ATTACHMENT 10

MAINTENANCE GROUP CHAIRMAN'S FACTUAL REPORT

DCA-07-MA-310

GPM Chapter 23 Surveillance 23-01 Reliability/Performance Analysis

Chapter 23: Surveillance

23-01 RELIABILITY/PERFORMANCE ANALYSIS

NOTE: **Any change to this GPM Section requires prior approval by the FAA Airworthiness Principals before implementation.**

A. GENERAL

1. The Continuing Analysis and Surveillance System (CASS) is composed of two basic elements in accordance with 14 CFR Sec. 121.373. One element is the Reliability/Performance Analysis System.

   NOTE: The other element is covered by the CASS Manual.

2. The Reliability/Performance Analysis System provides long-term monitoring related to the mechanical reliability of aircraft systems, structures, engines and components.

   NOTE: Dependability is the ability of a system (in this case Maintenance) to deliver its intended level of service to its users. The attributes of dependability express the properties which are expected from a system. Three primary attributes are reliability, availability and safety.

   Reliability is a measure of the continuous delivery of correct service. High reliability is required in situations when a mechanical system is expected to operate without interruptions or when maintenance cannot be performed because the system cannot be accessed.

   Availability is the proportion of time where the system is able to deliver its intended level of service. Impairments to availability usually are the results of aircraft damage, part shortages, manpower, and several other factors.

   Safety is the ability of the system to perform its functions correctly.

   Thus, if an aircraft is reliable, available, and safe, it can be said it is dependable.

   As previously mentioned, the Reliability/Performance Analysis system is responsible for measuring and reporting on the mechanical reliability of AA's fleet.

3. The aircraft reliability program, as described by this document, is authorized and incorporated into AA's overall maintenance program by approval of the applicable Part "D" Operations Specification page.

B. AUTHORITY AND RESPONSIBILITY

1. Managing Director, Fleet Operations Engineering (FOE)

   The Managing Director, FOE has responsibility for ensuring the Reliability/Performance Analysis Element of CASS is properly established, implemented and maintained. This position will:

   a. Establish and maintain adequate Reliability/Performance Analysis procedures.

   b. Ensure adequate resources are in place to support the Reliability/Performance Analysis Element.

   c. Modify/revise procedures as appropriate.

   d. Ensure that an active and effective interface exists between both the Surveillance and Reliability CASS Elements.

   All responsibilities of the Director of FOE can be delegated per GPM Sec. 01-01.

C. RELIABILITY/PERFORMANCE ANALYSIS POLICY/DESCRIPTION

This section provides a general description of:

- AA's Reliability Program
- Organizational structure, duties, and responsibilities
- Individual systems within the program
- Changes that require FAA approval

NOTE: Per FAA Advisory Circular (AC) No 120.17A (Chapter 3, Section 26, Paragraphs a & b).

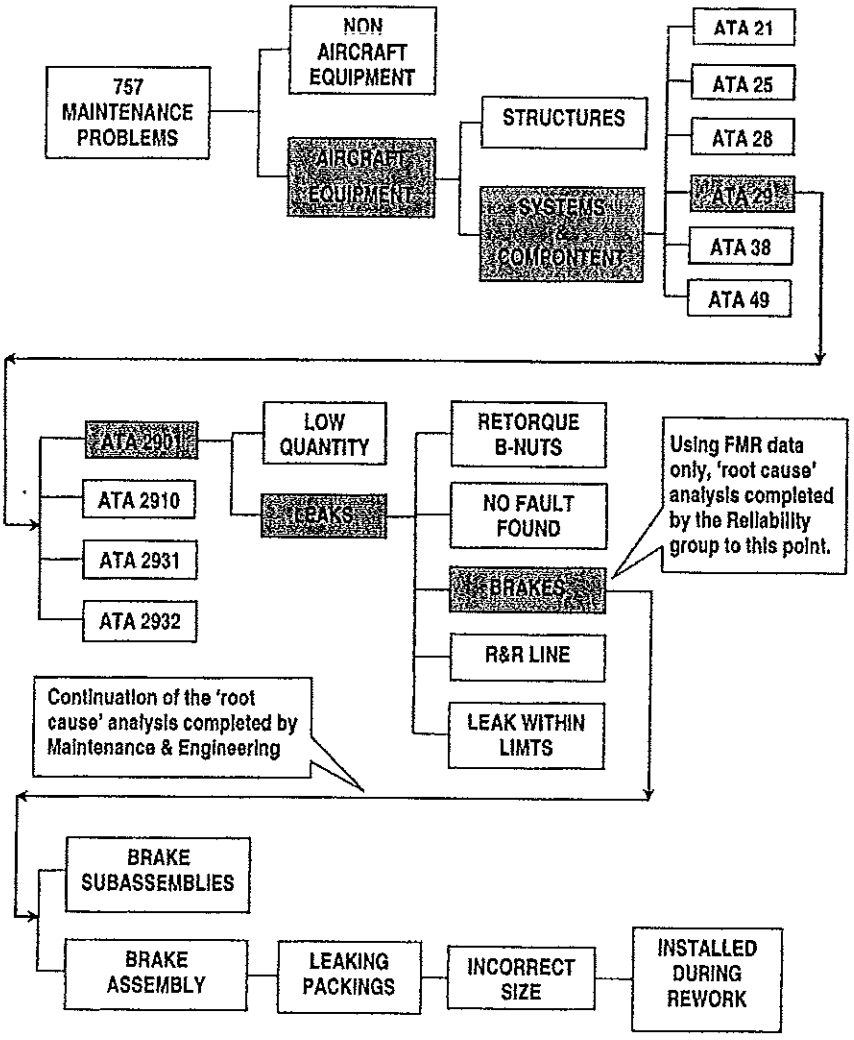
1. Reliability/Performance Analysis System, Long Term Monitoring

   a. Reliability/Performance Analysis System Objective.

      The basic philosophy of AA's Reliability/Performance Analysis System is to ensure the realization of the inherent safety and reliability levels of the aircraft flown by AA by accomplishing the following objectives:

      - Identify those systems/components whose inherent reliability prove inadequate and provide this information to the appropriate Engineering and Maintenance groups to develop enhancements, as required, to restore reliability to its inherent level.
      - Provide data displays (reports, graphs, etc.) that accurately summarize the fleet performance to the appropriate Engineering and Maintenance groups to help evaluate the effectiveness of the total maintenance program.

      These objectives are achieved through a continuous cycle of data collection and analysis, maintenance program adjustment and monitoring/feedback as shown in Figure 1.



ROOT CAUSE ANALYSIS EXAMPLE

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Figure 1.

Also, these objectives recognize that scheduled maintenance, as such, cannot correct deficiencies in the inherent safety and reliability levels of the aircraft. The scheduled maintenance can only prevent deterioration of such inherent levels. If the inherent levels are found to be unsatisfactory, design modification is necessary to obtain improvement.

b. Operational Concept of the Reliability/Performance Analysis System

(1) American's Reliability/Performance Analysis System collects and analyzes data.

The system collects operational data. This data reflects the performance of the aircraft outside of scheduled maintenance visits such as Main Base Visits.

(2) The analysis of the data begins by compiling all the mechanical events that have impacted the airline operation to identify the top operational impact ATA systems. Analyzing the events that impact the airlines' operation aids in eventually identifying those systems/components with deteriorating performance that affect safety and operational costs. This method of analysis is known in industry as an "event" based system and is the basis for AA's Reliability/Performance Analysis System.

NOTE: 'Event' based programs are also known as 'Non-alert' programs and are acceptable methods of analysis per FAA Advisory Circular (AC) No. 120-17A (Chapter 2, Section 15, Paragraph b.(2)).

(3) Using "trend" analysis on the top operational impact ATA systems identifies those systems with deteriorating performance trends. This analysis proves useful when evaluating an adjustment to the maintenance program and/or a modification. However, if the objective is to identify the cause of the deteriorating performance, further analysis is required.

(4) This requires the accomplishment of "root cause" or contributing factor analysis to determine various causes for the poor performance and to find an effective solution. In some systems, this analysis may only require the review of the appropriate data found in the Field Maintenance Reliability (FMR) system. Other ATA systems may require a more intensive analysis that requires the simultaneous review of data in FMR and shop findings to fully define the problem and find the solution.

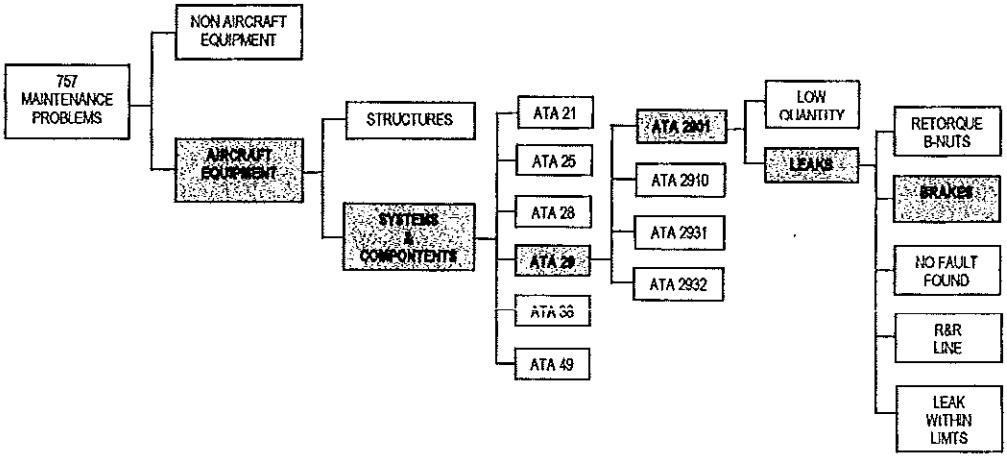
"Root cause" analysis can become a complex process when trying to find an effective solution. Consequently, the process is broken into two manageable steps. The Reliability Engineer accomplishes the first step by defining the problem by analyzing FMR data. This review only takes it to a component or system level, if possible.

(5) Components/systems found with deteriorating performance by the Reliability/Performance Analysis group are submitted to the appropriate Engineering and Maintenance groups for review and possible corrective action development. If accepted, the responsible groups, start the second step, 'ROOT CAUSE' Analysis. With the FMR data exhausted, new data sources, such as shop findings, vendor reports, field/dock experience, Engineering investigation, etc. are required to further define the actual problem and to find an effective solution to the problem. This review, for example, could go down to a resistor found on a printed circuit board installed in a sensor assembly. Figure 2 & Figure 3 provide a general overview of the root cause analysis process.

(6) With an "event" based system, AA's Reliability/Performance Analysis System identifies deficient items that impact the airlines operations, but focuses primarily on those items that also have cost effective solutions. Thus, in lieu of chasing several items such as a "Top Ten" list, the Reliability/Performance Analysis System carefully directs the limited resources in M&E on items that can be worked completely through the corrective action development phase to full implementation.

(7) The type of corrective action used varies with the problem. Corrective actions may require modification (accomplished by an Engineering Change Order) or an adjustment to the maintenance program (accomplished by a revision to the Engineering Specification Manual). In all situations, the various methods used to complete a corrective action are contained in American's approved manual system (EPM, GPM, etc.).

(8) Continued analysis of the operational data by comparing the current 12 months vs. the previous 12 months will provide a general impact assessment of maintenance program adjustments and/or system/component modification. The rolling 24-month timeline provides an optimum period for allowing ample time for implementing significant maintenance program adjustments and/or equipment modifications on a fleet and determining if the desired affects were achieved.



ACCOMPLISHED BY THE RELIABILITY GROUP

In this example, the Boeing 757 is reviewed for maintenance problems. The Reliability/Performance Analysis System is only concerned about the performance of aircraft equipment. The program does not address dependability issues (non-aircraft equipment) such as why an aircraft was late out of a check.

Next, the program focuses on the reliability of aircraft systems and components. The respective Production & Engineering Groups address aircraft structure issues.

By analyzing the performance data such as delays, cancels, air interrupts, and out-of-service, the top operational impact ATA systems are identified. To further narrow the work scope, systems with deteriorating PIREP trends are flagged.

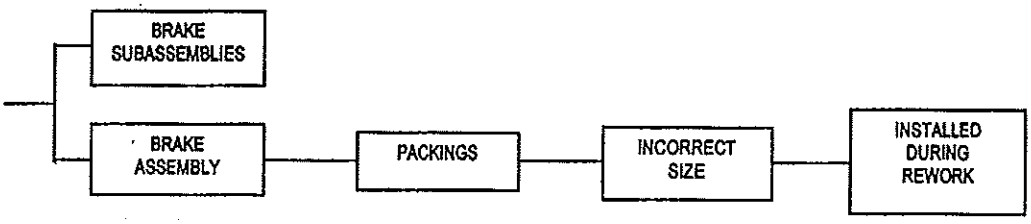
This example identified ATA 2901 as a system with deteriorating performance and PIREP trends. With a 4-digit ATA identified as an offender, the FMR data is "mined" to extract/classify the Mainteance Discrepancies (MDIS).

By sorting all MDISs into various discrepancy classifications and totaling the number of events, the overall impact of each type of discrepancy can be quantified. If the resulting analysis shows that a large percentage of the problems can be isolated to only a few discrepancies or a small discrepancy happens to be a big contributor to delays and cancellations, the discrepancy is identified as a possible corrective item candidate. In this example, leaks and low quantity are the two major discrepancies for system 2901.

Further sorting of the data can be completed against each discrepancy to classify the corresponding Final Action Taken (FACT). The resulting data provides direction in identifying problems experienced by the system. The majority of fixes in this example were re-torquing B-nuts, servicing the brakes, and replacing hydraulic lines.

At this point, the brakes are chosen as a corrective item to be presented to the appropriate Engineering and Maintenance groups.

Figure 2.



ACCOMPLISHED BY ENGINEERING/MAINTENANCE

Continuing the process, the item has been submitted to the appropriate Engineering and Maintenance groups for corrective item review and acceptance. For those items accepted, Engineering/Maintenance coordinates the corrective action development.

In this example, several organizations may be involved in continuing the "root cause" analysis. Since the FMR data was exhausted, new data sources, such as shop findings, vendor reports, field/dock experience, Engineering investigation, etc. are required to aid in finding the root cause of the leaking brakes. After the problem is clearly defined, the installation of undersized packings at time of last rework, an effective solution can be developed.

Figure 3.

c. Reliability/Performance Analysis System Application

(1) The Reliability/Performance Analysis System has the provisions for analyzing the operational reliability of the entire aircraft, its systems, rotable components, structures, and powerplants.

Items found with deteriorating performance are presented to appropriate Engineering and Maintenance groups for evaluation and possible corrective action development.

(2) The Reliability/Performance Analysis System evaluates operational data, such as, delays, cancels, air-interrupts and out-of-service to determine the integrity of the maintenance program.

The time limitations for inspections and checks of the aircraft and related systems, including major appliances and components are contained in the Maintenance Check Manual (MCM) and Engineering Specification Maintenance (ESM) documents for each model and series aircraft and/or Aircraft/Shop Engineering Specification Order (ESO). Any adjustment to the ESM and/or MCM is the responsibility of Engineering and is accomplished per EPM 5-50 and GPM, Sec. 23-23.

NOTE: The Reliability Program cannot adjust the Inspection Interval on Life Limited Parts, CMRs or AD related items.

(3) The Reliability/Performance Analysis System evaluates the effectiveness of maintenance program adjustments by routine monthly reviews.

Corrective actions to restore the inherent reliability of a component or system such as accomplishing modification work and adjustments to the maintenance program to escalate a check interval, shall be evaluated by comparing the current 12 months vs. the previous 12 month 4 digit ATA Operational Data.

(4) GPM Chapter 22 contains the policy and operating procedures for Extended Operations (ETOPS). The special maintenance program requirements contained in the GPM provide tighter control on aircraft utilized in ETOPS. A primary goal of these event-oriented procedures is the early identification and prevention of ETOPS related problems.

In addition to the requirements found in the GPM Sec. 22-02, the Reliability/Performance Analysis System accomplishes a "trend" analysis on the primary ATA systems that are identified in GPM Sec. 22-03 and all ER incidents.

d. Reliability/Performance Analysis System Systems

(1) The objective of identifying deteriorating performance and evaluating the effectiveness of maintenance program adjustments is achieved through the accomplishment of several processes. These processes when completed on a continuous basis, provide a "closed loop" system that not only identifies negative trends that require attention, but also tracks any corrective actions to ensure that the identified deficiencies are corrected.

The following systems contain the policies and procedures applicable to the Reliability/Performance Analysis

Group:

PROCESS	GPM SECTION
Responsibility for Maintenance Publications	03-01
Data Collection	23-20
Data Analysis	23-21
Data Display	23-22
ESM Substantiation	23-23

(2) Policies and procedures used by other organizations that augment the overall Reliability/Performance Analysis System and contained in other chapters in the GPM or documents in AA's manual system are listed below.

PROCESS	MANUAL REFERENCE
Aircraft ECO preparation	EPM Sec. 5-02
Shop ESO	EPM Sec. 5-26
Event Review Board Policy for M&E	GPM Sec. 11-05
Repeat Control	Technical Services Procedures Manual
Extended Operations	GPM Sec 22
Powerplants Condition Monitored Maintenance	GPM Sec. 16-21

e. Reliability/Performance Analysis Organization Structure.

The Reliability/Performance Analysis Group is responsible for administering the Reliability/Performance Analysis System. The organization chart in Figure 4 shows the organization elements.

The names of the individuals currently accomplishing the responsibilities of the various positions shown in Figure 4 are available on the Reliability website at:

http://me.aa.com/engineering/foe/reliability/main.asp.

Reliability/Performance Analysis Group

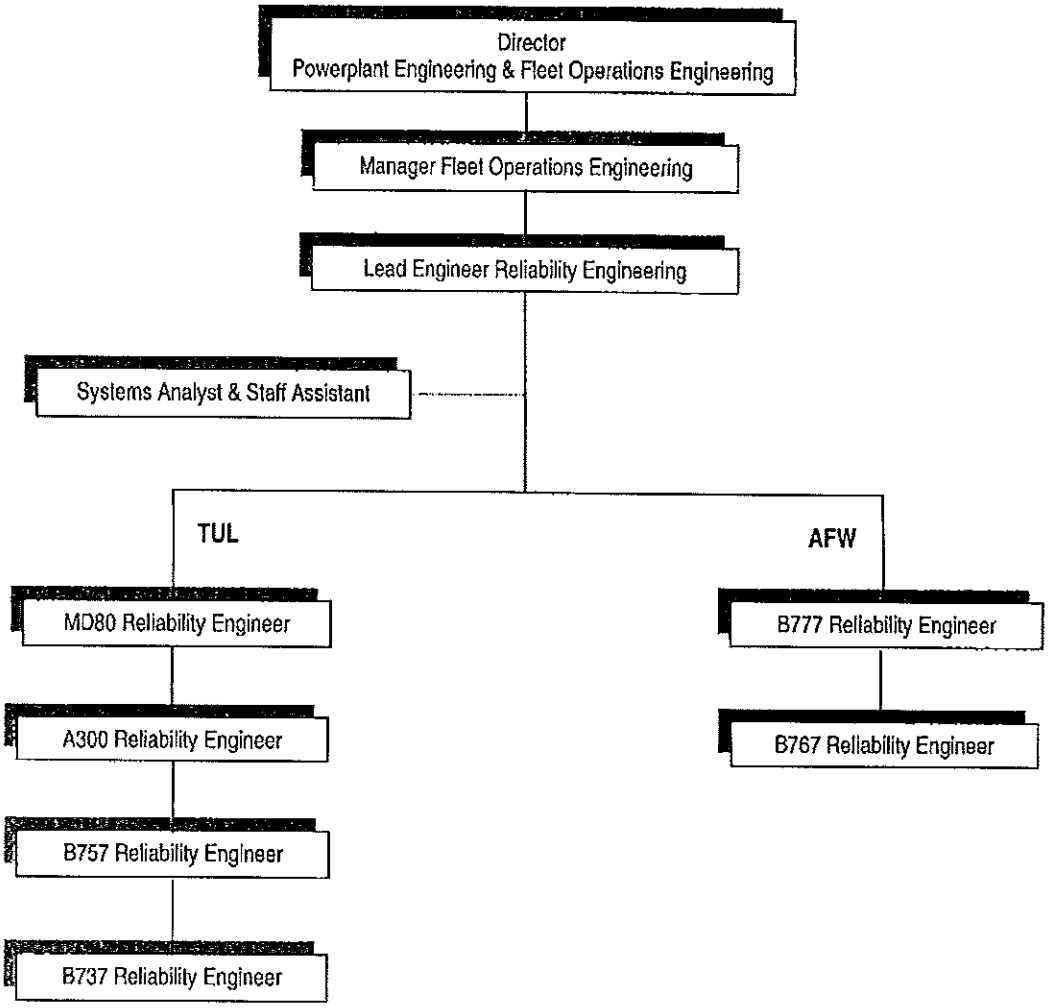


Figure 4.

The following lists the primary duties and responsibilities for each member of the Reliability/Performance Analysis Group.

(1) Reliability/Performance Analysis Group Members

(a) Manager Fleet Operations Engineering

[1] Participate as required in the operation of the Reliability/Performance Analysis System.

[2] Perform other duties as delegated by the Director of FOE.

All responsibilities of the Manager FOE can be delegated per GPM Sec. 01-01 (except for delegated duties).

(b) Reliability/Performance Analysis Lead

[1] Act as an administrator for the Reliability/Performance Analysis System application.

[2] Act as a facilitator for training activities common to the Reliability/Performance Analysis Group.

[3] Coordinate activities between all members of the reliability/performance analysis group.

[4] Participate in the development of new analysis methods.

[5] Participate in the development and publishing of reliability data.

(c) Reliability/Performance Analysis Engineer

[1] Review ESM Substantiation File Letters.

[2] Analyze performance data to identify corrective items through trend and root cause analysis.

[3] Coordinate corrective items with appropriate Engineering & Maintenance Groups.

[4] Evaluate maintenance program adjustments (comparison analysis).

[5] Participate in the development of new analysis methods.

[6] Participate in the development and publishing of reliability data.

[7] Work with Fleet Managers on special issues and projects/presentations.

[8] Work with the CASS department on operational concerns.

[9] Interface with FAA.

f. Reliability/Performance Analysis Personnel Qualifications

(1) Each member of the Reliability/Performance Analysis Group must be determined to be qualified and competent to perform their assigned duties and responsibilities.

(2) An integral part of the Reliability/Performance Analysis Engineers is the use of individuals with technical backgrounds to compile and analyze performance data to arrive at meaningful conclusions.

g. Reliability/Performance Analysis Personnel Training Requirements

(1) Training will consist of documented on-the-job training (OJT) and/or classroom training for the procedures found in the applicable systems listed in paragraph C. 1. d. (1).

(a) A qualified Reliability/Performance Analysis Engineer, or Lead may conduct the required training.

(b) Additional training will be completed for other functions that fulfill regulatory requirements.

(2) It is the responsibility of the Lead to determine, implement and record the training requirements of each member in the group.

h. Reliability/Performance Analysis Revision Procedures

(1) As conditions warrant, procedural changes to the Reliability/Performance Analysis System may be necessary.

Requests or recommendations concerning changes to the procedures shall be accomplished by using the Manual Revision Checklist (TULE Form 1262A) in front of this manual, unless using the Electronic Document Approval process the form is not required. Make changes in RED ink on a copy of the current applicable page(s). DO NOT retype the page(s) with changes. However, typed draft revision(s) proposals can be attached to the marked-up page(s). Attach these changes to TULE Form 1262A or the electronic document approval process.

Submit completed package to Maintenance Publications, MD 1-420, MCI . Editor of the GPM will prepare a draft to accompany TULE Form 1262A, which is then circulated for AA approval signatures.

NOTE: Review and approval of the change must be obtained by the Manager of Fleet Operations Engineering (FOE), MD 207.

(2) Revision(s) to any of the Reliability/Performance Analysis procedures require FAA approval and shall be obtained per the procedures given in GPM Sec. 03-01.

(3) In the event that unforeseen problems arise as a result of procedural changes, those concerns should be reported to the Manager of FOE for review.

i. Reliability/Performance Analysis Assessment

(1) Accomplishment of both external and internal audits shall serve as a means to ensure that all procedural requirements of the Reliability/Performance Analysis System are appropriate and are complied with.

(2) Any procedural deficiency identified during the normal course of business shall be evaluated and resolved appropriately.

2. Daily Monitoring

Maintenance Operations Control (MOC) provides 24-hour coverage of the maintenance operation. A Manager-On-Duty (MOD), Technical Manager-On-Duty (TMOD), and Tech Services are on duty at all times to monitor maintenance operations and initiate corrective actions as necessary to assure aircraft airworthiness and dependability. Daily monitoring of operating aircraft and associated maintenance activities is conducted in system-wide telephone conferences. Daily conferences are:

Aircraft Status Conference	Reviews the status of overnight aircraft, out-of-service aircraft and plans to cover morning originations. It also includes a review of the status of parts, equipment or provides technical assistance that may be pending.
M & E Maintenance Performance Conference	Review maintenance performance from previous day's operations, including: delays, cancellations, engine shut-downs/removals, incidents and other significant events. It also reviews the status of any events which may have an impact on the current day's operation.
International Maintenance Conference	Reviews the status of aircraft committed to international schedules. In addition to aircraft requirements, ground support needs are reviewed as appropriate.
Base Maintenance Conference	Reviews activities and status of TULE, MCIE and AFW aircraft docks, CAM shops and engine shops. Also reviews activities at maintenance stations that require support from the main bases and potential aircraft drops-in which may impact main base operations.

These conferences are held at previously announced times and are conducted by MOC, with participation as necessary from Fleet Operations Engineering, Quality Assurance, CASS Quality Surveillance, Engineering, Base and Line Maintenance and Inventory Control.

Procedures for providing technical support and control for the maintenance operation are contained in the General Procedures Manual and Tech Services Procedures Manual. Pertinent chapters that are followed are:

GPM Chapter 6	FOS, AMS, and Communications Systems
GPM Chapter 17	Repairs/Deferrals/MEL
Technical Services Procedures Manual	Tech Services Procedures

3. Emergency Responding

Emergency Responding includes identifying emergency/critical situations, determining causes and formulating a plan to ensure that similar conditions do not exist in like equipment. Typical examples of emergency/critical situations include:

- Uncontained engine failures
- Critical structural failures
- Any life-limited part failure

GPM Sec. 11-05, "Management action regarding aircraft damage, incidents and occurrences of compliance" describes Maintenance & Engineering policy concerning management action to be taken with incidents and occurrences of noncompliance and delineates the procedures to be followed in conducting investigations of such occurrences.

END