenance career fields.

SOLUTIONS: To improve the effectiveness of unit analysis functions the experience level of assigned analysts must be raised. Specific areas that may resolve this problem are inter/intra command analysis conferences and a guide for use by field level analysts.

In many units within the Air Force, and in each MAJCOM, the experience level of assigned analysts needs improvement. Several MAJCOMs have established intra-command analysis conferences to assemble analysts from the various levels in the command. These conferences are a good means of exchanging job-related information and affording unit-level analysts the opportunity to learn from more experienced analysts throughout the command. In addition to these intra-command conferences, HQ AF/LEYM should sponsor inter-command conferences to enable cross-feed of analysis information between the various commands, AFLC, AFSDC, AFMPC and the analysis technical training center at Chanute AFB, IL.

During our visits to field units, personnel interviewed stated an analysis guide or pamphlet would be very useful. This handbook should explain the analysis process, the procedures for an in-depth analysis, provide case studies, define terminology, set general guidelines, suggest texts and reference material, and provide general guidance to unit analysis functions. This handbook should also emphasize the importance of an adequate interface between analysis, other staff agencies, and the production workcenters.

CAUSE: Organizational placement of unit analysis functions.

DISCUSSION: Presently unit maintenance analysis activities are assigned under two different lines of authority depending on command: one reporting directly to the DCM and the other to the Maintenance Management Directorate. Comments received from the FMI team indicated analysis functions organized under the DCM were more efficient and did a better job.

SOLUTION: In order for analysts to perform their primary function, they need to know what the DCM wants. This works effectively when the analysis function is organized under the DCM. However, when analysis is placed under

the Maintenance Management Directorate, the person in charge of this function normally attends these meetings and the analysis function receives indirect guidance. MAJCOMs should review the placement of their analysis functions within the DCM complex to determine where the analysis function should be assigned to meet their mission objectives.

CAUSE: Higher headquarters taskings.

DISCUSSION: A large percentage of time spent by wing maintenance analysts is used for gathering and formatting data for time consuming reports to higher headquarters. Within some MAJCOMs this problem has been compounded by numbered Air Force agencies tasking individual wings for the same information as contained in the MAJCOM reports but with different suspenses. In addition, at least one MAJCOM requires the same information be provided them on a weekly and monthly basis in message format then a printed report be forwarded.

SOLUTION: MAJCOM LGs should review and reevaluate their information requirements for compliance with the letter and intent of AFR 178-7, Air Force Information Requirements Management program. Two of the objectives of this regulation are to ensure information needed is obtained with a minimum burden on subordinate activities and all unnecessary duplication in systems and reporting is eliminated.

CAUSE: Current data sources inadequate.

DISCUSSION: A major finding of the FMI and AF Audit Agency reports were that maintenance information systems products, in general, do not provide information. Rather they provide data in a format not easily used by analysts. Many analysis functions were more occupied with data management than data analysis and information output. The lack of a real-time data management system has inhibited the usefulness of unit analysis functions. Without a readily accessible data base, analysis is less able to provide timely information for maintenance management. The maintenance data base is enormous and is comprised of several somewhat independent systems.

SOLUTIONS: Unit analysis functions generally collect and reduce data manually. Efforts underway to resolve portions of these problems are the procurement of microcomputers for unit analysis functions and the development of the Core Automated Maintenance System (CAMS). These should provide needed relief from data manipulation tasks; however, care needs to be exercised in the following areas.

Microcomputers being considered for unit analysis functions will aid the analysts in many areas of analysis. However, because these microcomputers do not now interface with the B3500, analysts will have to contend with historical data for the foreseeable future. The requirement to duplicate manual data entry is labor intensive. Also, MAJCOMs need to ensure adequate training and software are made available for analysts to use.

During the development of CAMS, HQ AF/LEY and MAJCOMs need to ensure the unit analysis requirements for real-time information and user-friendly data retrieval capabilities are included.

## CHAPTER 3

### CONCLUSIONS

The USAF IG FMI and the USAF Audit Agency report both pointed out numerous issues affecting the ability of unit maintenance analysis functions to perform their primary responsibility of providing analyses and studies as directed by the DCM.

Both field units and MAJCOMs surveyed by the AFLMC agreed these inspection reports did outstanding jobs of pointing out problem areas associated with unit maintenance systems analysis functions. During the course of this study we validated these issues and determined the underlying causes were: selection of analysis personnel, education of assigned analysts, guidance given to the analysis functions, experience level of assigned analysts, organizational placement of analysis functions, higher headquarters taskings, and problems associated with data available to analysis.

One problem area identified in the FMI was the merger of the W392X0, files maintenance, and the 391X0, maintenance systems analysis, career fields which may have diluted analytical effectiveness. Although this merger has caused problems initially, with adequate training we believe the long term benefits will far outweigh the initial impact.

## CHAPTER 4

### RECOMMENDATIONS

Based on our investigation of the problem we recommend the following:

1. Raise prerequisites in AFR 39-1 for entry into the 391X0 Maintenance Systems Analysis career field to include: 55 general and 45 mechanical or electrical AFQT scores, completion of high school, a secret security clearance, the ability to communicate effectively, and a 60 EDPT score. (OPR: AF/LEYM)
2. Require prior maintenance experience for retraining into this AFSC. (OPR: AF/LEYM)
3. Strengthen training requirements by teaching computer literacy at the initial formal technical school. (OPR: AF/LEYM OCR: ATC/TT)
4. Require completion of an effective writing course prior to upgrade to the five-level. (OPR: AF/LEYM)
5. Restructure the DCM course taught by the LMDC to include how to effectively use and manage maintenance analysis. (OPR: AF/LMDC OCR: AF/LEYM)
6. Sponsor intercommand analysis conferences. (OPR: AF/LEYM)
7. Publish a DCM analysis handbook for use at unit level. (OPR: AF/LEYM OCR: AFLMC/CC)
8. Publish an analysis guide for use by analysts at unit level. (OPR: AF/LEYM OCR: AFLMC/CC)
9. Ensure unit analysis requirements for real-time information and a user-friendly retrieval system are included in CAMS. (OPR: AF/LEXY OCR: AF/LEYM and AFSDC/CC)
10. Reevaluate familiarization course requirements for unit-level analysts. (OPR: MAJCOM/LG)
11. Sponsor intracommand analysis conferences. (OPR: MAJCOM/LG)
12. Review placement of unit DCM analysis functions. (OPR: MAJCOM/LG)
13. Review information requirement taskings. (OPR: MAJCOM/LG)
14. Ensure adequate training and software packages are available for microcomputer procurements. (OPR: MAJCOM/AD (SCTC) OCR: MAJCOM/LG)



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