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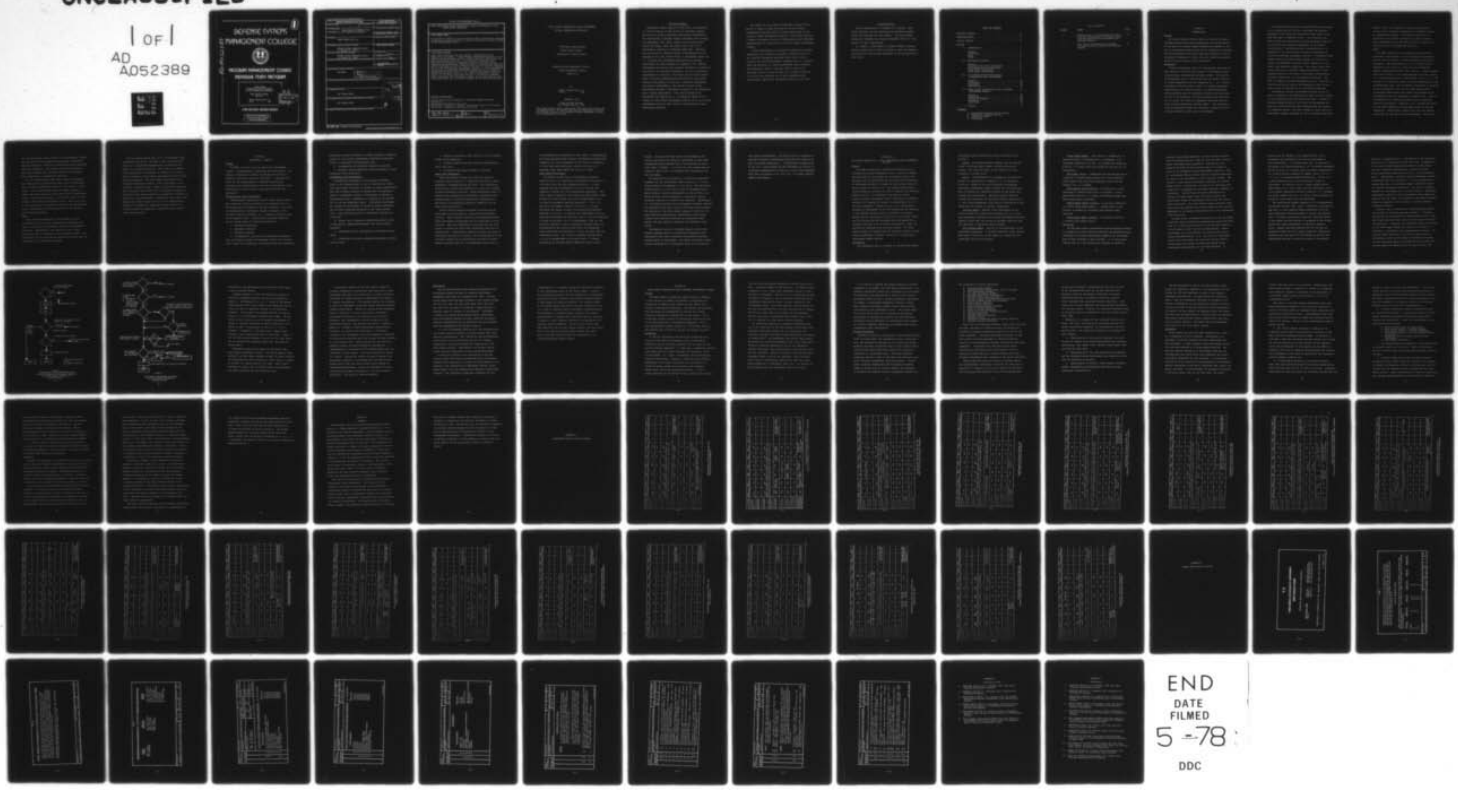

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PROGRAM MANAGEMENT COURSE
INDIVIDUAL STUDY PROGRAM

THREE DEGREE
INTERMEDIATE LEVEL MAINTENANCE
OF NAVY AERONAUTICAL MATERIALS

STUDY PROJECT REPORT
PMC 77-2

Robert Edward Bates, Jr.
GS-12 DNC

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DEFENSE SYSTEMS MANAGEMENT COLLEGE

STUDY TITLE: THREE DEGREE INTERMEDIATE LEVEL MAINTENANCE OF NAVY AERONAUTICAL MATERIALS

STUDY PROJECT GOALS:

To provide an example of efforts made by Navy aeronautical material maintenance program managers to improve maintenance support posture at the intermediate level.

STUDY REPORT ABSTRACT:

This report discusses the development, implementation and impact of the concept of three degree maintenance relative to the traditional maintenance policy of three levels of maintenance for Navy aeronautical materials. An additional management tool specifically designed to supplement efforts directed towards improving the maintenance support posture of aeronautical materials at the intermediate level of maintenance results from the development of the three degree maintenance concept. A formal methodology is provided to supplement management capability on an individual equipment/component basis to: (a) classify maintenance functions within levels and by activity; (b) assign maintenance responsibility to a specific level and activity; (c) assign maintenance tasks consistent with complexity, depth, scope, and range of work to be performed; and (d) ensure optimum use of limited resources.

SUBJECT DESCRIPTORS:

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Operations Information Feedback, Maintenance Reports and Surveys (10.12.02); Suggestion Programs (10.12.04)

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THREE DEGREE INTERMEDIATE LEVEL MAINTENANCE OF NAVY AERONAUTICAL MATERIALS

Individual Study Program

Study Project Report

Prepared as a Formal Report

Defense Systems Management College

Program Management Course

Class 77-2

by

Robert Edward Bates, Jr
GS-12 DNC

November 1977

Study Project Advisor
MAJ Joseph Salvitti, USA

This study project report represents the views, conclusions and recommendations of the author and does not necessarily reflect the official opinion of the Defense Systems Management College or the Department of Defense

EXECUTIVE SUMMARY

Maintenance support posture of each level of maintenance is a direct function of the ability of individual support activities to satisfy experienced maintenance requirements. The availability of specific support resources such as tools, test equipment, skill level, repair parts and facilities dictate the depth, scope and range of work that can be performed on individual aeronautical materials. Realizing that activities at identical levels of maintenance are not equipped to the same resource level, a requirement exists to: (1) correlate the maintenance operations with resource requirements for each equipment or component; (2) identify maintenance requirements with resource allocation of individual activities; (3) correlate maintenance capability to mission requirements of individual activities; and (4) assign maintenance functional responsibilities and allocate appropriate resource requirements to individual activities commensurate with mission requirements. The concept of three degree maintenance provides a methodology to assist in the accomplishment of these requirements. This report discusses the development and implementation and potential impact of the concept of three degree maintenance relative to the traditional maintenance policy of three levels of maintenance for Navy aeronautical material.

The concept of three degree maintenance has been implemented in support of Navy aircraft gas turbine engines. Consideration has been given to include application of the concept to other aeronautical material. This report presents a general discussion of both the implementation and additional considerations for application of the three degree maintenance concept.

A formal methodology is provided to supplement management capability on an individual equipment/ component basis to: (a) classify maintenance functions within levels and by activity; (b) assign maintenance responsibility to a specific level and activity; (c) assign maintenance tasks consistent with complexity, depth, scope and range of work to be performed; and (d) ensure optimum use of limited resources. It is felt that widescale use of this methodology will significantly improve the maintenance posture of the fleet.

ACKNOWLEDGEMENTS

Sincere appreciation is extended to my advisor, Major Joseph Salvitti, for the assistance and guidance provided during the preparation of this report. The moral support afforded me thoughout the Program Management Course by Major Salvitti is fully appreciated.

Mr. Donald J. Hish, Naval Air Systems Command, deserves special recognition for having provided me with the exposure, experience and understanding necessary for the development of this report.

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SECTION I

INTRODUCTION

Purpose

The primary purpose of this report is provide the reader information concerning recent developments and considerations by the Naval Air Systems Command Headquarters (NAVAIR) in the area of maintenance support planning for aeronautical materials. Selected management tools which have been developed to assist maintenance management in their effort to improve aeronautical material support posture will be presented.

Background

Military maintenance policy for aeronautical materials has been defined in terms of three levels of maintenance; namely organizational, intermediate and depot levels. The division of maintenance into the three levels has the basic objective to provide management with the capability to : (a) classify maintenance functions within levels; (b) assign maintenance responsibility to a specific level; (c) assign maintenance tasks consistent with the complexity, depth, scope and range of work to be performed; (d) ensure optimum use of resources; and (e) assist all levels of management concerned with the Naval Aviation Maintenance Program (NAMP).[1] The objective is to be accomplished through the collection, analysis and use of data provided by each level of maintenance.

A Maintenance Data Collection System (MDCS) was developed as an integral part of the Navy Maintenance and Material Management (3-M) System and provides the data input to the NAMP described in OPNAVINST 4790.2. This subsystem provides information reports which provide management tools for the efficient and ecomonical management of maintenance organizations.[2] The MDCS provides a standardized set of procedures to be used through the Naval establishment to simplify maintenance management functions. Standardized data elements within the MDCS allows everyone to converse in a common, understandable language readily adaptable to electronic data processing techniques. The system allows individual activities to conduct inspections peculiar to the assigned mission as the result of equipment configuration, operating requirement, or environmental conditions. The MDCS, in essence, provides management with the visibility to identify areas which need to be addressed in order to maintain a level of readiness of all aeronautical material.

Aeronautical material maintenance programs are developed in response to the determinations made from the analysis of the information provided through the MDCS. A number of programs developed apply to all levels of maintenance and there are those which have been developed that are peculiar to respective levels. The basic concept of three levels of maintenance remains unchanged for all the programs developed;

however, there are instances in which policy has been tailored to the specific requirements of respective levels at individual activities. The programs which will be presented in this report illustrate the extent to which basic maintenance policy has been tailored to improve the support posture of aeronautical materials.

Scope

The NAMP provides the basic concepts and guidelines applicable to the support of Naval aeronautical materials such as aircraft engines, airframe components and support equipments. The effectiveness of the operating forces is dependent of the efficiency with which the maintenance support organizations perform their mission. Support requirements are initiated at the organizational level upon receipt of a reported malfunction of some systems or component on the aircraft. If corrective action cannot be accomplished at the organizational level, the maintenance requirement is reported to the intermediate level via the local supply system. Maintenance requirements which cannot be satisfied by the intermediate level are forwarded to a depot level. Such is the hierarchy of maintenance capabilities of respective levels of maintenance. Typically, the organizational level has the least capability and the depot level has maximum capability. Additionally, capabilities will vary between activities for the same level of maintenance. That is to

say, an intermediate level located at one maintenance activity may have more or less capability than another intermediate activity located at a different location with each supporting identical equipments. The programs which will presented in this report address that particular aspect of maintenance policy applicable to aeronautical materials.

The Gas Turbine Engine (GTE) Three Degree Intermediate Level Maintenance Program and the Three Degree Intermediate Level Component Maintenance Program are the subjects of this report. Each of the programs have the common purpose to support the basic objective of the three level of maintenance policy. The major distinction is seen in the title of each program - three degree intermediate level. Hence, the focus of this report will be primarily in terms of the intermediate level of maintenance and the application of the concept of three degree maintenance.

Range

Prior to the presentation of the programs, a brief discussion will be provided regarding the individual functions of each level of maintenance and their relationship to each other. Additionally, the concept of three degree maintenance will be developed in very simplistic terms. The significance of the three degree concept will evolve with the discussion of the individual programs.

The Gas Turbine Engine Three Degree Intermediate Level Maintenance Program was initiated in the early 1970 time frame and has continued implementation in much the same manner as originally conceived. This report will address that program only to the extent to indicate to the reader that the concept of three degree maintenance has been effectively implemented. The Three Degree Intermediate Level Component Maintenance Program, on the other hand, is not currently a formal program. Rather, a feasiblity study has been in process since early 1973 to determine the applicability the three degree concept to aeronautical materials in addition to aircraft engines. Accordingly, this report will address the latter program in terms of its evolution and potential to enhance the maintenance support posture in similiar fashion as appparently accomplished with the aircraft engine program.

SECTION II

MAINTENANCE CONCEPTS

GENERAL

The NAMP is founded upon the three level maintenance concept - organizational, intermediate and depot levels. The concept is designed to provide for optimum utilization of manpower, facilities, materials and funds. It provides the basis for the establishment of standard organizations, procedures and responsibilities for the accomplishment of all maintenance of naval aircraft, associated materials and equipment.[1]

Organizational Level Maintenance

Organizational maintenance includes those upkeep maintenance functions normally performed by an operating unit on a day-to-day basis in support of its own operations. This work is accomplished by maintenance personnel assigned to the aircraft reporting custodian; i.e., individual aircraft users at the squadron level. Organizational functions generally can be grouped under the following categories:[1]

a. Equipment inspections.

b. Equipment servicing.

c. Equipment handling.

d. "On-equipment" corrective and preventive maintenance. This maintenance includes "on-equipment" repair and "on-equipment" removal and replacement of defective parts and components.

Maintenance actions performed on removed repairable components, usually at the Aircraft Intermediate Maintenance Department (AIMD), is considered "off-equipment" work.

e. Incorporation of designated technical directives.

f. Necessary record keeping and reports peculiar to organizational level maintenance.

Intermediate Level Maintenance

Intermediate maintenance is that upkeep maintenance which is the responsibility of, and is performed by, designated maintenance activities in support of using organizations. This work normally consists of calibrations; off-equipment repair or replacement; repair or replacement of damaged or unserviceable parts, components, or assemblies; the manufacture of certain unavailable parts. Intermediate maintenance may include the performance of certain periodic inspections and providing technical assistance at the organizational level. The intermediate level of maintenance includes the following:[1]

a. Repair, test, inspection, modification and/or check of aeronautical components/equipments and related support equipment.

b. Intermediate level calibrations of designated equipments.

c. Processing of aircraft components/equipments stricken from aircraft.

d. Technical assistance, when required, to the organizational levels supported.

e. Perform selected functions normally accomplished at depot level only.

f. Incorporate designated technical directives.

Depot Level Maintenance

Depot maintenance includes the rework of materials requiring major overhaul or a completed rebuilding of parts, assemblies, subassemblies and end items. The manufacture, modification, testing and reclamation of parts are included as depot maintenance functions. Depot maintenance serves to support lower categories of maintenance, intermediate and organizational, by providing engineering assistance and performing that maintenance beyond the capability of the lower level activities.[1]

Certain selected depot/intermediate functions may be authorized to be performed by a lower level maintenance activity. These selected functions are designated selected depot and selected intermediate and are indicated by the SX notation. Depot and intermediate activities have the capability to perform any lower level maintenance functions as defined above. Documentation normally reflects the level of maintenance assigned the function, not the designation of the acivitity (except for the maintenance performed on Ground Support Equipment (GSE) at the intermediate level which is

all documented for performance at that level.) Organizational activities assigned these selected intermediate functions will respond to the supply department in the repair of components received from other activities, and the development of component repair data sheets for designated items.

Three Degree Maintenance

The ability of any level of maintenance to perform specific maintenance functions is determined by the degree to which each level has been allocated maintenance support resources and the corresponding capability of each type resource to satisfy any given maintenance requirement. The tools, support equipment, skill level and other support items dictate the depth of work that can be accomplished on any component or equipment requiring maintenance. The availability of the support items to a maintenance activity determines the extent to which that activity can maintain equipments supported. In general, all maintenance functions which can be performed on any given component may be classified in terms of the three levels of maintenance. That is, for any given component, there are specific functions which can be performed by the organizational level of maintenance, others which must be performed at a level not lower than the intermediate level, and, finally, remaining function which can only be accomplished at the depot level. A further distinction can be made between identical levels of main-

tenance. Not every activity having an intermediate capability can perform the identical maintenance as some other intermediate levels because each is not provided the identical level of support. It is for this very reason that the concept of three degree intermediate level maintenance has been developed.

The objective of the concept is to provide a consistent framework for all intermediate level activities to perform various depths of maintenance on components. The definitions provided earlier for the three levels of maintenance still apply; however, further consideration is given to both, the functions which can be performed on a component, and the resources required to accomplish the functions. Subsequently, the maintenance functions and corresponding resources required are categorized into one or more of the three degree classes. The structure of the three degree concepts is such that the least difficult functions are classified as third degree; slightly more difficult functions are classified second degree; the most difficult functions are classified first degree.

Intermediate levels are assigned specific degree maintenance responsibility on a component-by-component basis commensurate with their respective ability/need to perform various depths of maintenance. The degree maintenance responsibility assigned to an intermediate level is in consonance

with mission requirements. An activity will not normally be assigned a degree of maintenance which would not allow it to meet its mission requirements. A significant characteristic of the three degree concept is that assignment of maintenance functional responsibility is made on a component-by-component basis and in accordance with individual maintenance activity support requirements.

SECTION III

GAS TURBINE ENGINE THREE DEGREE INTERMEDIATE LEVEL MAINTENANCE PROGRAM

General

The NAMP provides basic concepts and guidelines which represent the engine maintenance program policies of NAVAIR. The objectives of the program are to prescribe policy and procedure for the application and monitoring the performance of maintenance required in support of gas turbine engines at various levels of maintenance. The Complete Engine Repair (CER) Program was initiated in 1958 to establish the necessary support criteria and management guidelines to achieve shorter pipeline (turnaround) times, increasing time between overhauls and reducing the number of unservicable engines in the Navy inventory.[1] Another concern to management which promoted the development of the CER Program was the awareness of the sizeable inventory dollar investment in aircraft engines and the continually rising cost of new engine models. The CER Program provided management with the capability to establish controls so as to reduce and maintain a lower new acquisition requirement for aircraft engines. The three degree concept has evolved with the continual efforts of maintenance management to improve aircraft gas turbine engine maintenance support posture.

Terminology

The terminology used in relation to the GTE Three Degree

Intermediate Level Maintenance Program are amplified as follows:[3]

Engine. All turbine engines, whether used for powered flight (including target drones, missiles and missile targets), for auxiliary power or for starting purposes (airborne or ground units).

Repair. The restoration of a damaged or non-operating engine, its accessories or components, to an acceptable condition. Repair by designated Aircraft Intermediate Maintenance Departments (AIMD) includes the repair/replacement of turbine and combustion sections of the engine and includes the afterburners. Additional repair functions include the replacement of externally damaged, deteriorated or time limited components, gear boxes or accessories of the engine and the conduct of calendar inspections.

Complete Repair. Applies to the maintenance of gas turbine engines to a depth which includes and goes beyond that maintenance authorized for non-CER designated activities. Complete repair does not include maintenance functions that are equivalent to performing depot overhaul.

First Degree Repair. Applies to the performance of CER maintenance functions. It includes compressor rotor replacement and/or disassembly of the engine to a depth that the compressor rotor can be removed.

Second Degree Repair. The repair of a damaged or non-operating engine, its accessories or components, to an acceptable operating condition. It includes the repair/replacement of turbine rotors and combustion sections and the afterburners.

Third Degee Repair. Encompasses the same GTE maintenance capability as Second Degree except the certain functions which require high maintenance man-hours and are of low incident rate are excluded.

First Degree Repair Activity. A maintenance activity authorized to perform First Degree Repair/CER. A First Degree Repair Activity is capable of performing Second and Third Degree Repair functions.

Second Degree Repair Activity. An activity authorized to perform Second Degree Repair. A second Degree Repair Activity is capable of performing Third Degree Repair functions.

Third Degree Repair Activity. An activity authorized to perform Third Degree Repair.

Discussion

The GTE Three Degree Intermediate Level Maintenance Program is intended to provide specific guidelines and responsibilities throughout the aviation maintenance community for the management of GTEs installed in Navy aircraft. It is intuitively obvious that it is not economically feasible to establish

identical maintenance capability at each and every Intermediate Maintenance Activity (IMA) for each and every aircraft engine type/model/series supported. Additionally, the operating scenario of each activity limits the extent to which it can accomplish certain maintenance functions. That is, shore-based IMAs and afloat IMAs are equipped differently by virtue of the environment in which they are located. The concept of three degree maintenance recognizes the environmental factor, in particular, in terms of an IMA having the capability to accomodate the resources required in support of a component. Certain types of support equipments will require more space than a ship can afford; certain test requirements cannot be accomplished aboard ship for lack of proper facilities. The three degree concept considers these type factors for determining the most effective and practical assignment of maintenance responsibilities to the intermediate level activities.

Aircraft engine maintenance activities are not designated a specific degree maintenance responsibility across-the-board. That is, it would not be correct to say that NAS Miramar is a first degree activity for gas turbine engines. Rather, NAS Miramar is a first activity for specific gas turbine engine type/model/series: e.g., the J-79, all type/model/series; the J-57-22/420; the TF-3--412; and the J52-6/8. Additionally, NAS Miramar is authorized second degree maintenance responsibility for the T56-8/425/426. It

follows that NAS Miramar is not authorized and is not responsible for performing first degree maintenance of the T56-8/425/426. It is conceivable that, in addition to performing first degree maintenance for the engine type/model/series for which the activity has first degree responsiblity, the activity would be expected to support nearby activities not having first degree capability/authority. Herein lies another characteristic of the three degree concept of maintenance. An activity having a lesser capability may seek support from a higher level activity contingent on the higher degree classified activity's capability to accomodate the lesser capable activity. A similar criteria applies for second and third degree activity interfaces.

The three degree process conmences at the Organizational Maintenance Activity [OMA] level. A decision is required at OMA level for each reported engine malfunction as to the type maintenance actions necessary to correct the malfunction. Typically, corrective actions not requiring removal of the engine from the aircraft is performed at OMA through removal and repair/replacement of defective component parts. Engines requiring removal from the aircraft are processed through the local supply system for disposition. Depending upon the nature of the malfunction and the type maintenance required to return the engine to serviceable

condition, a determination is made whether or not corrective actions can be accomplished by the local IMA. Documentation in the form of NAVAIR Notice 4700 identifies each activty and their respective authorization to perform specific degree maintenance functions by aircraft engine type/model/series. Additionally, individual engine Maintenance Instruction Manuals (MIM) are structured so as to correlate maintenance functions and associated support resources required for specific maintenance operations. The AIMD can readily determine if the engine can be repaired locally. Maintenance requirements beyond the local intermediate level capability requires that the engine is processed to the nearest activity having the capability, and capacity, to effect necessary corrective actions.

Figures 1 and 2 illustrate the decision making process for purposes of screening rejected engines.[1] A reported malfunction may be corrected at organizational level if the maintenance functions which have to be performed are within its capability. Otherwise, the defective engine is forwarded to the local supply system and a replacement engine, if available, is returned to the organizational activity. The rejected engine presently in the local supply system is considered in terms of the degree of maintenance required and the authorized degree of maintenance for the local IMA. Engines beyond the capability of the local activity are

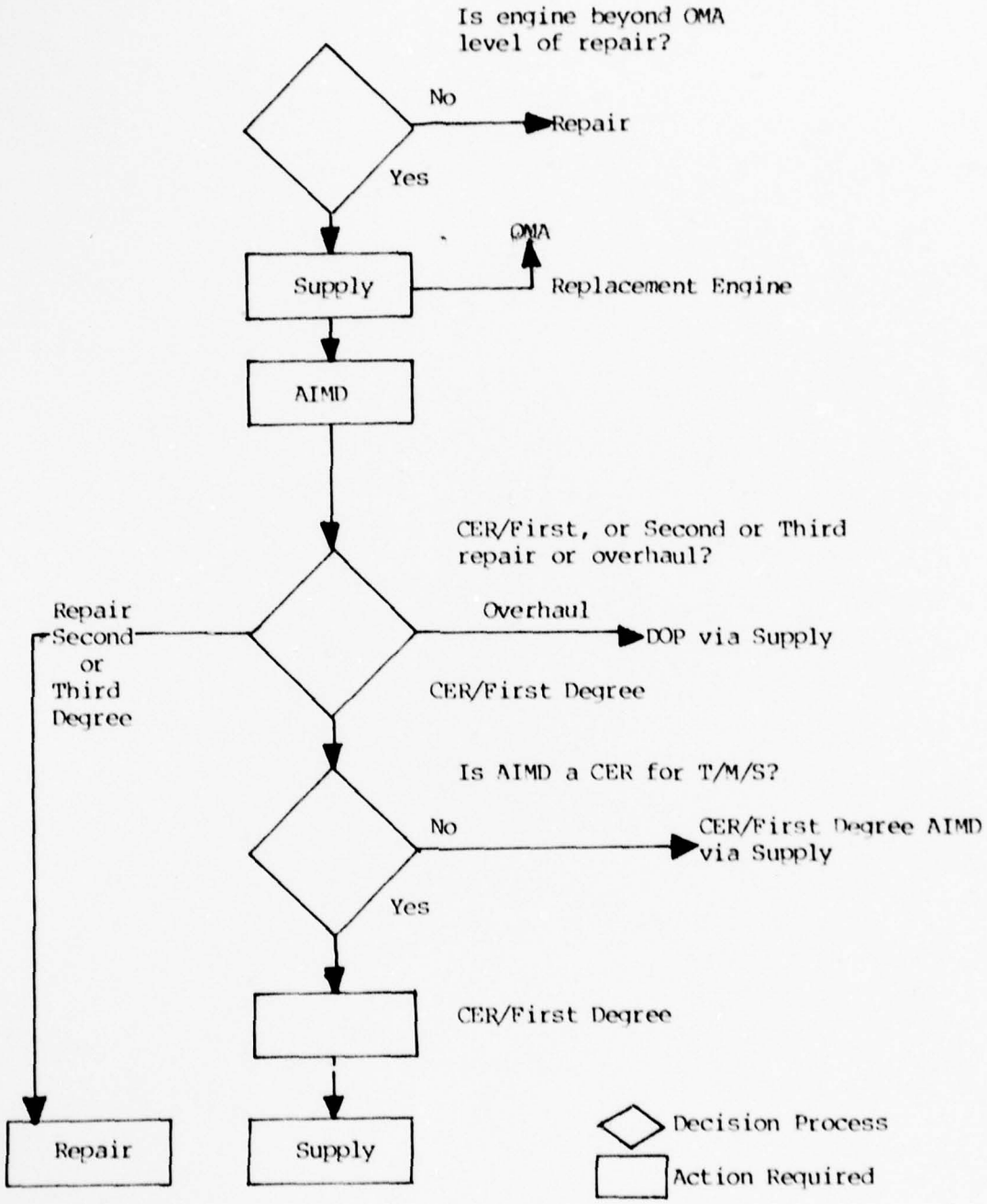

Figure 1
Organizational, First/Second/Third Degree
Aircraft Intermediate Maintenance Department
Screening Sequence Procedure for
Rejected Engines

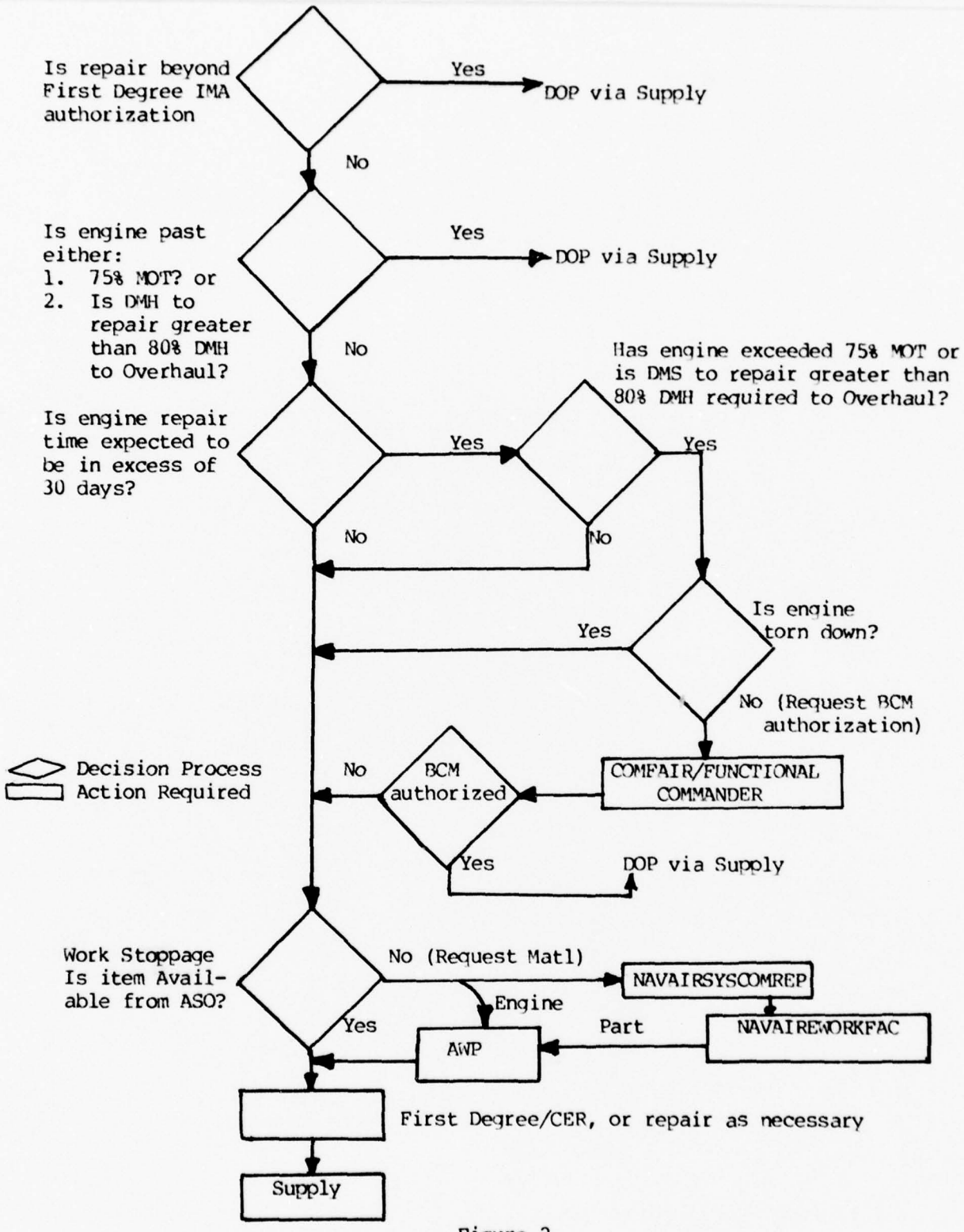

Figure 2

First Degree Intermediate Maintenance
Activity Screening Sequence for
Rejected Engines

forwarded to the appropriate level which can effect appropriate corrective action.

Engines processed at CER/First Degree are subject to additional detailed screening criteria as indicated in Figure 2. Considerations are made in terms of the Maximum Operating Time [MOT] which refers to the amount of time an engine has been in operation relative to its scheduled overhaul. If the engine has exceeded 75% MOT, it must be forwarded to its Designated Overhaul Point [DOP]. The net effect of this criteria is to not expend large amounts of manpower, materials and money to effect a CER/ First Degree Repair at such a close period in time to the scheduled overhaul. In general, a CER/First Degree Repair effort involves a near complete tear down of the engine. Then, if the 75% MOT criterial applies, it would be more cost effective to institute the overhaul rather than the CER/First Degree Repair.

Additional criteria which apply in the case of CER/ First Degree maintenance include: (a) Direct Manhours (DMH) required to effect repair compared to DMHs to effect overhaul; (b) Turnaround Time [TAT] required to effect repair in excess of 30 days; (c) Engine state of tear down. Each criteria functions to ensure that a rejected engine is maintained at the lowest practical and cost effective level.

A significant feature of the three degree concept as currently employed for intermediate level activites is that a procedure does exist for an activity to either up-grade or down-grade its degree designation commensuate with changes in support requirements. The procedure applies for instances in which the complement of aircraft engine type/model/series changes significantly. Should the aicraft engine complement reduce in quantity to a level that certain authorized maintenance functions are not performed with as great a frequency, and, consequently, certain resoures are not effectively employed, the activity may submit a request to NAVAIR for a change in degree maintenance responsibility. Similarly, an activity that experiences a significant increase in the requirement to perform maintenance functions not previously authorized may do so through the same channels as in the former case. NAVAIR receives and evaluates all proposed changes in degree maintenance designations. A recommendation is forwarded to CNO by NAVAIR based upon its evaluation of each request. CNO either approves or rejects the request. Appropriate changes are made throughout the mainentance community in consonance with the CNO decision. NAVAIR Notice 4700, Gas Turbine Engine Three Degrees of Intermediate Maintenance, records the assignment of first, second and third degree designation of all participating activities.[4] The notice is updated annually.

Application

The Gas Turbine Engine Three Degree Intermediate Level Maintenance Program has been an effective maintenance management tool since its introduction in 1971. Aircraft engine types which have been included in the program include the J52, J57, J60, J79, J85, TF30, TF34, TF41, T53, T56, T58, T64, T76, and T400 to illustrate a broad spectrum of aircraft types on involved in the program.[4] NAVAIRINST 13700.6A, Gas Turbine Engine Threee Degree Intermediate Level Maintenance Program, has been issued and delineates specific responsibilities and guidelines for the establishment and management of the subject project.[3]

A review of NAVAIRINST 13700.6A will show application to gas turbine engines installed in weapon systems other than aircraft installations. The GTC-100-53 and the GTC-100-56, power plants for the USS America and USS J.F. Kennedy, respectively, have been scheduled for application of the three degree concept. Additionally, the Harpoon Missile engine has been considered for three degree maintenance.

A final note related to the application of the Gas Turbine Engine Three Degree Intermediate Level Maintenance program which also serves to relate the effectiveness of the program is the introduction of NAVAIRINST 5303.4B, Performance Awards in the Jet Engines Three Degrees of Maintenance Program.[5] The instruction prescribes procedures for the

implementation of an awards program for excellent performance at the intermediate level of jet engine repair. Briefly, the instructions provides for the recognition of intermediate activities who have excelled in performing assigned degrees of maintenance for engines supported. The apparent affect of the awards program has been to motivate activities to do their best for assigned degree maintenance responsibilities. The atmosphere of competitiveness created by the awards program makes it apparent that individual IMAs are motivated to excell in their respective degrees of responsibility for aircraft engines supported. And then, after awards have been made each year for each degree category, the non-recipients of the available awards respond "Maybe next year." Such an attitude should provide for enhancement of jet engine maintenance support posture.

SECTION IV

THREE DEGREE INTERMEDIATE LEVEL COMPONENT MAINTENANCE PROGRAM

General

The Naval Weapons Engineering Support Activity (NAVWESA), a field activity to NAVAIR, was tasked to investigate the feasibility of applying the concept of three degree maintenance to aeronautical materials. The concept had previously been developed and implemented for aircraft gas turbine engines as discussed in Section III of this report. Since maintenance support posture of aeronautical material was not at an acceptable level to maintenance management, efforts were specifically directed towards the intermediate level as one possible area in which to improve the support posture.[6]

Background

It had been determined that definitive guidelines pertaining to the depth of maintenance that an AIMD should perform on various aircraft components did not exist for all aircraft systems supported.[6] In particular, maintenance instruction manual were not always developed for respective levels of maintenance; i.e., depot, intermediate and organizational levels of maintenance. Generally, AIMDs performed component maintenance to the depth dictated by the availability of logistics support assets such as tools, test equipment, repair parts, skills and maintenance manuals. It was a common experience of activities to have a maintenance require-

ment and less than minimum resources to satisfy the requirement. A typical example of the experiences of AIMDs involves attempting to use a depot level (overhaul) manual to effect repairs on a component. With little more than given the task to repair the component, the artisan had to determine those maintenance functions that were, in fact, feasible at the intermediate level. More often than not, the difficulty of the task was amplified with problems incurred due to improper maintenance rather than to the failure of the component. What may have been a retrievable asset through proper maintenance resulted in a lost asset in many instances.

An additional indicator to maintenance management that led to the initiation of the Three Degree Intermediate Level Component Maintenance Program was the observation that comparably equipped IMAs demonstrated appreciable differences in capabilities.[6] The Maintenance Data Report (MDR) system, Maintenance and Material Management (3-M), would show that an identical component supported by two or more comparably equipped IMAs would vary significantly in type actions taken for that component. Whereas one activty may have reported a reasonable repair rate for the component, other activites would report a significantly lower repair rate and higher Beyond Capability & Maintenance (BCM) rate. The reasons for this disparity were not discernable from the 3-M data.

In an effort to improve the support posture of aircraft components at the AIMDs, the Three Degree Intermediate Level Component Maintenance Program was initiated as a pilot effort to investigate IMA capabilities in terms of their current maintenance practices and to determine feasible alternatives, or changes, in maintenance management policies in order that component maintenance support posture would improve, particularly at the intermediate level. The primary objective of the pilot effort was to develop an appropriate methodology for determining practical and cost effective maintenance policy applicable to intermediate level support of aircraft components employing the concepts three degree intermediate level maintenance.[6]

Program Development

The Navy F4 aircraft, having been in the operating forces since the early 1960s, and considered to have a large data base, was selected for purposes of an intital pilot study. Nineteen repairable components known to have high Not Operationally Ready (NOR) rates were selected for purposes of evaluation at intermediate level. The study candidate components varied in terms of the depth and difficulty with which corrective maintenance could be performed. Typical AIMDs, including Headquarters and Maintenance Squadrons (HAMS) at Marine Cors Air Stations (MCAS), were selected to determine and evaluate current maintenance practices for

the following F4 aircraft components:

a. Multiple Brake Assembly
b. Electrohydraulic Tandem Power Control Cylinder
c. Seat Positioning Actuator
d. Oil Tank and Sensor Assembly
e. Constant Speed Drive Transmission
f. External Center-Line Fuel Tank
g. In-Line Variable Displacement Hydraulic Pump
h. Hydraulic Motor Driven Air Compressor
i. Liquid Oxygen Converter
j. True Airspeed Indicator
k. Counting Accelerometer Indicator
l. Angle of Attack Indicator
m. Angle of Attack Transmitter
n. Counter Drum Pointer Sevoed Altimeter
o. Yaw Rote Gyroscope
p. Motional Pick-up Transducer
q. Computer Control
r. Horizontal Situation Indicator Remote Amplifier
s. Attitude Director Indicator

Marine Air Corps Stations Beaufort, Cherry Point, El Toro, and Yuma, and Naval Air Stations Miramar and Oceana were surveyed to determine maintenance postures for each of the study components. Cognizant maintenance personnel at each site visited provided responses to specific questions relating to the maintenance practices employed for individual components. (Discussion were held with several depot activities as indicated in the survey summary so as to provide the study team with a second opinion with which to evaluate intermediate level response to the survey questions.)

Results obtained during the course of surveys made of the representative maintenance activities are summarized in Appendix A.[6] Analysis of the survey results in conjuction with historical data presented in the 3M maintenance data

reports were conducted. Considerations were made in terms of the frequency with which the various functions were performed, depth of maintenance, difficulty to perform individual functions, and types of resources required. Survey responses were correlated between activities. Individual MIMs for each component were also employed throughout the analysis process. Finally, the objective conclusions made by the study team were documented in the form of Shop Process Cards [SPC].

Appendix B is a sample SPC set resulting from the pilot study. The SPCs, patterned after the format employed for safety and survival equipment, are structured for use with existing MIMs. The significant features of individual SPC sets include:

a. Identification of the specific component for which the SPC set applies by aircraft type/model/series, component nomenclature, Part Number (P/N), National Stock Number (NSN) and Work Unit Code (WUC).

b. Identification of the IMAs supporting the component and the designated degree maintenance that respective activities are authorized to perform.

c. Identification of Peculiar Ground Support Equipment (PGSE), consumables and maintenance functions by degree maintenance classification.

The SPC presented for the F4 aircraft Hydraulic Motor Driven Air Compressor, Appendix B, is representative of the content for SPC sets developed for each of the nineteen components cited earlier. An observation which should be made is that the maintenance functions attributable to the variety of components are not necessarily subject to classification into each of the three possible degree categories. In general, the more complex the component and/or the higher the skill and test requirements, the more likely the component maintenance functions tend toward classification into more than one degree category. The sample SPC sets demonstrate this feature of the three degree concept.

Discussion

Shop process card sets have been developed for a total of 72 components of the F4 aircraft. Additionally, 50 components of the A7E aircraft have been investigated and SPCs developed. In each instance, fleet maintenance activities have participated in a review/comment exercise. The exercise entailed validation of maintenance functions and corresponding tool requirements into reasonable and acceptable degree categories for each component. An evaluation/correlation of the feasibility and practicality of performing specific maintenance functions at individual IMAs, ashore and afloat, was made. It was confirmed, as previously determined in the pilot study, that not all IMAs could, nor should,

perform identical maintenance functions. Additionally, the three degree concept, in general, is viewed as a reasonable and acceptable approach to assisting in the improvement of maintenance support posture of aeronautical material at intermediate level.[6]

The status of the Three Degree Intermediate Leval Component Maintenance Program at this writing is uncertain in view of decisions pending at management level responsible for establishing maintenance policy. Recommendations have been made through formal reports to NAVAIR for continued development of the program. Several of the recommendations made to NAVAIR include:

a. The current defacto existence of degrees of IMA components repair needs to be officially recognized in the Naval Aviation Maintenance Program (NAMP). In addition to providing a basis for consistent decision making, the proposal for limiting variations to three degrees of IMA component repair and incorporation of the program into the NAMP is a necessary first step to changing the procurement and distribution requiremnts in the areas of spare parts, test equipment, material support, funding, etc.

b. A cost/benefit analysis of the program should be made. Test site selections should be made from representative Marine and Navy IMAs for the F-4 and A-7 aircraft. Preferable sites would be those activities not previously involved with the

program to ensure at least some impartiality. 3-M data six months previous to the test start-date would be used as a comparison to the 3-M data obtained during the test period. NOR rates, maintenance man-hours, mean-time-to-repair, etc., would be compared in the analysis as well as the comments obtained on the SPC evaluation questionnaires.

c. A formal presentation should be developed for use at briefings and meetings. A general overview of the three degree intermediate component maintenance program would comprise the presentation. Areas for consideration in the presentation would include:

- o current problem IMAs are experiencing
- o three degree concept - aircraft engines
- o three degree concept - airframe components
- o SPCs as an integral part of IMA support posture improvement
- o maintenance activity participation in SPC development
- o cost/benefit trade-offs

d. The program should be expanded to include other types of aircraft beside the F-4 and A-7. Again, the aircraft would be selected based on high NOR rates obtained from Navy 3-M data.

e. Aviation Supply Office (ASO) and Naval Aviation Engineering Center (NAEC) should be involved in the process to develop the necessary revisions to the material and tool listings for IMA component repair according the the three degree concept. These revisions will be only for those sites and aircraft types selected for the cost/benefit analysis.

ASO and NAEC will develop three degree component program recommendations concerning projected cost, time and manhours needed to implement and adminster the program, and any additional comments or actions on the program. These recommendations will be considered as part of the analysis in the cost/benefit study. Meetings to be held between NAVAIR, NAEC and ASO will be convened as deemed necessary by NAVAIR.

f. Ecomonic analyses should be performed to determine the impact of change to existing maintenance policy applicable to individual component. Level of Repair techniques presented in MIL-STD 1390B (Navy) may be employed.

Conclusion

Whatever was suspected on an intuitive basis prior to implementing the pilot component maintenance program was substantiated during the course of site surveys and discussions with cognizant maintenance personnel. Intermediate maintenance activities have continually sought to maintain a reasonable support posture for components supported. They have been able to succeed in some instances and failed miserably in others.

It has not been the intermediate levels own doing in many instances. A prevailing cause for the problem has been improper, or insufficient, resource allocation in the form of tools, test equipment, repair parts and personnel. Problems of this nature actually occurred early in the life cycle of the equipment, prior to any activity ever putting a hand on

the aircraft. Had the systems engineer, logistics engineer and maintenance engineer, to name a few, properly performed their functions in the acquisition phase of the equipment, many of the problems experienced by the operational and support personnel could have been fewer in number and less consequential to the readiness status of a complete weapons systems. A five digit Source Maintainability an Recoverability (SMR) code, for example, has created a significant portion of the problems experienced by maintenance activities. That is, the inconsistency with which the SMR code has been assigned to components and associated logistics support resources is responsible for much of the maintenance support problems.

Planning the support for any component or equipment cannot be effective if the plan, itself, is not supported. Supporting the plan, therefore, ensures that all relevant support elements are essentially on the same frequency. Continual monitoring of the actual operating and support posture of a component or system is as important as when orignially planned in the early planning stages of the acquisition process. The concept of three degree maintenance has the potential to provide significant benefits during the operational and support community of an equipments life cycle. Application of the concept can be planned during the early stages of acquisition.

The Three Degree Intermediate Level Component Maintenance Program should be seriously considered for implementation.

The program will provide maintenance management additional capability to support the basic maintenance policies of the NAMP. Fleet Commanders can plan for more effective and efficient utilization of limited resources. The overall support posture of components maintained at Fleet IMAs should improve with the virtual elimination of the necessity to circumvent the system to achieve the required readiness of materials supported.

SECTION V

SUMMARY

Historically, intermediate maintenance activities have experienced defacto degrees of component maintenance due to limitations of required maintenance support resources such as trained personnel, test equipment, material support, etc. Intermediate level activities were encouraged to perform all possible maintenance short of overhaul. This situation has caused activities to compete for scarce resources in order to satisfy experienced maintenance requirements. While this "can do" attitude was commendable from the Fleet Commander's viewpoint, it did not necessarily result in the most efficient or cost-effective utilization of resources. The standard three levels of maintenance concept - organizational, intermediate and depot levels - do not provide a method for adequately defining specific component repair functions within the intermediate level of maintenance.

This report has described the concept of Three Degree Intermediate Level Maintenance. The objective of the concept is to provide for practical and cost-effective maintenance support of aeronautical materials at the intermediate level. This is accomplished through the identification of specific maintenance responsibilities and corresponding resource requirements. Upon application of the three degree concept, the maintenance support posture of individual

IMAs will be enhanced through more effective allocation of resources in conjuction with specific assignment of responsibilities to IMAs. The overall cost of maintaining components in the Fleet should decrease with the elimination or reduction of practices which "circumvent the system" to meet maintenance requirements. Operational readiness, as related to material readiness, is also expected to improve upon wide scale adoption of the three degree concept as standard policy.

APPENDIX A

Maintenance Facility Survey Results

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	8	8	10	20	15	30	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	100% (A799: %)	95% (A799: %)	100% (A799: %)	95% (A799: %)	95% (A799: %)	95% (A799: %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-_; 0 %	BCM-2; 5 %	BCM-4; ___ %	BCM-2; 5 %	BCM-2; 5%	BCM-2; 5 %	--	--	--
Present repair function being accomplished	Major Repair	Major Repair	Complete Repair	Complete Repair	Complete Repair	Complete Repair	--	IRAN (Inspect, Repair, as Necessary); Overhaul, as required.	
Additional repair function needed to be accomplished	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	A-4; A-6 6-10 95%	C-117 1 A-4 5 100%	A-4 15/mth F-8 20/mth	N/A	N/A	F-4B, 5 50% F-8, 60 95% A-4B 15 F-14	--	--	--
Comments/Suggestions relative to support of components, i.e., problem areas, improvements, ...	Common and most significant problem area for all IMA's is supply support for piece parts. Lack of proper tools is a minor problem.							Complete repair feasible at intermediate level.	

Maintenance Facility Survey for
Multiple Brake Assembly

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	1	2	1	1	3	7	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	Ø % (A799: %)	5Ø% (A799: %)	Ø% (A799: %)	Ø % (A799: %)	7Ø % (A799: %)	99 % (A799: %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-1; 100 %	BCM-2; 50 %	BCM-2; 100%	BCM-1; 100%	BCM-2 ; 30 %	BCM-4; 1 %	--	--	--
Present repair function being accomplished	Check, Test	Check, Test, Minor Repair	NONE	NONE	Complete Repair	Complete Repair	--	IRAN (Inspect, Repair as Necessary); Overhaul, as required.	
Additional repair function needed to be accomplished	NONE	NONE	Check, Test	Check, Test	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	Trained Personnel	Trained Personnel	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	N/A	N/A	N/A	N/A	N/A	N/A	--	--	--
Comments/Suggestions relating to support of component, i.e., problem areas, improvements, ...	NONE	Need more training and better tools	Need improved supply	Need more training	NONE	Need permanent personnel allotment increase for extra work		Minor repair feasible at intermediate level.	

Maintenance Facility Survey for
Electro- Hydraulic Tandem Power Control Cylinder

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	2	5	0 (No Record)	0 (No Record)	2	3	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	0 % (A799: 0%)	0 % (A799: 0%)	0 % (A799: 0%)	0 % (A799: 0%)	90% (A799: 0%)	100% (A799: 0%)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-1; 100%	BCM-1; 100%	BCM-_; - % (Anticipated)	BCM-4; - % (Antipicated)	BCM-4; 10%	BCM-4; - % (Anticipated)	--	--	--
Present repair function being accomplished	NONE	Check, Test, Minor Repair	Complete Repair	Complete Repair	Complete Repair	Complete Repair	--	IRAN (Inspect, Repair as Necessary); Overhaul as required.	
Additional repair function needed to be accomplished	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	N/A	N/A	N/A	N/A	N/A	N/A	--	--	--
Comments/Suggestions relating to support of component, i.e., problem areas, improvements, ...	NONE	NONE	NONE	NONE	NONE	NONE		Complete repair feasible at intermediate level.	

Maintenance Facility Survey for
Seat Positioning Actuator Assembly

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	2	1	1	1Ø	1Ø	9	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	5Ø % (A799: %)	95 % (A799: %)	Ø % (A799: %)	9Ø % (A799: %)	Ø % (A799: %)	7Ø % (A799: %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-2; 5Ø %	BCM-4; 5 %	BCM-1; 1ØØ %	BCM-2; 1Ø %	BCM-1; 1ØØ %	BCM-2; 3Ø %	--	--	--
Present repair function being accomplished	Check, Test, Minor Repair	Check, Test, Minor Repair		Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	--	IRAN (Inspect, Repair as Necessary); Overhaul, as required.	
Additional repair function needed to be accomplished	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	N/A	N/A	N/A	N/A	N/A	N/A	--	--	--
Comments/Suggestions relating to support of component, i.e., problem areas, improvements, ...	better tank supply support	NONE	NONE	Need more training	NONE	NONE		Minor Repair feasible at intermediate level.	

Maintenance Facility Survey for
Oil Tank and Sensor Assembly

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	5	8	2	6	24	30	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	25 % (A799: %)	70 % (A799: %)	70 % (A799: %)	20 % (A799: %)	85 % (A799: %)	75 % (A799: %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-2; 75 %	BCM-2; 30 %	BCM-2; 30 %	BCM-2; 80 %	BCM-2; 15 %	BCM-2; 25 %	--	--	--
Present repair function being accomplished	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	--	IRAN (Inspect, Repair as Necessary); Overhaul as required.	
Additional repair function needed to be accomplished	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	N/A	N/A	N/A	N/A	N/A	N/A	--	--	--
Comments/Suggestions relating to support of component, i.e., problem areas, improvements, ...	NONE	Publications need to be improved	NONE	Publications facilities need to be improved	NONE	NONE	Minor repair recommended but could allow I* to open case to R/Rclutch	Recommended only perform minor repair at I level	

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Maintenance Facility Survey for
Constant Speed Drive Transmission Assembly

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	1	No Record	No Record	9	4	12	--	70/QTR	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	10 % (A799: %)	0 % (A799: %)	No Record (A799: %)	90 % (A799: %)	50 % (A799: %)	0 % (A799: %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-2; 90 %	BCM-2; 100%	BCM-_; _ %	BCM-1; 10 %	BCM-2; 50 %	BCM-2; 100 %	--	--	--
Present repair function being accomplished	Check, Test, Major Repair	NONE	Complete Repair	Complete Repair	Check, Test, Major Repair	Check, Test	--	IRAN (Inspect, Repair as Necessary); Overhaul as required.	
Additional repair function needed to be accomplished	NONE	NONE	NONE	NONE	NONE	NONE	--	-- [1]	--
Additional support necessary to accomplish additional repair function	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	N/A	N/A	N/A	Wing Tanks 30 90%	Wing Tanks 25%	Wing Tanks	--	--	--
Comments/Suggestions relating to support of component, i.e., problem areas, improvements, ...	NONE	NONE	NONE	Training and Personnel & Facilities need to be improved	Facilities & Test Equipment need to be improved	NONE		Complete repair feasible at intermediate level	

Maintenance Facility Survey for
External Centerline Fuel Tank

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	2	5	5	9	8	7	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	25 % (A799: %)	10 % (A799: %)	75 % (A799: %)	75 % (A799: %)	99 % (A799: %)	80 % (A799: 30 %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-2; 75 %	BCM-2; 90 %	BCM-2; 25 %	BCM-2; 25 %	BCM-2; 1 %	BCM-2; 20 %	--	--	--
Present repair function being accomplished	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	--	IRAN (Inspect, Repair as Necessary); Overhaul as required.	
Additional repair function needed to be accomplished	NONE	NONE	NONE	Seal Replacement	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	NONE	Pullers Seal Sleaves	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	A-4; A-6 2 25%	A-4 C-117 3 0%	A-4 6 75%	N/A	A-4 5-10 F-4 3-8 98%	F-8 16-17 A-4 3 80%	--	--	--
Comments/Suggestions relating to support of component, i.e., problem areas, improvements, ...	NONE	NONE	Supply needs improving to supply all piece parts	NONE	Supply needs improving to supply all piece parts	Training and tools and additional HCT-10 required		Complete repair feasible at intermediate levels.	

Maintenance Facility Survey for
In-Line Variable Displacement Hydraulic Pump Assembly

Survey Question \ Site	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	1	4	3	5	8	4	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	No Record % (A799: %)	10 % (A799: %)	50 % (A799: %)	55 % (A799: %)	50 % (A799: %)	99% (A799: %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-_; % No Estimate	BCM-2; 90 %	BCM-2; 50 %	BCM-2; 45 %	BCM-2; 50 %	BCM-4; 1 %	--	--	--
Present repair function being accomplished	Check, Test	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test	Check, Test, Major Repair ✓	Complete Repair ✓	--	IRAN	IRAN
Additional repair function needed to be accomplished	NONE	NONE	NONE	NONE	Complete Repair	NONE	--	--	--
Additional support necessary to accomplish additional repair functions	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	N/A	N/A	N/A	N/A	N/A	N/A	--	--	--
Comments/Suggestions relating to support of component, i.e., problem areas, improvements, ...	An approved compressor test stand is required at all IMA's to improve diagnostic capability.					Additional pump test stand req'd.		Complete repair possible if I levels have appropriate test stand	

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Maintenance Facility Survey for
Hydraulic Motor Driven Air Compressor

Survey Question / Site	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	14	8	30	7	12	50	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	33 % (A799: %)	99 % (A799: %)	90 % (A799: %)	90 % (A799: %)	100 % (A799: %)	90 % (A799: %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-2; 67 %	BCM-4; 1 %	BCM-4; 10 %	BCM-4; 10 %	BCM-4; Minimal %	BCM-4; 10 %	--	--	--
Present repair function being accomplished	Check, Test, Major Repair	Complete Repair	Complete Repair	Complete Repair	Complete Repair	Complete Repair	IRAN --	IRAN	IRAN
Additional repair function needed to be accomplished	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of another components received per month. Approximate percentage repaired	N/A	N/A	A-4 A-7 F-8	A-6	N/A	N/A	--	--	--
Comments/Suggestions or issues in support of equipment, i.e., problem areas, improvements, ...	Improve Supply	Improve Supply	Improve Supply	Improve Facilities	NONE	Need Extra Test Stand		All the NARF's stated that complete repair feasible at intermediate level	

Maintenance Facility Survey for
Liquid Oxygen Converter

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	(No Record)	7	3	8	(No Record)	10	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	0 % (A799: 0 %)	0 % (A799: 14%)	0 % (A799: 90%)	0 % (A799: 0%)	0% (A799: 2%)	0% (A799: 90 %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-1; 100%	BCM-1; 86%	BCM-1; 10 %	BCM-1; 100%	BCM-1; 98 %	BCM-1; 10 %	--	--	--
Present repair function being accomplished	Check, Test	Check, Test	Check, Test	Check, Test	Check, Test	Check, Test	--	IPAN (Inspect, Repair as Necessary); Overhaul as required.	
Additional repair function needed to be accomplished	Complete Repair	NONE	NONE	NONE	Complete Repair	NONE	--	--	--
Additional support necessary to accomplish additional repair function	All Special tools and facilities	NONE	NONE	NONE	All Special tools and facilities	NONE	--	--	--
Average number of similar components received per month. Approximate testing required.	N/A	N/A	N/A	N/A	N/A	N/A	--	--	--
Comments/Suggestions relating to support of component, i.e., problem areas, improvements, ...	High frequency component justifies IMA repair capability.	NONE	NONE	NONE	High frequency component justifies IMA repair capability	NONE		Complete repair feasible at intermediate level	

Maintenance Facility Survey for
True Airspeed Indicator

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	(No Record)	2	0	0	5	6	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	0 % (A799: %)	0 % (A799: %)	0 % (A799: %)	0 % (A799: %)	95 % (A799: %)	100% (A799: %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-1; 100%	BCM-1; 100%	BCM-1; 100 %	BCM-1; 100 %	BCM-7; 5 %	BCM-_; 0 %	--	--	--
Present repair function being accomplished	NONE	NONE	NONE	Check, Test	Complete Repair	Complete Repair	--	IRAN (Inspect, Repair as Necessary); Overhaul as required	
Additional repair function needed to be accomplished	NONE	NONE	Check, Test	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	Tester	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	N/A	N/A	N/A	Quantity and percent repair not available	Quantity not known. Repair: 95%	4 Components per month Repair: 100%	--	--	--
Comments/Suggestions relating to support of component, i.e., problem areas, improvements, ...	NONE	NONE	Need proper test equipment for check & test	NONE	NONE	NONE		Complete repair feasible at intermediate level with proper tools, equipment, etc.	

Maintenance Facility Survey for
Counting Accelerometer Indicator

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	4	2	6	10	20	15	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	0 % (A799: %)	0 % (A799: %)	0 % (A799: %)	80 % (A799: %)	95% (A799: %)	95% (A799: %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-1; 100 %	BCM-1; 100%	BCM-1; 100%	BCM-7; 20 %	BCM-2; 5 %	BCM-2; 5 %	--	--	--
Present repair function being accomplished	Check, Test	Check, Test	Check, Test, Minor Repair	Check, Test, Minor Repair	Complete Repair	Complete Repair	--	IRAN (Inspect, Repair as Necessary); Overhaul as required.	
Additional repair function needed to be accomplished	NONE	NONE	Complete Repair	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	Test Set (SL% 9060)	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	Quantity not available. Repair: 0%	N/A	Quantity not available. Repair: 0%	Quantity and Percent repair not available	Quantity and percent repair not available	Quantity and percent repair not available	--	--	--
Comments/Suggestions relative to support of component, i.e., problem areas, improvements, ...	NONE	Improved manuals required	Need test set, tools and improved training	Need additional personnel with improved training.	NONE	NONE		Complete repair feasible at intermediate level	

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Maintenance Facility Survey for
Angle of Attack Indicator

Sites / Survey Questions	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	6	4	7	10	12	120	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	0 % (A799: %)	0 % (A799: %)	0 % (A799: %)	0 % (A799: 20%)	10% (A799: 10 %)	100% (A799: %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-1; 100%	BCM-1; 90%	BCM-1;100 %	BCM-1; 80 %	BCM-1; 80 %	BCM- ; 0 %	--	--	--
Present repair function being accomplished	Check, Test	NONE	NONE	Check, Test	Check, Test, Major Repair	Complete Repair	--	IRAN (Inspect, Repair as Necessary); Overhaul as required.	
Additional repair function needed to be accomplished	NONE	Complete Repair	Check [illegible] Minor Repair	NONE	Complete Repair	Probe Assembly Repair	--	--	--
Additional support necessary to accomplish additional repair function	NONE	Need all tools and test equipment.	Need tools and test equipment	NONE	Rescind BCM-1 order	Probe Assembly Wind Tunnel adapter	--	--	--
Average number of unfit components received per month. Approximate percentage repaired.	N/A	N/A	BCM-1 0% Repair	BCM-1 0% Repair	N/A	Quantity not available. Limited Repair	--	--	--
Comments/Suggestions relative to support of component, i.e., problem areas, improvements, ...	NONE	NONE	NONE	NONE	NONE	Improved supply support needed.		Complete repair feasible at intermediate level	

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Maintenance Facility Survey for Angle of Attack Transmitter

Survey Question \ Site	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	3	4	3	4	13	30	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	0 % (A799: %)	0 % (A799: 75%)	0 % (A799: %)	0 % (A799: %)	0% (A799: 33 %)	0% (A799: 70 %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-1; 100%	BCM-1;100%	BCM-1; 100%	BCM-1; 100%	BCM-1; 100 %	BCM-1; 100 %	--	--	--
Present repair function being accomplished	NONE	Check, Test	Check, Test	Check, Test	Check, Test	Check, Test	--	IMAN (Inspect, Repair as necessary); Overhaul as required.	
Additional repair function needed to be accomplished	Check, Test	NONE	NONE	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	Test Equipment	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	N/A	N/A	N/A	Similar Components, Yes 0% Repair	N/A	Similar Components, Yes 0% Repair	--	--	--
Comments, Suggestions relative to support of component, i.e., problem areas, improvements, ...	NONE	NONE	NONE	NONE	NONE	Need improved publications		Intermediate level not capable of repairing component	

Maintenance Facility Survey for
Counter Drum Pointer Servoed Altimeter

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	2	6	2	4	3	2	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	0 % (A799: 0 %)	0 % (A799: 30%)	0 % (A799: %)	0 % (A799: 70%)	0% (A799: 5%)	0% (A799: %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-1; 100 %	BCM-1; 100%	BCM-1; 100%	BCM-1; 100%	BCM-1; 100%	BCM-1; 100 %	--	--	--
Present repair function being accomplished	Check, Test	Check, Test	Check, Test	Check, Test	Check, Test	Check, Test	--	IRAN (Inspect, Repair as Necessary); Overhaul as required.	
Additional repair function needed to be accomplished	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	N/A	N/A	N/A	N/A	N/A	N/A	--	--	--
Comments/Suggestions relative to support of component, i.e., problem areas, improvements, ...	NONE	NONE	NONE	NONE	NONE	NONE		Intermediate level not capable of repairing this sealed, engineering critical components.	

Maintenance Facility Survey for
Rate Gyroscope

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	2	2	2	1	4	10	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	95% (A799: 5 %)	100% (A799: 50%)	100% (A799: %)	100% (A799: %)	80% (A799: 20%)	100% (A799: %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-4; ___ %	BCM-4; ___ %	BCM-4; ___ %	BCM-4; ___ %	BCM-4; ___ %	BCM-4; ___ %	--	--	--
Present repair function being accomplished	Complete Repair	Complete Repair	Complete Repair	Complete Repair	Complete Repair	Complete Repair	--	IRAN (Inspect, Repair as Necessary); Overhaul as required.	
Additional repair function needed to be accomplished	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of similar components received per month; approximate percentage repaired.	N/A	N/A	N/A	N/A	N/A	N/A	--	--	--
Comment/Suggestions relative to support of component, i.e., problem areas, improvements ...	NONE	NONE	Improve supply support for piece parts needed.	NONE	NONE	NONE		Complete repair feasible at intermediate level	

Maintenance Facility Survey for
Motional Pickup Transducer

Survey Question \ Site:	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	6	8	5	5	No Record	15	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	0 % (A799: 65%)	0 % (A799: 90 %)	0 % (A799: - %)	0 % (A799: - %)	0 % (A799: - %)	0 % (A799: 50%)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-1: 100 %	BCM-1: 100 %	BCM-1: 100 %	BCM-1: 100 %	BCM-1: 100 %	BCM-1: 100 %	--	--	--
Present repair function being accomplished	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	Check, Test, Minor Repair	--	IRAN (Inspect, Repair as Necessary); Overhaul, as required.	
Additional repair function needed to be accomplished	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	N/A	N/A	N/A	N/A	N/A	N/A	--	--	--
Comments/Suggestions relative to support of component, i.e., problem areas, improvements ...	NONE	NONE	Improved training required	Improved training required.	NONE	NONE	--	Intermediate level not capable of repairing this engineering critical component.	

Maintenance Facility Survey for
Computer Control

Survey Question \ Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	1	6	1	1	6	1	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	100% (A799: —%)	100% (A799: 33%)	100% (A799: —%)	100% (A799: —%)	100% (A799: —%)	100% (A799: —%)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-7; —%	BCM-7; —%	BCM-7; —%	BCM-7; —%	BCM-7; —%	BCM-7; —%	--	--	--
Present repair function being accomplished	Complete Repair	Complete Repair	Complete Repair	Complete Repair	Complete Repair	Complete Repair	--	IRAN (Inspect, Repair as Necessary); Overhaul, as required.	
Additional repair function needed to be accomplished	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage repaired.	N/A	N/A	N/A	N/A	N/A	N/A	--	--	--
Comments/Suggestions relative to support of component, i.e., test equipment, improvements, ...	NONE	NONE	Improved training required.	NONE	NONE	NONE	--	Complete repair feasible at intermediate level. (Modules only)	

Maintenance Facility Survey for
Remote Amplifier (Horizontal Situation Indicator)

Survey Question / Sites	MCAS CHERRY POINT	MCAS BEAUFORT	MCAS YUMA	MCAS EL TORO	NAS OCEANA	NAS MIRAMAR	NARF NORFOLK	NARF CHERRY POINT	NARF NORTH ISLAND
Average number of components received per month	4	4	15	(No Record)	10	16	--	--	--
Approximate number of aircraft supported	24	30	12	36	108	126	--	--	--
Average percentage of components repaired	0 % (A799: 50 %)	0 % (A799: — %)	0 % (A799: — %)	0 % (A799: — %)	0 % (A799: 10 %)	0 % (A799: 50 %)	--	--	--
Reason for BCM's and approximate percentage for each reason	BCM-1: 100 %	BCM-1: 100 %	BCM-1: 100 %	BCM-1: 100 %	BCM-1: 100 %	BCM-1: 100 %	--	--	--
Present repair function being accomplished	Check, Test	Check, Test	Check, Test	Check, Test	Check, Test	Check, Test	--	IRAN (Inspect, Repair as Necessary); Overhaul, as required.	
Additional repair function needed to be accomplished	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Additional support necessary to accomplish additional repair function	NONE	NONE	NONE	NONE	NONE	NONE	--	--	--
Average number of similar components received per month. Approximate percentage for each.	N/A	N/A	N/A	N/A	N/A	N/A	--	--	--
Comments/Suggestions relating to support of component, i.e., problem areas, improvements, ...	NONE	Improved test equipment req'd.	NONE	NONE	NONE	NONE	--	Intermediate level not capable of repairing this engineering critical component.	

Maintenance Facility Survey for
Attitude Director Indicator

APPENDIX B

Sample Shop Process Card Set

F-4

THREE DEGREE INTERMEDIATE MAINTENANCE

SHOP PROCESS CARDS

HYDRAULIC MOTOR DRIVEN AIR COMPRESSOR

WORK UNIT CODE	PART NO.	NATIONAL STOCK NO.
4521C	890272	2R 4310-00-937-1374
	890272-01	2R 4310-00-809-2351

PUBLISHED BY DIRECTION OF THE COMMANDER, NAVAL AIR SYSTEMS COMMAND

15 APRIL 1976

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LIST OF EFFECTIVE CARDS

Insert latest changed cards; dispose of superseded cards in accordance with applicable regulations. Total number of pages in this manual is 11 consisting of the following:

CARD NO.	CHANGE NO.	CARD NO.	CHANGE NO.	CARD NO.	CHANGE NO.
Cover	0	1.1	0		
A	0	1.2	0		
i	0	1.3	0		
ii	0	1.4	0		
1.0	0	1.5	0		
		1.6	0		

NOMENCLATURE	WORK UNIT CODE	CARD SET DATE	CHANGE NO.	CARD
HYDRAULIC MOTOR DRIVEN AIR COMPRESSOR	4521C	15 APR 76	0	A

F-4

THREE DEGREE INTERMEDIATE MAINTENANCE INFORMATION CARD

This card set contains Intermediate Maintenance Activity (IMA) Degree Designations, Peculiar Ground Support Equipment (PGSE) and Consumable Material Requirements, and Matinenance Functions for each applicable degree category covering intermediate level maintenance of the component identified below. Additional information which can be used for maintenance planning purposes is provided in card 1.0 of this card set.

Maintenance functions presentes in this card set are applicable to the following additional part numbers: N/A

NOMENCLATURE	WORK UNIT CODE	CARD SET DATE	CHANGE NO.	CARD
HYDRAULIC MOTOR DRIVEN AIR COMPRESSOR	4521C	15 APR 76	0	i

F-4

INTERMEDIATE MAINTENANCE ACTIVITY DEGREE DESIGNATIONS

FIRST	SECOND	THIRD
NAS OCEANA	NAS PAX RIVER	NAS POINT MUGU
NAS MIRAMAR	MCAS IWAKUNI	NAS KEY WEST
	MCAS EL TORO	MCAS BEAUFORT
	MCAS YUMA	CV FORRESTAL
	MCAS KANEOHE	CV SARATOGA
		CV INDEPENDENCE
		CV NIMITZ
		CV MIDWAY
		CV RANGER
		CV KITTY HAWK

NOMENCLATURE	WORK UNIT CODE	CARD SET DATE	CHANGE NO.	CARD
HYDRAULIC MOTOR DRIVEN AIR COMPRESSOR	4521C	15 APR 76	0	ii

DEGREE MAINTENANCE CLASSIFICATION			NOMENCLATURE	TYPE ACFT	WORK UNIT CODE	CARD
			HYDRAULIC MOTOR DRIVEN AIR COMPRESSOR	F-4	4521C	1.0
3	2	1	PART NUMBERS: 890272, 890272-01	RATING: AMH ESTIMATED MAINTENANCE MAN-HOUR:	SMR CODE: PAOGD	
			TECHNICAL MANUALS: MIM, NA 03-30EL-4 IPB, NA 03-30EL-5	1st: 2nd: 3rd:	MFR CODE: 33525	
				CHANGE NUMBER: 0	CARD SET DATE: 15 APR 1976	

PECULIAR GROUND SUPPORT EQUIPMENT REQUIRED, or equivalent

		Nomenclature	Part No.
X	X	Universal Compressor Test Stand	890370
X	X	Plate and Adapter Assembly	842012
	X	Socket Wrench	242058
	X	Torque Adapter	802668
	X	Torque Adapter	802671
	X	Torque Adapter	802672
	X	Air Spindle	209984
X	X	Fan Assemble Fixture	890854
X	X	Run-in Fixture	890856

continued

DEGREE MAINTENANCE CLASSIFICATION			NOMENCLATURE	TYPE ACFT	WORK UNIT CODE	CARD
			HYDRAULIC MOTOR DRIVEN AIR COMPRESSOR	F-4	4521C	1 1
			PART NUMBERS	CARD SET DATE	CHANGE NO.	
3	2	1	890272,890272-01	15 APR 76	0	

PECULIAR GROUND SUPPORT EQUIPMENT REQUIRED, or equivalent

			Nomenclature	Part No.
		X	Thimble	209450
		X	Thimble	209451
		X	Thimble	209452
	X	X	Wrench	841102
	X	X	Wrench	841020
	X	X	Third Stage Shoe	841763
	X	X	Fourth Stage Shoe	802764
	X	X	Thread Adapter and Gasket	841016
	X	X	Thread Adapter	841017
	X	X	Ultrasonic Cleaner	

continued

DEGREE MAINTENANCE CLASSIFICATION			NOMENCLATURE	TYPE ACFT	WORK UNIT CODE	CARD
			HYDRAULIC MOTOR DRIVEN AIR COMPRESSOR	F-4	4521C	1.2
			PART NUMBERS	CARD SET DATE	CHANGE NO.	
3	2	1	890272,890272-01	15 APR 76	0	

CONSUMABLES

			Nomenclature	Part No.
		X	Repair Kit	803342
		X	Repair Kit	842297
	X	X	Salvosol	MIL-N-15178
	X	X	Detergent, Ultrasonic Concentrate	
	X	X	Oil, Lubricating	NSN:9150-00-753-4667
	X	X	Grease	MIL-G-7187
	X	X	Acetone	O-A-51

continued

DEGREE MAINTENANCE CLASSIFICATION			NOMENCLATURE	TYPE ACFT	WORK UNIT CODE	CARD
			HYDRAULIC MOTOR DRIVEN AIR COMPRESSOR	F-4	4521C	1,3
			PART NUMBERS	CARD SET DATE	CHANGE NO.	
3	2	1	890272,890272-01	15 APR 76	0	

MAINTENANCE FUNCTIONS

NOTES: 1. Personnel authorized to perform maintenance functions presented in this card set are responsible for adherence to all applicable notes, cautions and warnings included in the referenced maintenance instruction manual.

2. IMAs designated 3rd degree have no repair capability on this component, hence they should perform step 33, and send defective unit to nearest facility that has repair capability IAW standard procedures.

	X	X	1. Visually inspect for obvious damage/cause of malfunction.
	X	X	2. Test the basic Hydraulic Motor Driven Air Compressor utilizing the universal compressor test stand part No. 890370 - IAW para. 3-2 thru 3-8.
	X	X	3. If no fault found, return to RFI status.

continued

DEGREE MAINTENANCE CLASSIFICATION			NOMENCLATURE	TYPE ACFT	WORK UNIT CODE	CARD
			HYDRAULIC MOTOR DRIVEN AIR COMPRESSOR	F-4	4521C	1.4
			PART NUMBERS	CARD SET DATE	CHANGE NO.	
3	2	1	890272,890272-01	15 APR 76	0	

	X	X	4. If faulty, trouble shoot utlizing para. 3-10, Figure 3-3.
	X	X	5. Perform the follcwing disassembly actions as necessary to isolate the fault and repair.
	X	X	6. Disassemble Hydraulic Motor Driven Air Compressor - IAW, paras. 2-4 thru 2-6 and Figure 2-2.
	X	X	7. Disassemble Air Compressor Subassembly - IAW, para. 2-8 and Figure 2-3.
	X	X	8. Disassemble Check and Emergency Pressure Relief Valve Assembly - IAW para. 2-9 and Figure 2-4.
	X	X	9. Disassemble Sump Assembly - IAW para. 2-10 and Figure 2-5.
	X	X	10. Disassemble 2nd Stage Relief Valve Assembly - IAW para. 2-11 and Figure 2-6.
	X	X	11. Disassemble 1st Stage Relief Valve Assembly - IAW para. 2-12 and Figure 2-7.
	X	X	12. Disassemble Line Bleed Valve - IAW para. 2-13 and Figure 2-8.
	X	X	13. Disassemble Oil Pump - IAW para. 2-14 and Figure 2-9.
		X	14. Disassemble Hydraulic Motor Driven Basic Compressor - IAW para. 2-15 and Figure 2-10.

continued

DEGREE MAINTENANCE CLASSIFICATION			NOMENCLATURE	TYPE ACFT	WORK UNIT CODE	CARD
			HYDRAULIC MOTOR DRIVEN AIR COMPRESSOR	F-4	4521C	1.5
			PART NUMBERS	CARD SET DATE	CHANGE NO.	
3	2	1	890272,890272-01	15 APR 76	0	

3	2	1	
			NOTE: Only 1st degree IMAs are authorized to disassemble and replace any defective parts that are part of the basic air compressor.
	X	X	15. Inspect - IAW paras. 2-20, 2-21 and Figure 2-11.
	X	X	16. Clean - IAW paras. 2-16 thru 2-18.
	X	X	17. Repair - IAW paras. 2-42 and 2-43.
			NOTE: Repair of the basic air compressor and its subassemblies is limited to the replacement of defective parts. Maintenance operations which are peculiar to depot level such as lapping and matching of parts are not recommended for intermediate maintenance activities.
	X	X	18. Lubricate - IAW paras. 2-46 and 2-47.
	X	X	19. Reassembly - General - IAW paras. 2-50 and 2-51, and Figure 2-17.
		X	20. Reassemble Hydraulic Motor Driven Basic Compressor - IAW paras. 2-52 thru 2-57.

continued

DEGREE MAINTENANCE CLASSIFICATION			NOMENCLATURE	TYPE ACFT	WORK UNIT CODE	CARD
			HYDRAULIC MOTOR DRIVEN AIR COMPRESSOR	F-4	4521C	1.6
			PART NUMBERS	CARD SET DATE	CHANGE NO.	
3	2	1	890272,890272-01	15 APR 76	0	

		X	21. Test reassembled Hydraulic Motor Driven Basic Compressor - IAW paras. 3-1 thru 3-4.
	X	X	22. Reassemble Line Bleed Valve - IAW para. 2-59.
	X	X	23. Reassemble 1st Stage Relief Valve Assembly - IAW para. 2-60.
	X	X	24. Test reassembled 1st Stage Relief Valve Assembly - IAW para. 2-26.
	X	X	25. Reassemble 2nd Stage Relief Valve Assembly - IAW para. 2-61.
	X	X	26. Test 2nd Stage Relief Valve Assembly - IAW para. 2-25.
	X	X	27. Reassemble Sump Assembly - IAW para. 2-62.
	X	X	28. Test Sump Assembly - IAW para. 2-24.
	X	X	29. Reassemble Check and Emergency Pressure Relief Valve - IAW para. 2-63.
	X	X	30. Reassemble Air Compressor Subassembly - IAW para. 2-64.
	X	X	31. Reassemble Hydraulic Motor Driven Air Compressor - IAW para. 2-65.
	X	X	32. Test - IAW Section III.
X	X	X	33. Preserve/Package - IAW standard procedures.

End of card

APPENDIX C

Literature Cited

1. OPNAVINST 4790.2A of 15 December 1975, The Naval Aviation Maintenance Program

2. FMSOINST 4790.1B of 1 Feburary 1977, Aviation 3-M Information Reports

3. NAVAIRINST 13700.6A of 5 January 1972, Gas Turbine Engine Three Degree Intermediate Level Maintenance Program

4. NAVAIR NOTICE 4700 of 15 November 1976, Gas Turbine Engine Three Degree of Intermediate Maintenance Activity Assignments

5. NAVAIRINST 5305.4B of 3 Feburary 1976, Performance Awards in the Jet Engine Three Degrees of Maintenance Program

6. Naval Weapons Engineering Support Activity Report of 26 November 1973, Pilot Study, Phase III Component Repair Program [Intermediate Level]

APPENDIX D

References

1. OPNAVINST 4790.2A of 15 December 1975, The Naval Aviation Maintenance Program

2. FMSOINST 4790.1B of 1 Feburary 1977, Aviation 3-M Information Reports

3. NAVAIRINST 13700.6A of 5 January 1972, Gas Turbine Engine Three Degree Intermediate Level Maintenance Program

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6. Naval Weapons Engineering Support Activity Report of 26 November 1973, Pilot Study, Phase III Component Repair Program [Intermediate Level]

7. NAVAIRINST 13700.5 of 7 March 1970, Navy Aircraft Engine Pipeline Standards

8. NAVAIRINST 13700.3 of 25 March 1968, Aircraft Engine Support Responsibilities

9. Department of the Navy, Navy Audit Service Report C35115, Review of the Management of Aircraft Engines, 25 March 1976

10. Proceeding of Aircraft Engine Design and Life Cycle Cost Seminar of 19-21 November 1975, Naval Air Development Center, Warminster, Pennsylvaina

11. NAVAIR 00-25-400 of 1 August 1975, Maintenance Plan Analysis Guide for In-Service Naval Aircraft

12. Naval Air Systems Command Report of 1 March 1976, Aircraft Maintenance Plan Analysis