NOTICE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

National Policy

N 8900.7

Effective Date:
6/21/07

Cancellation Date:
6/21/08

SUBJ: Revision to Order 8300.10, Volume 2, Chapter 65; and Volume 3, Chapter 37

1. Purpose of This Notice. This notice provides guidance for all principal inspectors and all other assigned aviation safety inspectors on revisions to the Federal Aviation Administration (FAA) Order 8300.10, Airworthiness Inspector's Handbook, Volume 2, Chapter 65, Assess Section 121.373 or 135.431, Air Carrier Continuing Analysis and Surveillance System, which has been completely rewritten; and cancels Volume 3, Chapter 37, Monitor Continuing Analysis and Surveillance Program/Revision.

2. Audience. The primary audience for this notice are Flight Standards District Office (FSDO) principal inspectors and all other assigned aviation safety inspectors. The secondary audience includes Flight Standards branches and divisions in the regions and in headquarters.

3. Where You Can Find This Notice. Inspectors can access this notice through the Flight Standards Information Management System (FSIMS) at http://fsims.avr.faa.gov. Operators may find this information on the FAA Web site at http://www.faa.gov/library/manuals/examiners_inspectors/8900/.

4. Background. In response to the National Transportation Safety Board safety recommendations A-97-74 and A-04-16, chapter 65 has been rewritten with all new information relating to the Continuing Analysis and Surveillance System (CASS) that is consistent with current editions of Advisory Circular (AC) 120-16D, Air Carrier Maintenance Programs, AC 120-79, Developing and Implementing a Continuing Analysis and Surveillance System, and the training course FAA25712, Air Carrier Continuing Analysis and Surveillance System. Chapter 37 is now redundant and is being canceled.

5. Action.

a. Replace existing volume 2, chapter 65, change 8, dated 7/24/1992 with the information in this notice.

b. Remove and discard existing volume 3, chapter 37, change 9, dated 8/12/1993.

Distribution: A-W(FS)-2; A-X(FS)-3; A-FFS-7 (LTD); AMA-200 (12 cys) Initiated By: AFS-300
(Electronically: A-W(FS)-2; A-X(FS)-2; A-FFS-7)

6. Disposition. We will permanently incorporate the information in this notice in FSIMS before this notice expires. Direct questions concerning this notice to the Air Carrier Maintenance Branch, AFS-330 at (202) 267-3807 or the Maintenance Division Technical Advisor, AFS-305 at (202) 267-3786.

ORIGINAL SIGNED by

James J. Ballough
Director, Flight Standards Service

Appendix A. Order 8300.10, Volume 2, Chapter 65

CHAPTER 65 ASSESS SECTION 121.373 OR 135.431, AIR CARRIER CONTINUING ANALYSIS AND SURVEILLANCE SYSTEM

Section 1 Background

1 PROGRAM TRACKING AND REPORTING SUBSYSTEM (PTRS) AND AIR TRANSPORTATION OVERSIGHT SYSTEM (ATOS) ACTIVITIES:

A. Maintenance: New: 3333; Revision: 3334; Surveillance: 3635.

B. Avionics: New 5333; Revision: 5334; Surveillance: 5635.

C. ATOS SAI or EPI Data Collection Tool, as appropriate, for the CASS Element 1.3.11.

2 OBJECTIVE. This chapter provides guidance and information on the design, implementation, functions, and other considerations of an air carrier's Continuing Analysis and Surveillance System (CASS).

3 REGULATORY SCOPE. Consistent with Title 14 of the Code of Federal Regulations (14 CFR) part 121, § 121.1(b) and part 135, § 135.1(a)(2), the rules contained in parts 121 and 135 govern each person that is employed or used by an air carrier for any maintenance, preventive maintenance, or alteration of its aircraft. Consistent with the definitions in 14 CFR part 1, § 1.1, this includes individuals certificated under 14 CFR part 65, repair stations certificated under 14 CFR part 145, and any other individual, firm, partnership, corporation, company, association, joint-stock association, or governmental entity that is not certificated by the Federal Aviation Administration (FAA).

4 BACKGROUND.

A. The FAA implemented the regulatory requirement for a CASS in 1964 in response to safety concerns and discoveries of systemic weaknesses in the maintenance programs of some air carriers. These concerns were identified during accident investigations and FAA surveillance activities accomplished during the 1950s. The FAA introduced CASS as an element of a Continuous Airworthiness Maintenance Program (CAMP) that contained other elements such as a manual, an adequate maintenance organization, a maintenance recordkeeping system, Required Inspection Items (RII), and more.

B. A CASS is required for air carriers operating under parts 121 and § 135.411(a)(2) applicability. CASS is a safety management tool that permits air carriers to identify and understand maintenance program deficiencies well enough to develop and implement permanent solutions for those discrepancies. CASS is a keystone of an air carrier's ability to produce airworthy aircraft on a consistent basis.

5 CASS DEFINITIONS. In order to ensure that everyone has the same understanding of the requirements and functions of CASS, here are the plain language meanings of specific words and phrases used in the regulations and this handbook chapter.

A. Authority. The power to design or change fundamental policy or procedures without having to seek a higher-level management approval. Authority is a permission; it is a right coupled with an autonomous power to accomplish certain acts or order others to act. Often, one person grants another authority to act as an employer to an employee, a corporation to its officers, or as a governmental empowerment to perform certain functions.

B. Carried Out by the Certificate Holder or Other Person. The certificate holder must maintain operational control over maintenance that any person performs on its aircraft. Operational control includes independently determining the scope and type of maintenance that may be required, when to accomplish that maintenance, and if the maintenance was done in accordance with its manual and program, regardless of who accomplished the maintenance.

C. Continuing Analysis and Surveillance. The elements of the system are always working. For example, continuing surveillance means someone is always looking and collecting information. Continuing analysis means that someone is always analyzing the information that is always being collected.

D. Correction. An action that is designed to eliminate or mitigate a deficiency that has been identified within one of the nine maintenance program elements.

E. Deficiency. A condition which is insufficient or incomplete, or where something required is lacking. In CASS, it is something that is missing from the air carrier maintenance program that should be there, or it is something that is there but not producing the desired results. Alternatively, it could indicate the maintenance program documentation is not being followed. For example, a program element that has failed and is not working, or a program element that has faults and is not working as it should are deficiencies.

F. Effectiveness. Producing or capable of producing a result. The maintenance program is producing the desired results, i.e., airworthy aircraft, competent personnel, and adequate facilities.

G. Establish and Maintain. To establish means that the air carrier develops a CASS that is appropriate for the type and scope of its operation. To maintain means that the air carrier keeps its CASS current and appropriate in response to changes in the type and scope of its operation.

H. Inspection Program and the Program Covering Other Maintenance, Preventive Maintenance, and Alterations. The air carrier maintenance program outlined in § 121.367 and other sections of part 121, subpart L, and described in some detail in Advisory Circular 120-16D, Air Carrier Maintenance Programs.

I. Maintenance. Inspection, overhaul, repair, preservation, and the replacement of parts, excluding preventive maintenance.

J. Performance. The act of doing something successfully–the successful execution of an action. In CASS, performance means that the maintenance program is being accomplished or executed as outlined in the air carrier manual.

K. Person. An individual, firm, partnership, corporation, company, association, joint-stock association, or governmental entity. It includes a trustee, receiver, assignee, or similar representative of any of them.

L. Program. An organized list of procedures.

M. Responsibility. The obligation to ensure that a task or function is successfully carried out. Responsibility includes accounting for actions related to the task or function. This is a key attribute of operational control.

N. Risk. Risk is the degree of probability that hurt, injury, or loss will occur over a specific period of time or number of operational cycles. Risk has two elements, severity and likelihood. Severity is the harm that will be inflicted if an unsafe event happens. Likelihood is a qualitative expression of the probability that a specific unsafe event will occur.

O. System. A functionally related group of elements. In CASS, the elements are surveillance, analysis, performance, effectiveness, corrective action, and follow-up.

6 CASS REGULATIONS. Sections 121.373 and 135.431, Continuing Analysis and Surveillance.

A. Each certificate holder shall establish and maintain a system for the continuing analysis and surveillance of the performance and effectiveness of its inspection program and the program covering other maintenance, preventive maintenance, and alterations and for the correction of any deficiency in those programs, regardless of whether those programs are carried out by the certificate holder or by another person.

B. Whenever the Administrator finds that either or both of the programs described in paragraph (a) of this section does not contain adequate procedures and standards to meet the requirements of this part, the certificate holder shall, after notification by the Administrator, make any changes in those programs that are necessary to meet those requirements.

C. A certificate holder may petition the Administrator to reconsider the notice to make a change in a program. The petition must be filed with the FAA certificate-holding district office charged with the overall inspection of the certificate holder's operations within 30 days after the certificate holder receives the notice. Except in the case of an emergency requiring immediate action in the interest of safety, the filing of the petition stays the notice pending a decision by the Administrator.

7 WHAT CASS DOES. CASS functions as an air carrier safety management tool that includes continuous and methodical monitoring and evaluation of an air carrier maintenance program. An air carrier CASS uses a continuous, system safety-based, closed-loop cycle of surveillance, data collection and analysis, corrective action, and monitoring/follow-up to continually evaluate the performance and effectiveness of the maintenance program. Through

CASS, the air carrier ensures that it is performing the right maintenance at the right time and that the intended results are produced. CASS is one of the tools an air carrier uses to exercise operational control over maintenance activities conducted on its aircraft.

8 HOW CASS DOES IT. CASS enables an air carrier to detect and correct discrepancies in all elements of its maintenance program by proactively looking for indicators and symptoms of deficiencies and reactively looking at the results of deficiencies. CASS monitors maintenance program performance and effectiveness through a closed-loop system of four major activities: surveillance, data analysis, corrective action, and monitoring/follow-up.

A. Surveillance. Surveillance is conducted so the air carrier can gather information and conduct analysis that is used to evaluate all elements of its program, including its maintenance providers, from two different perspectives, performance and effectiveness. Surveillance to verify performance involves the use of audits, specifically work-in-progress audits that are used to make sure the manual and program is being followed. Surveillance to verify effectiveness involves the collection and analysis of operational data and aircraft systems failure data so that conclusions can be made about the degree of effectiveness of the maintenance program.

B. Data Collection and Analysis. Data collection and analysis is the identification of system deficiencies in an air carrier maintenance program through analysis of the various kinds of data that the air carrier has chosen to collect. On the other hand, data collection and analysis is also used to verify an acceptable level of program performance or effectiveness.

1) A major analytical process that CASS uses to accomplish this function is Root Cause Analysis (RCA). Stated very simply, RCA is a methodology for finding and correcting the most central cause of the occurrence of a discrepancy. RCA differs from troubleshooting and problem solving in that these processes typically seek to resolve a specific discrepancy, while RCA is focused on identification of the underlying issues, i.e., root causes; why did the discrepancy occur in the first place.

2) The performance *(program execution)* surveillance and analysis function of CASS is carried out through the accomplishment of work-in-progress audits and the analysis of audit data. These audits examine the actual accomplishment of the activities and tasks of a maintenance program element relative to the standard, i.e., the air carrier manual and the maintenance program. Accomplishment of audits and analysis of audit data measures program execution.

3) The effectiveness *(intended results produced)* surveillance and analysis function of CASS is carried out through the collection and analysis of operational data. Collection and analysis of operational data allows the air carrier to measure the output of the maintenance program relative to its objectives. Collection and analysis of data that is generated by the aircraft operations measures maintenance program results.

C. Corrective Action. CASS finds deficiencies through analysis of the audit and operational data that it collects. CASS conducts RCA to identify the causal factor(s) for the identified discrepancy. Following the identification of a discrepancy, the next step is to address it. A comprehensive corrective action is a strategy designed to deal with an identified deficiency.

However, not all deficiencies will require corrective action. For example, a number of mechanical delays or cancellations may be acceptable in the eyes of the air carrier. This can be acceptable as long as safety is not compromised.

D. Monitoring/Follow-Up. Monitoring/follow-up is the very important function that ensures the corrective action has been implemented and it has or is addressing the deficiency. Monitoring/follow-up ensures the corrective action accomplishes what the air carrier intended it to do. Monitoring/follow-up connects the closed loop back to surveillance.

9 WHAT CASS LOOKS LIKE. An air carrier should tailor its CASS to its individual operation. Therefore, to a large degree, what CASS looks like will depend on the design of the maintenance organization, and the size, complexity, and the level of flight operations of that air carrier.

A. The basic CASS functions are always the same, but the personnel who carry out each function and the manner in which the functions are carried out will be different from one air carrier to another.

B. For example, an air carrier with a high level of daily aircraft utilization and a very large fleet of many different kinds of aircraft may have a separate department dedicated to performing CASS activities. An air carrier with a fleet of 25 aircraft, operating seasonally or weekly may find it more efficient to use its Quality Assurance department to perform CASS activities. A part 135 on-demand operator with few employees and one or two aircraft having an average annual utilization of less than 1000 hours may outsource most of its CASS activities.

C. Regardless of the air carrier's size and level of flight operations, a well-structured CASS helps an air carrier exercise operational control over maintenance activities. This involves taking a systems approach to enhancing safety and eliminating deficiencies as well as systematically determining the level of performance and effectiveness of its maintenance program. This is a key to achieving operations with the highest possible degree of safety as well as a very high degree of efficiency.

10 WHAT CASS LOOKS AT. CASS monitors all nine elements of the air carrier's maintenance program. CASS accounts for the consequences of various internal and external influences on the maintenance program. The following are examples of some, but not all, of the items within each element that CASS looks at. You should note that all of these items are predisposed to surveillance of the maintenance program performance function of CASS. This is accomplished through audits. However, in addition to real time events such as accidents/incidents, CASS will address effectiveness discrepancies that are identified through collection and analysis of operational data, i.e., RCA.

A. Airworthiness Responsibility.

1) Air carriers are primarily responsible for performance of maintenance, including work done by maintenance providers on its aircraft. All maintenance, including work done by outside persons, must be done in accordance with the air carrier's maintenance program and maintenance manual.

2) An air carrier certificate makes the certificate holder a maintenance entity. Each person who accomplishes maintenance on a certificate holder's aircraft does so on behalf of the certificate holder as an agent for the certificate holder. Consistent with the privileges and limitations of its air carrier certificate, air carriers, through their maintenance organization, are responsible for executing operational control over maintenance activities anyone accomplishes on its aircraft. Such activities include determining when maintenance is required, what maintenance is required, accomplishing the maintenance, determining if the maintenance was done satisfactorily, and approving its aircraft for return to service. Consistent with the regulations, an air carrier certificate holder may not delegate this responsibility to outside persons.

B. Maintenance Manuals. CASS ensures that:

1) The content of all manuals, including maintenance manuals and technical content, is the responsibility of the air carrier. The manuals may be based on the Original Equipment Manufacturer (OEM) manuals or other information, but the air carrier is required to use its own manual, not the OEM manuals.

2) Manuals, publications, and forms are useable, current, correct, and readily available to all personnel who are required to use them.

3) Each person who is required to comply with the air carrier's manual has access to it during performance of normal duties.

C. Maintenance Organization.

1) Consistent with the responsibility described above, air carriers have a maintenance organization that is able to effectively exercise and maintain operational control over all persons performing, supervising, managing, and amending the maintenance program. The maintenance organization must be able to manage and guide its maintenance personnel and provide the direction necessary to achieve overall maintenance program objectives.

2) In order to be effective, an adequate maintenance organization will have the following four characteristics as a foundation of its basic organizational duties and responsibilities:

- Defines the environment within which individuals conduct their tasks,
- Defines the policies and procedures that individuals must follow and respect,
- Allocates the resources that individuals need in order to achieve safety and production goals, and
- Investigates system failures and takes all needed remedial action to avoid a repetition.

3) A maintenance organization will become ineffective if the following failures occur:

- Failure to understand the effect of people on safety and reliability of aircraft maintenance operations,
- Failure to organize its employee's work,
- Failure to monitor its employee's work effectively, and
- Failure to implement corrective actions.

4) The individual with overall maintenance program authority and responsibility is the Director of Maintenance who functions as the accountable manager for the maintenance program. This individual must be clearly identified within the organization and must be qualified in accordance with 14 CFR part 119, §§ 119.65 and 119.67(c) or 119.69 and 119.71(e) as appropriate. While retaining overall authority and responsibility, the accountable manager may delegate responsibility for elements of the program as appropriate for its size and structure.

5) The air carrier manual must contain a chart or a description of the maintenance organization showing clear authority and responsibility, including delegated responsibility, for the overall maintenance program and all of its elements and functions. The air carrier should include a description of each person's duties and responsibilities in its maintenance manual so that there is not a fragmented organizational system with high risk of confusion over who is responsible for a given task.

6) The performance of the RII function(s) must be organizationally separated from the performance of the other maintenance (including inspection), preventive maintenance, and alteration functions. This organizational separation must be below the level of the individual who has primary responsibility for the RII function, other maintenance, preventive maintenance, and alterations functions. In simple terms, this means that the part of the maintenance organization that accomplishes the maintenance (including inspection), preventive maintenance, and alterations function cannot be the same part of the maintenance organization that accomplishes your RII function.

D. Maintenance Schedule. Sets out the appropriate item, task, and interval of the air carrier's scheduled maintenance effort. The FAA expects the air carrier's maintenance schedule to be task based and appropriately modified in accordance with the CASS data collection and analysis findings. The initial selection and the continuous validation of each scheduled maintenance task and its associated interval is accomplished according to well defined criteria throughout the service life of the item, system, or structure.

E. RIIs.

1) The air carrier has specific procedures, standards, and limits necessary for the acceptance or rejection of each RII and for periodic inspection and calibration of precision tools, measuring devices, and test equipment.

2) Personnel who are authorized to accomplish RII inspections are properly trained and qualified for each RII task they are authorized to perform.

3) Designated RII inspectors who perform an item of work do not perform the required inspection on that item.

4) The structure of the maintenance organization is designed to organizationally separate the accomplishment of the required inspection function from the accomplishment of the other maintenance, including other inspection, preventive maintenance, and alteration functions.

5) The manual contains procedures to ensure that only a supervisory personnel of an inspection unit or the person who has overall responsibility for the RII function as well as the other maintenance, preventive maintenance, and alteration functions may countermand the decision of any RII inspector regarding an RII.

F. Contract Maintenance. Vendors and suppliers are qualified and provide services and products according to the air carrier's maintenance program and manual. There should be little difference between the way work is done by air carrier personnel or by contract maintenance providers.

G. Personnel Training.

1) Personnel, including those of contract maintenance providers, are competent to accomplish their duties.

2) The air carrier has a training program for personnel (including inspection personnel and contract maintenance provider personnel) that determine the adequacy of accomplished maintenance. The program ensures that these personnel are fully informed about procedures, techniques, and new equipment in use, and that they are competent to perform their duties.

H. Accomplishment and Approval of Maintenance and Inspection.

1) Maintenance facilities and equipment, including base and line stations as well as contract maintenance providers' facilities and equipment are adequate to perform the maintenance.

2) Parts and components are properly stored, dispensed, identified, and handled.

3) Tools and equipment are properly calibrated.

4) Requirements for specialized tools or training are identified and the tools are provided.

5) Maintenance and alterations are performed according to methods, standards, and techniques specified in the air carrier's manuals.

6) Work interruptions and deferred maintenance are properly documented in shift turnover records and accomplished according to applicable procedures.

7) Major repairs and major alterations are properly classified and accomplished with approved technical data.

8) Log entries and Airworthiness Release Forms are executed by appropriately certificated mechanics or repairmen who are authorized by the air carrier to do so.

9) Log entries and Airworthiness Release Forms are completed according to the air carrier's written policies and procedures.

I. Maintenance Recordkeeping System.

1) Maintenance records and current status records are generated and retained in accordance with the air carrier's manual procedures.

2) Maintenance records and current status records are complete and correct.

3) Airworthiness Directives (AD) are appropriately evaluated, accomplished, and tracked.

4) Life-limited parts are identified and the current status time in service is tracked.

J. CASS.

1) CASS has four major activities that ensure, with a system-oriented, structured approach, that all elements of the air carrier maintenance program are properly executed and are consistently effective by design rather than by chance.

2) Senior management reviews CASS issues on a regularly scheduled basis. Meetings of CASS or maintenance management committees or boards, are also held on a regular basis to discuss findings, analysis, and the progress of corrective actions. These meetings may address events, as well as statistical data and trends.

11 FOUR MAJOR ACTIVITIES OF CASS. The regulations require that CASS accomplish surveillance and analysis of the air carrier maintenance program from two perspectives: performance and effectiveness. The first two steps in the CASS process (surveillance and analysis) are carried out in two different ways. One is primarily based on auditing, and the other is primarily based on operational data collection and analysis. The results of these two types of surveillance and analysis feed into the third and fourth basic CASS activities: corrective action and follow-up. The following table summarizes the flow of the four basic steps of a CASS.

Table 1 – The CASS Process

VERIFY PERFORMANCE OF INSPECTION AND MAINTENANCE PROGRAMS	VERIFY EFFECTIVENESS OF INSPECTION AND MAINTENANCE PROGRAMS
1. Surveillance: Audit process. __Create an audit plan based on risk assessment. __Perform transaction audits. __Perform systems evaluation. __Identify hazards.	1. Surveillance: Data collection process. __Select data sets. __Collect operational data. __Collect equipment failure data. __Note trends, anomalies, and potential hazards.
2. Analysis: Accomplish hazard risk assessment and preliminary root cause analysis.	2. Analysis: Investigate adverse indicators; accomplish risk assessment and preliminary root cause analysis.
3. Corrective Action: Complete final root cause analysis, develop corrective action options, risk assessment, decision-making, and develop and implement a corrective action plan.	
4. Follow-up (Performance Measurement): Monitor corrective action implementation, verify the corrective action is effective, and initiate risk based follow-up surveillance planning.	

12 HOW CASS MONITORS MAINTENANCE PROGRAM PERFORMANCE. The program performance part of CASS ensures that everyone, including all of the air carrier's maintenance providers, comply with the air carrier's manual and program and with all applicable regulations and statutes. Generally, the program execution part of CASS functions through a system of scheduled audits and investigations of operational events. The air carrier should consider each negative audit and each operational event as an indicator or symptom of a program or systemic failure. Each one should be evaluated. However, depending on the results of the evaluation, every symptom or indicator may not require corrective action. The program execution part of CASS should include a continuous cycle of both scheduled and unscheduled (proactive and reactive) surveillance and investigations, data collection and analysis, corrective action and monitoring and feedback.

13 HOW CASS MONITORS MAINTENANCE PROGRAM EFFECTIVENESS. The program effectiveness part of CASS ensures that the maintenance program is producing the desired results. Primary indicators of the level of maintenance program effectiveness are the level of unscheduled maintenance, and the rate of availability of the aircraft for use in air transportation. Generally, the program effectiveness part of CASS functions through a system of data collection and analysis of operational data that results from operation of the aircraft. Operational data and equipment failure data should be collected that measures the output (results) of the maintenance program. Since one of the primary objectives of a maintenance program is to produce airworthy aircraft for operations in air transportation, data sets such as the rate of aircraft availability, the rate of unscheduled landings, and the rate of schedule and dispatch reliability are useful for this purpose. This data can be collected in relation to a particular aircraft or a particular fleet. While the FAA does not mandate the specific data an operator should collect, the FAA does expect an operator to have an effective process that is designed to select appropriate, relevant, and useful types of data that is collected. This data

selection process should also ensure that any data collected is useful for its intended purpose. Moreover, a periodic review of the type of data collected ensures that the data that is collected remains appropriate, relevant, and useful.

RESERVED. Paragraphs 14 through 28.

Section 2 Procedures

29 PREREQUISITES AND COORDINATION REQUIREMENTS.

A. Prerequisites:

- Knowledge of the requirements of 14 CFR parts 119, 121 and/or 135,
- Successful completion of the Air Carrier Airworthiness Inspectors Indoctrination Course, and
- Successful completion of FAA25712, Air Carrier Continuing Analysis and Surveillance System.

B. Coordination. This task may require coordination between the principal maintenance inspector and the principal avionics inspector.

30 REFERENCES, FORMS, AND JOB AIDS.

A. References (current editions):

- AC 120-16, Air Carrier Maintenance Programs,
- AC 120-79, Developing and Implementing a Continuous Analysis and Surveillance Program, and
- FAA Order 8040.4, Safety Risk Management.

B. Forms. None.

C. Job Aids. None.

31 VERIFY THE CASS ORGANIZATIONAL STRUCTURE.

A. Surveillance of the Performance of Maintenance Programs. Identify the positions within the company that have authority and responsibility for CASS. The definitions below have meaning within the context of an air carrier's organization. Consistent with existing regulations, there should be a chart or description of the CASS organization in the air carrier's manual.

1) Authority is the power to create or modify fundamental policy or procedures without higher level review or approval. Authority also means the power to accomplish a function, as well as the power to assign responsibility for carrying out the various functions of the maintenance program. The individual with authority for the CASS may design or change the CASS without having to seek approval from a higher level of management. CASS procedures should include a process to modify or revise the CASS.

2) Responsibility is the obligation, with attendant accountability, for ensuring tasks and functions are successfully accomplished in accordance with applicable policies, procedures, and standards. This work may be accomplished directly by the individual with the responsibility, or the responsibility for the work may be delegated. The individual with responsibility for the CASS has the obligation to carry out the functions of the CASS, including overseeing and managing any personnel to whom responsibility for CASS functions and duties are delegated.

Note that for smaller organizations where personnel share duties and may only carry out CASS functions part-time, this oversight and management responsibility relates only to those part-time tasks.

B. Authority and Responsibility.

1) An individual or position within the maintenance organization should have authority for the CASS, and an individual or position within the maintenance organization should have overall responsibility for managing and implementing the CASS. An individual may have both responsibility and authority for the CASS. That individual might also have responsibility for other functions as well as the CASS. It would be common for the individual with responsibility for CASS functions to delegate some or much of this work to others within the organization, depending on the size and staffing of the operator. What the FAA expects is clear responsibility for the overall CASS functions so that there is not a fragmented system with high risk of confusion over who is responsible for a given task or function.

2) Personnel with CASS responsibilities and duties should be as independent as possible from the day-to-day operations of the maintenance program. Theoretically, the most independent, objective audits are conducted by outside agency personnel who are contracted to perform such work for the air carrier. However, air carrier personnel who are conducting audits should work in separate departments from the departments performing the actual inspection and maintenance activities that are being audited. However, this is not necessarily feasible for small operators. At small operators, personnel performing CASS functions, particularly audits, may consist of one or more of the following:

a) Borrowed personnel from other shops or departments. The operator's procedures should include ways to avoid having these individuals assigned to audit areas where they normally work.

b) The company owner or chief executive officer, particularly if there are no other employees and the CASS audits are focused on outside vendors and maintenance providers because all or most of the actual inspection and maintenance work is accomplished through contracts.

c) Outside resources contracted to perform audits and analysis for the company.

d) Others deemed qualified by the operator to provide the operator with an independent objective audit, operational data collection, and analysis services that fulfill the requirements of a CASS.

C. Risk Assessment. In concert with the attributes of a good organization, personnel and resources for CASS should be prioritized as part of the overall risk management process. Essentially, any methodology that is used to prioritize surveillance personnel and resources (as well as to formulate corrective action decisions later in the process) involves principles of risk assessment. Risk assessment is a concept applicable in many aspects of an aviation operation (see Order 8040.4 for additional information). Order 8040.4 is an example and is not the only source of risk assessment procedures; however, it provides insight into FAA expectations.

1) In an effective CASS, you should be able to identify the principles of the systematic risk assessment process that:

a) Establish a plan, including the scope of the process and priorities (for example, detect and prevent noncompliance);

b) Specify the areas of concern for surveillance and analysis (personnel, maintenance and inspection programs and organizations, operations, aircraft, facilities, systems);

c) Identify hazards or potential threats to the operation;

d) Determine how likely such hazards are to be realized and actually cause harm;

e) Determine the severity of the consequences if the hazard is realized;

f) Express a combination of the likelihood and severity of harm as risk; and

g) Evaluate the appropriate response to the identified risk.

2) A CASS should take into account four principal potential sources of hazards:

a) Personnel (hiring, capabilities, interaction);

b) Equipment (design, maintenance, logistics, technology);

c) Workplace (environment, sanitation); and

d) Organization (standards, procedures, controls).

3) A number of quantitative and graphical off-the-shelf tools exist to help a user determine the gradations of a risk (high, medium, low) based on the likelihood of an unwanted event occurring and the severity of the consequences if it does occur. In the initial steps of the CASS process, the appropriate response involves setting surveillance priorities based on risk assessments aimed at maintaining compliance and safety in inspection and maintenance. A CASS risk assessment, through the feedback loop, helps to set the audit and data collection priorities. The process is best accomplished by an interdisciplinary team, guided by CASS management but involving representatives of the relevant areas.

32 VERIFY THE CASS FUNCTIONS CONCERNING THE PERFORMANCE OF THE MAINTENANCE PROGRAM.

A. Surveillance of the Performance Maintenance Programs.

1) The main tool for surveying whether the operator and its contractors are properly performing the maintenance program is audits. For purposes of a CASS, an audit is a formal examination of the activities of a department or area of an operator’s maintenance program based on an established standard such as the applicable manual. Audits are intended to ensure operator maintenance personnel and outside maintenance providers comply with the operator’s manual, program, and all applicable requirements.

NOTE: Consistent with the "performance" part of the CASS regulation, the primary type of audit that the operator should be accomplishing is the work-in-progress audit.

2) The operator should have written procedures to guide its auditing process, including the scheduling of audits. The CASS must address both internal and external audits. Internal audits are audits the operator conducts within the company. External audits are audits the operator conducts of vendors supplying parts and services to the operator. CASS procedures should include a risk-based methodology for determining priorities and for establishing and adjusting audit cycles (for example, 12-, 18-, 24-, 36-month cycles) so that resources are focused on the most pressing issues. This is a risk assessment and risk management process. You should note that a risk assessment and risk management process may show that a department or maintenance provider self audit is applicable and effective.

3) Although the majority of the inputs to this process would be generated internally, one additional input may be the results of outside audits of the operator or its vendors conducted by entities other than the operator. For example, the results of audits or inspections conducted by the FAA or the Department of Defense (DOD) may be useful by providing an operator with:

a) Specific findings requiring RCA and possible corrective action; and

b) Information useful in focusing the operator's own audits and operational data collection

B. Planning Audits. The operator may approach this initial scheduling task in many different ways, ranging from resource allocation based on company experience and very basic analysis to use of a sophisticated, software-supported risk analysis process. Within this range of possible methodologies, expect the operator's CASS audit scheduling procedures to contain processes to systematically make those decisions that are compatible with the size and complexity of its operations. Encourage your operator to make this process as structured as possible. The operator should place priority first on safety and regulatory compliance, and second on issues of operational efficiency. However, an effective CASS will meet all three of these objectives.

1) To identify the areas to audit and to set priorities, the CASS process should include consideration of factors in outside reports. These factors could include inspections, reports, special studies, or audits conducted by outside entities such as the FAA, DOD, Department of Transportation, Office of the Inspector General, or National Transportation Safety Board. Outside reports may address:

a) Information specific to the operator or its vendors;

b) Information related to the industry as a whole and of interest to the operator; and

c) Information about an accident, incident, procedure/process, or equipment type that is relevant.

2) The operator should equip CASS auditors with checklists to ensure consistency and completeness of audits. The accountable manager responsible for the CASS should ensure the checklists are updated as needed. An auditor should also be permitted a level of flexibility to ask questions not contained in the checklist if he or she finds an area that requires further investigation.

3) An operator's procedures should include identification of all areas that need to be audited, along with a process for updating this list. The following list presents examples of areas operators should consider for routine audit. A CASS audit should verify that:

a) Manuals, publications, and forms (paper and electronic versions) are useable, up-to-date, accurate, and accessible to users when they are performing assigned duties;

b) Maintenance and alterations are performed according to the methods, standards, and techniques specified in the operator's manuals, including ensuring major repairs and alterations are properly classified and accomplished consistent with technical data approved by the Administrator;

c) Parts and components are properly stored, dispensed, identified, and handled;

d) ADs are appropriately evaluated, accomplished, and tracked;

e) Maintenance records are generated in accordance with manual procedures and are complete and correct;

f) RIIs are identified and addressed according to the operator's procedures;

g) Sections 121.709 and 135.443 Airworthiness Release Forms and Log Entries are executed by authorized individuals according to the operator's procedures;

h) Shift turnover records, work interruptions, and deferred maintenance are accomplished according to applicable procedures;

i) Maintenance facilities and equipment, including base and line stations and contract maintenance providers' facilities, are adequate for the work that is to be done;

j) Personnel, including those of contract maintenance providers, are qualified and competent to accomplish their duties;

k) Tools and equipment are properly calibrated;

l) Requirements for specialized tools or training are met, such as for nondestructive testing, Category II/III maintenance, and run-up/taxi;

m) Computer programs for the maintenance program are used in accordance with specifications;

n) Maintenance providers, vendors, and suppliers provide services and products according to the operator's policies and procedures; and

o) Each aircraft released to service is airworthy.

4) CASS audits should be primarily proactive, searching out potential problem areas before they can result in undesirable events. However, CASS procedures should also address how to direct unscheduled audits in response to events or a series of events. For example, rejected takeoffs, unscheduled landings, in-flight shutdowns, accidents, or incidents may indicate the need for special audits or surveillance under a CASS. One of the primary purposes of a CASS is to detect and analyze trends for indications of program weaknesses or deficiencies. For example, CASS auditors would not necessarily audit a single maintenance-related rejected takeoff, although the CASS would investigate the event as part of the reactive function. A CASS would, however, consider whether that instance indicated a need to focus audits on a particular area from the trending proactive point of view.

5) Auditors and analysts should maintain informal lines of communication with personnel in the other departments so that maintenance personnel can discuss concerns they may have. Through this informal communications process, the operator can learn about potential hazards in the system. For example, the operator may learn about an event that could have occurred but, because of some intervention, did not. This event would be known to shop personnel but is otherwise difficult or impossible to detect in routine audits. With informal lines of communication open to shop personnel, a CASS may detect this near-event. You should ensure that the operator's CASS procedures address how to encourage this type of communication and interaction.

C. Analysis of Audits.

1) Audit results should undergo risk assessment and preliminary RCA to identify a deficiency, or potential deficiency, in any aspect or element of the maintenance program. A risk assessment process tells operators where to allocate resources and helps them understand what is found. This preliminary analysis helps CASS personnel determine the level of priority the issue merits and what type of additional technical expertise may be required to complete the RCA and evaluate corrective action options.

2) RCA treats errors as defects in the system rather than in an individual. RCA looks beyond the symptom to find the organizational defect that permitted an error to occur, to correct the fundamental problem, and to prevent recurrence. The more thorough the analysis, the greater the likelihood the operator will uncover why the system deficiency occurred and how the organization can respond definitively. The process starts during the audit itself, because auditors must collect information conducive to later analysis. If a CASS is to uncover a procedural weakness, for example, information about the procedure must be collected. This should be factual and objective information, not premature judgment about root cause. RCA is a key to any complete CASS, even though procedures may vary in complexity from operator to operator.

3) The objective of the audit analysis is to allow the operator to address the problem in such a way as to avoid recurrence of the deficiencies. To the extent possible, the operator

should set forth the analysis process in the CASS documentation. The analysis process should be as objective as possible to avoid any tendency to promote individual or commercial interests. The system should also place priority on finding the systemic or root cause of a program deficiency over seeking to assign personal blame, at any level of the organization, for an error.

4) Ensure that the operator's procedures or corporate culture do not advocate the blame culture. The blame culture can have a significant negative effect on safe operations. Terminating the individual who has the blame assigned is usually not consistent with effective RCA. Operators that adopt the blame culture:

a) Fix the blame and move on;

b) Focus on the individual(s) who made the error;

c) Stop short of identifying systemic problems and root causes;

d) Never fix the problem; and

e) Allow mishaps/mistakes to recur.

5) While audits are designed mainly to verify that an operator is performing maintenance in accordance with its manual, the regulations, and applicable requirements, auditors and analysts should also be alert for systemic deficiencies. That is, there may be procedures in the manual that are correctly followed, but that have become outdated, conflict with other manual procedures, or for some other reason are in need of change. Auditors and analysts should be encouraged to be inquisitive and think in terms of "what if?" so that the CASS functions proactively, detecting problem areas or trends before they lead to an accident, incident, or infraction of regulations. For example, what if event x occurred in conjunction with observed condition y? This approach is closely tied to the CASS analysis process but would require an analytical approach that permeates the CASS organization, from determining audit priorities and scheduling through auditing and analyzing, and including monitoring and evaluating corrective actions.

6) The audit analysis process is not as typically oriented toward quantitative analysis as the operational data analysis discussed below. However, operators may find it useful to manage the data through database or quantitative applications. Be aware that this approach does not have to be complicated or costly. The level of formality and sophistication should match the operator's conditions.

33 VERIFY THE CASS FUNCTIONS CONCERNING THE EFFECTIVENESS OF THE MAINTENANCE PROGRAM.

A. Surveillance of the Effectiveness of the Maintenance Program.

1) The main tool for assessing whether the air carrier's maintenance program is effective is the collection of operational data (data resulting from airplane operations). This way the output of the maintenance program can be measured. However, not all operational data or information may be useful for determining maintenance program effectiveness.

NOTE: Consistent with the “effectiveness” part of the CASS regulation, the primary type of effectiveness surveillance that the operator should be accomplishing is the collection of operational data.

2) A primary goal of air carrier maintenance programs is to ensure that each air carrier aircraft is airworthy at all times as well as to provide the maximum level of availability for operations in air transportation. However, in order to consistently reach these goals, the air carrier must have a means of determining if the maintenance program is producing the intended results so that the appropriate intervention may be initiated.

3) Generally speaking, at the end product level, an indicator of the effectiveness of the maintenance program is the amount of time an air carrier aircraft is not available for operations in air transportation due to issues controlled by the maintenance program. This particular effectiveness indicator can be broken down into fleet availability or individual aircraft availability, and broken down still further to the reliability of aircraft systems, subsystems, and components. In simple terms, the amount of unscheduled maintenance that reduces the availability of an air carrier aircraft for operations in air transportation is a primary indicator of whether or not the maintenance program is producing its intended results.

B. Collecting Operational Data.

1) Air carrier operational data collection systems under the CASS effectiveness activity are critical to the air carrier’s ability to determine the level of effectiveness of its maintenance program. These systems should have capabilities for collecting, storing, managing, and retrieving all types of operational data that the air carrier can use to help it determine the level of maintenance program effectiveness.

2) Current systems that collect information regarding the status of aircraft structures, systems, and engines have a wide variance ranging from simple paper systems administered manually by air carrier personnel to the very sophisticated, complex, and automatic real time data collection systems that use information collected from sensors embedded all over the aircraft. As of this writing, there are operational data collection systems planned that will manage, and sometimes repair, system faults through automatic computer activity. Newer transport category aircraft are delivered with sophisticated electronic, propulsion, flight control, and structural monitoring and data acquisition systems.

3) In recent years, an increased emphasis has been placed on using these automatic data collection capabilities, in conjunction with emerging sensor, data processing, and systems status monitoring and assessment technologies to realize real time conditions of aircraft components. While most of these automatic systems are not well defined, the goal is to use real-time flight data to detect system flaws or defects or abnormal operating conditions early enough to allow timely intervention.

4) The key thing to remember is that these new maintenance management systems are part of the continuing evolution of maintenance. They should be characterized as a new and different way of doing maintenance, not a means of eliminating maintenance. As maintenance is

still being accomplished, these systems do not eliminate maintenance actions. They may, however, eliminate some scheduled maintenance activities.

5) Contact the Aircraft Maintenance Division, AFS-300, for guidance before you authorize an air carrier to use an automatic data collection system or automatic Aircraft Systems Health Monitoring and Management System.

C. Operational Data Procedures.

1) The operator should have written procedures to guide its operational data collection process. CASS procedures should include a risk-based methodology for determining the type and frequency of operational data collection so that resources are focused on the most revealing data, with regards to maintenance program effectiveness. This is a risk assessment and risk management process. An air carrier CASS should include clear procedures for determining:

a) What operational data to collect;

b) How to collect it; and

c) What to do with it.

2) Operational data can be divided into routine or non-routine data collection and analysis. The routine data element uses a proactive data collection and analysis process that seeks to identify indicators of maintenance program ineffectiveness before they can progress to a functional failure that results in a reduction in aircraft availability. Some examples are:

a) Aircraft logbook information detailing unscheduled maintenance, including maintenance deferred in accordance with the minimum equipment list/configuration deviation list;

b) “Chronic” aircraft systems that have repeat write-ups within a specified time period (for example, 10 to 15 days);

c) Corrosion prevention and control program findings;

d) Engine condition trend monitoring data;

e) Individual item failure rates;

f) Mechanical reliability reports, mechanical interruption summaries, and similar data; and

3) The non-routine operational data element is a reactive data collection and analysis process that seeks to identify indicators of maintenance program ineffectiveness after an undesirable event has occurred. Some examples are:

a) Accidents and incidents;

b) In-flight engine and propeller separations and uncontained engine failures;

c) In-flight engine shutdowns;

d) High load events;

e) Flight delays and cancellations related to mechanical issues;

f) Rejected takeoffs;

g) Unscheduled parts replacement or unscheduled maintenance;

h) Unscheduled landings due to mechanical issues;

i) Lightning strikes; and

j) Hard landings.

4) As with reactive audit surveillance, a CASS generally approaches problems from the analytical, systems perspective. For example, in response to one or more rejected takeoffs, a CASS might focus the operational data collection and analysis to determine if a pattern in rejected takeoffs was evident, or if other types of data might be examined in relation to the rejected takeoff situation.

5) The above data sets are presented only as examples. Although the data sets are oriented toward equipment, this area of a CASS may also collect other types of data, such as information on the different types of maintenance errors experienced by the operator.

6) The operator's CASS documentation should include a means of identifying data that is relevant and useful for that operator to use in monitoring the effectiveness of its specific maintenance program. The operator should periodically review and reevaluate the usefulness of the data it collects and analyzes to accomplish this portion of the CASS.

D. Analysis of Operational Data.

1) Provide analysts with an understanding of the potential significance of each data set and how to process the data to understand its significance. This may require statistical analysis to compare the frequency of certain events or equipment failures with a determined norm, or qualitative analysis to evaluate reports of certain types of events.

NOTE: This process is not necessarily the same as what would be used in an FAA-approved reliability program.

2) Emphasize that the analysis of operational data should consider root causes of negative trends or anomalies. This preliminary RCA, including human factors, may require collaboration with technical personnel in the affected areas or specialists in engineering and reliability departments, or the OEM.

3) Delineate the roles of the CASS analysts as well as other departments or personnel in the analysis of operational data.

4) Some operators select a system that uses alerts or warnings if results of the analysis exceed certain predetermined parameters. A CASS should not rely completely on such alerts to the exclusion of analysts' judgment. The FAA's expectation of a CASS in this regard is that the operator has a complete, written procedure to review and analyze the operational data collected and to determine when further review is necessary.

5) While the surveillance and analysis steps differ for the verification of the performance of the maintenance program versus verification of the effectiveness of the program, the process merges when responding to CASS findings. The two types of analyses identify potential deficiencies in the maintenance program. In responding to these findings and analyses, the objective of a CASS is to determine the root causes of program deficiencies and address them appropriately, regardless of the perspective from which the deficiencies are found. Note that the discussion is focused on a CASS function, not an organization. For a given operator, that function might be performed by more than one organization.

6) Generally, the area responsible for surveillance will present their results to the technical or production area of the operator with a preliminary analysis of the collected information and, in some cases, possible underlying causes of the problem. Personnel in technical or production areas usually complete the RCA (if necessary) and develop proposed corrective action alternatives.

E. Final RCA.

1) Analysis of audit findings or operational data requires evaluating mechanical and human performance, or other results generated by the CASS process, to determine the condition of a process, maintenance practices, or equipment. In the case of operational data, analysis begins with comparison of the data to a standard representing acceptable performance. The standard may be in the form of an average or other means of calculating a reference. The standard may be set by the FAA, industry common practice, or the operator, as appropriate.

2) The key is to have a CASS structure that addresses the basic disciplines and elements involved in finding and correcting program deficiencies. The CASS procedures should note that in performing RCA, all relevant areas should be considered, including the role of senior management in setting appropriate policies, procedures, and an environment of communication.

3) RCA applies to both audit findings and analysis of results and trends in the operational data. For example, either audits or operational data analysis may point to maintenance errors being committed because of inadequate training. Analysis should not stop with simply determining which mechanics were inadequately trained and then retraining the mechanics. Rather, the analysis should determine why the training breach occurred and consider areas in management, communications, scheduling, or training program design that may be involved.

4) Principles and considerations of RCA are closely related to those of risk assessment, particularly in terms of the thoroughness of the analysis. Both processes do not simply consider the person involved in an issue (for example, the mechanic made a mistake), but all aspects of the organization within which that person works. This approach includes the

premise that human error is a consequence of the system rather than a deliberate action of an individual, and that proactive measures and continuous reform of different aspects of the processes and organization can address "latent conditions" in the system and increase the system's resistance to operational hazards. The term latent condition refers to flawed procedures or organizational characteristics that are capable of creating hazards if the right conditions or actions occur.

F. RCA Areas.

1) Systems analysis plays an increasingly important role in a CASS because of the increasing complexity and variety of operations, equipment, and organizations. Systems analysis emphasizes a coordinated approach to an enterprise, including specific written procedures and planning for all activities, clearly established authority and responsibilities, communications processes, and methods of measuring results, detecting system errors, and preventing recurrence. This approach recognizes the wide range of interrelated issues potentially associated with a problem in the system, such as management policies, communications, and pilot technique, in addition to the maintenance activities themselves.

2) Human factors analysis looks at how humans communicate and perform in the work environment and then seeks to incorporate that knowledge into the design of equipment, processes, and organizations. This enhances safety and maximizes the human contribution, partly by designing systems to anticipate the inevitability of human error. Human factors include basic issues that can be addressed in audit checklists, such as whether there is adequate lighting for mechanics and inspectors to perform their work, and whether schedules permit personnel to be properly rested. But the discipline addresses a wider range of issues affecting how people interface with technology and the operational system, including:

- Human physiology,
- How people learn and perceive,
- Equipment, technology, and documentation, and
- Workplace.

3) Knowledge gained from human factors analysis can help avoid maintenance errors; ensure that personnel skill sets match task requirements; ensure skill sets are maintained and improved, and enhance the work environment. This knowledge can help CASS analysts perform RCA. Continuing with the previous example of inadequate training, with insufficient awareness of human factors issues, operators may trace a maintenance error to a mechanic or technician who appears to be insufficiently trained for the task, and determine that the solution is more technical training. Further analysis may reveal, however, that there are contributing flaws in equipment design, job cards, manuals, the work environment, or organizational procedures such as shift turnover that more training will not satisfactorily overcome. Or, it may turn out that a different kind of training, perhaps involving decisionmaking skills, is called for.

4) As of this writing, the FAA is deeply involved in cooperative efforts with industry and academia in promoting human factors in aviation. This field is rapidly evolving, particularly in its application to aviation maintenance. According to a study conducted for the FAA, which cited Boeing research, maintenance error contributes to a significant portion of air carrier

accidents, with shift-turnover errors and work interruptions standing out as leading underlying causes. Based on the growing importance of human factors and information available to industry, the FAA expects that operators will apply concepts of human factors to their CASS surveillance and analysis.

5) CASS surveillance also should ensure that RCA considers human factors and that personnel designated to respond to events such as rejected takeoffs also include human factors as part of the investigation of individual events. Otherwise, data reviewed in a CASS may be incomplete.

6) One challenge presented by the increasing emphasis on human factors is how to balance two seemingly contradictory purposes. On the one hand, the FAA and industry need to encourage personnel to cooperate in addressing system organization and design issues without inhibitions caused by fear of discipline or enforcement. On the other hand, in some cases, individual employees or the operator may bear a degree of culpability (for example, deliberately bypassing important controls or committing a serious regulatory infraction in the commission of a maintenance error). In some rare instances, disciplinary action or even FAA administrative or legal enforcement may be indicated, if the action was deliberate and not a result of corporate culture. In any case, a RCA should be accomplished. This is a common issue in industry and FAA programs designed to promote the greater good of the system by encouraging voluntary reporting of errors and infractions by aviation personnel and operators without threat of disciplinary action or penalty. A CASS, in any event, is concerned specifically with identifying and correcting deficiencies in the maintenance programs, not assigning blame to any individual or individuals. CASS should be designed to that objective, rather than specific event resolution, even if CASS analysts research specific events.

G. Analytical Tools and Processes. While it is not a requirement for an operator to implement any specific externally developed system, analytical tools or processes are available to assist in the analysis process. In view of the continuing evolution of this process, as of this writing, some examples of these tools are:

1) The Maintenance Error Decision Aid tool was developed by the Boeing Human Factors Engineering group in collaboration with the FAA, airlines, and the International Association of Machinists for analyzing human performance issues related to maintenance errors and trends. Operators use the Maintenance Error Decision Aid to track events, investigate and prevent maintenance errors, and identify contributing factors, corrective actions, and prevention strategies. A software analysis package has been developed to work with this aid and facilitate analysis of systemic issues.

2) The Managing Engineering Safety Health tool was developed by the University of Manchester in collaboration with British Airways Engineering. This system is geared toward researching the workplace and organizational environment in aircraft maintenance to find the issues with the greatest potential to contribute to human factors problems. The system uses software, diagnostic, and sampling tools. Managing Engineering Safety Health conducts anonymous survey-like assessments among personnel at the work location. This is a more structured, data-intensive approach toward determining and monitoring personnel attitudes toward the system than the interview process discussed earlier. The industry has far less practical

experience with Managing Engineering Safety Health than with the Maintenance Error Decision Aid.

3) The Human Factors Accident Classification System Maintenance Extension tool was developed by the U.S. Naval Safety Center in collaboration with the FAA for use in the air carrier industry as well as naval aviation. This comprehensive system incorporates a number of analytical tools and has profiled maintenance errors and contributing conditions, permitting development of potential prevention measures. While the Human Factors Accident Classification System Maintenance Extension may be more sophisticated than many operators would need, it demonstrates principles and techniques of software-aided analysis that could be applied to a CASS.

H. Corrective Action Options.

1) Determining whether or not to proceed with a corrective action. Once the CASS auditors and analysts have identified a problem or deficiency, the operator must determine if a corrective action is warranted and, if so, the details of the corrective action.

2) CASS procedures regarding determining whether to proceed with a corrective action. CASS procedures should outline:

- How such a determination will be made,
- Who will make the determination, and
- What levels of review, if any, will be performed.

3) Technical area personnel should have primary responsibility for developing the proposed corrective action, as they would be most familiar with the technical workings of the area in question and would be sensitive to the possibility of creating new problems as a result of the corrective action. CASS procedures should emphasize a team approach. Team members may include the CASS auditors or analysts, but should include technical area personnel in the affected maintenance and inspection disciplines, and perhaps other affected areas such as training or flight operations. The CASS auditors should not develop the corrective action. This would compromise any later audits of the corrective action.

4) There are several possible types of general corrective actions or responses, depending on the outcome of the risk assessment.

a) Prevent recurrence through engineering or system changes designed to eliminate the risk.

b) Accept the underlying cause of a trend or discrepancy, but reduce the risk through implementing controls or countermeasures. Examples are training, policy or procedure revisions, or warning devices. Other countermeasures might involve modifying or introducing new equipment or technology.

c) Accept that under certain conditions a discrepancy may occur, and be prepared to contain or mitigate the results of that situation. A CASS does not necessarily have to implement corrective actions for every apparently negative trend or finding. Analysis of findings

or trends may identify problem areas that do not present safety hazards and that the operator is willing to accept, in accordance with its risk assessment process. For example, the operator might find that a higher than average number of component removals with “no fault found” occurs at a particular location. The operator might determine that the reason for this situation is that the aircraft spends insufficient time on the ground for line maintenance to completely isolate the fault. The operator might prefer to continue the brief turn times and simply switch components. This would be a business decision for the operator to make. However, more comprehensive corrective actions would be mandatory if the CASS detects that the maintenance program lack adequate procedures and standards to meet the requirements of part 121 or part 135, as applicable.

I. Written Procedures for Developing and Implementing Corrective Actions. A CASS should provide written procedures for developing and implementing corrective action. The procedures should:

1) Result in a specific corrective action plan that addresses basic questions of:

a) Development of the corrective action proposal.

b) Analysis and final approval level of the corrective action, including who is accountable for approval of the corrective action.

c) Who will implement the corrective action.

d) How the accountable individual person will implement the corrective action.

e) When the corrective action should be completed.

f) Who will evaluate the outcome, and how, including identification of data to be collected, awareness of the possibility of unintended consequences, and events that should trigger a response.

g) Who will monitor the status of the corrective action, and how.

h) Reporting the status of the corrective action (to whom, with what frequency).

2) Maintain the appropriate role of auditors in developing responses to findings so that they continue to remain independent from the corrective actions they may subsequently audit.

3) Distinguish clearly between the technical area personnel’s responsibility for developing and implementing corrective actions, and CASS personnel’s responsibility for producing the findings.

4) Designate the position or organization responsible for evaluating and approving proposed corrective actions. The CASS director or other designated manager may appoint a corrective action team to design and propose a corrective action. The team—which typically represents a cross section of the departments involved in audits, operational data collection,

analysis, and production—oversees the implementation of the corrective action. Technical and reliability control boards are most often used in conjunction with FAA-approved reliability programs; however, a similar concept applies to a CASS, even if no FAA-approved reliability program exists.

J. Corrective Action Risk Assessment.

1) CASS procedures should:

a) Specify that personnel will analyze a corrective action proposal carefully before its selection and implementation to ensure corrective action is necessary and will actually fix the problem and not lead to unintended negative consequences.

b) Remind both CASS and technical area personnel of the need to consider the impact of the proposed corrective action on other aspects of the operation. This would include other areas of the inspection and maintenance programs, such as manuals. The corrective action may require coordination with other areas, such as flight operations, that might be affected.

2) Technical area personnel play the key role in risk assessment, but the process should include the CASS analysts, who will act as resources in support of the technical area managers and bring risk assessment and systems analysis techniques to the process. The auditor and analyst should be qualified (through training or experience) in systems analysis and can contribute to the evaluation of a proposed corrective action by determining if the basic system elements have been considered. However, the technical personnel have the expertise to actually develop and implement the corrective action, and to evaluate it in practical terms. Thus, the corrective action is a result of cooperation between the technical personnel and the CASS personnel.

3) Personnel working on the proposed corrective actions should ensure they consider issues of a timetable for the corrective action implementation, as well as the safety attributes of authority, responsibility, procedures, controls, process measurement, and interfaces.

K. Corrective Action Plan.

1) With the RCA complete, corrective action options identified, and risk assessment performed as appropriate, a final decision can be made on the proposed corrective action plan. The corrective action plan should address all relevant issues, including a timetable for completion of the action, with milestones, if appropriate. The appropriate technical department (and other departments, such as flight operations, if the corrective action goes beyond the inspection and maintenance organizations) should then implement the plan.

2) The CASS procedures should identify how this plan will be approved and at what level of the company, and the parties responsible for implementing, monitoring, and ensuring all affected parties are notified, both within the company and externally, if necessary.

L. Monitoring Corrective Actions. The CASS procedures should:

1) Specify how implementation of corrective actions will be monitored and evaluated. This may require the following:

a) Follow-up audits of a specific area;

b) Regular communication from the affected technical area as to the status of the corrective action; and/or

c) Other forms of verification action by the auditors or analysts tracking the implementation.

2) Identify the person or entity (such as a CASS board) accountable for determining if any changes in the status of a corrective action are acceptable. The CASS auditors or analysts may have the duty of ensuring the corrective action has been implemented in accordance with the established timetable or, if not, determining why the timetable has changed.

3) Include responsibilities and guidelines for:

a) Tracking the implementation of corrective actions in accordance with the timeline;

b) The role of auditors, managers, management committees, and senior management;

c) How automation or computerized systems will be used;

d) How risk assessment and/or systems analysis will be used to guard against unintended consequences;

e) Measures to evaluate the effect of the corrective action; and

f) The affected technical area to communicate the status of the corrective action to the person responsible for monitoring implementation.

M. Getting Help from a Manufacturer. In some cases, the operator may require data or assistance from a manufacturer to help correct a deficiency detected by the CASS. However, manufacturers may not always assign these issues the same priority as the operator does. The operator should offer guidance in its CASS procedures, based on its particular experience, on how CASS and other personnel should address the need for assistance or information from manufacturers, and how to proceed in case of unsatisfactory or slow responses. This may include developing a standardized letter citing the need for this information or assistance to satisfy the requirements of § 121.373, § 135.431, or other pertinent regulations. It may also include working with you, the FAA principal inspector to find solutions.

N. Follow-up Surveillance Plan. CASS procedures should include how to determine the level of follow-up audits for verifying corrective action implementation. For example, based

on the risk assessment or complexity of the corrective action, the designated CASS analyst or team may schedule special, less frequent or more frequent audits. They may also change the data collection process or institute other means of verification. The FAA expects the operator to have a well-designed and logical process to design the follow-up actions.

O. Closed-Loop. The information and analysis performed through the closed-loop, continuous cycle of surveillance, investigations, analysis, and corrective action permits the operator to refine its audit and data collection priorities through the risk assessment process.

P. Analyze Results. Upon completion of the review/surveillance, analyze the results and determine if the operator/applicant's CASS meets all of the requirements. If deficiencies are identified, initiate collaborative discussions with the operator/applicant to resolve the issues.

34 TASK OUTCOMES.

A. Complete the PTRS Record.

B. Complete the Task. Complete ATOS SAI or EPI Data Collection Tool, as appropriate, for the CASS Element 1.3.11. Successful completion of this task will result in the acceptance of CASS program or revision and/or a determination that the CASS is being performed properly and is producing the desired results.

C. Document the Task. File all supporting paperwork in the operator/applicant's office file.

35 FUTURE ACTIVITIES. Normal surveillance.

RESERVED. Paragraphs 36 through 51.