# APPENDIX 6. Air Transportation Oversight System

## CHAPTER 7. ANALYSIS

**701. INTRODUCTION.** The ATOS Risk Management Process (RMP) is comprised of Analysis (ATOS Process Module 7) and Implementation (ATOS Process Module 8) processes. The Analysis process uses the results of the CMT's Surveillance Implementation, Reporting, and Evaluation processes to aid in risk management decision-making. When appropriate, the process also calls upon other available sources of data and information. The CMT uses these data to identify trends, deficiencies, and root causes. Once the analysis is complete, the Principal Inspector (PI) determines a course for FAA action in the Implementation (Action) process. During these activities, the air carrier has the primary responsibility for taking action on all safety problems.

**702. OBJECTIVES.** The ATOS Process Module 7 (Analysis) objectives are to:

- Provide the CMT with an effective way to identify, analyze, and assess risks so that they can be effectively managed.
- Provide CMT decision-makers with rational bases for decision-making by understanding and structuring complex situations and using this understanding to predict system behavior and improve system performance.

**703. RESPONSIBILITY.** The CMT members and their assigned roles and responsibilities for Analysis are as follows:

**a. CHDO/CMO.** Office managers ensure that the CMT analyzes information regarding their assigned air carrier.

**b. Principal Inspectors (PI).** PIs identify and bring aviation safety concerns to the analyst's attention. PIs communicate their analysis needs to the CMT analyst.

**c. Aviation Safety Inspectors.** Inspectors identify unsafe conditions or possible regulatory violations observed during surveillance and make appropriate entries in FAA data systems (e.g., ATOS Data Repository, PTRS). They may also perform qualitative reviews of available data that falls within their subject matter expertise.

**d. The Operations Research Analyst (ORA).** The ORA provides information to guide the CMT in conducting system safety analyses. The ORA helps clarify safety issues by researching data and looking for trends, patterns, and generalizations. The ORA also helps to build effective sampling plans for data collection.

**e. Data Evaluation Program Manager (DEPM).** The primary responsibility of the DEPM is to evaluate data that has been entered into the ATOS Data Repository using the ATOS Data Quality Guidelines.

**f. Flight Standards Safety Analysis Information Center (FSAIC).** FSAIC provides guidance and support to CMTs on analytical matters.

**704. PROCEDURES.**

**a. The System Safety Process.**

**(1)** The system safety process assists the CMT in documenting identified hazards, conducting the risk analysis process, preparing an action plan, and validating the effectiveness of the action plan.

**(2)** PIs and other CMT members should focus on the carrier's system processes and systemic problems during analysis (ATOS Process Module 7) and implementation (ATOS Process Module 8). Systemic problems are those that indicate defects in the carrier's processes (e.g., missing procedures, poor controls, lack of attention to interfaces, etc.), poor performance of procedures, or patterns of repeated non-compliance with procedures.

**b. Introduction to Analysis.** The ORA conducts routine analyses of data from the ATOS CSP (e.g., SAI, EPI) and will assist the CMT in designing and executing special studies and analysis to support needs that are outside of the normal scope of the ATOS tools. The *System Data Analysis Guide* contains instructions for correlating data from the Program Tracking and Reporting Subsystem (PTRS). More detailed information on analysis processes can be obtained from the *System Data Analysis Guide, the Special Studies Analysis Guide, and the Data Collection Planning Guide.*

**c. Analysis for Risk Management.** Hazards are situations, concerns, or other problems that have been evaluated in terms of risk. Analysis consists of three elements of the system safety process: hazard identification, risk analysis, and risk assessment. A database of hazards, along with linkages to underlying ATOS data and planning tools will be part of the ATOS automation toolset. At the end of the risk assessment procedure, the output of the process is a set of hazards and associated potential consequences, along with information on risk factors involved and an assessment of the level of risk severity and likelihood. This information will be provided to the decision-making process for the formulation of an action plan. These processes are covered in Chapter 8.

**(1) Hazard Identification.** The first step of the analysis process is identification of a hazard and the potential consequences of that hazard.

**(a) Hazard Identification.** The PI will prepare a short statement describing the hazard. Emphasis should be on identifying and then managing systemic issues versus isolated findings.

All members of the CMT should be alert for potential hazards and bring them to the attention of the PI. PIs will determine which issues will be entered into the Risk Management Process (analysis (ATOS Process Module 7) and Implementation (ATOS Process Module 8)).

PIs may also use the Risk Management Process if, in their judgment, an issue is significant enough to justify intensive analysis and tracking. They may also use other processes for addressing the hazard (e.g., EPI "Inspector Action" block, PTRS, ASAP program documents, EIR, etc.). Without conducting a complete analysis, PIs may also notify the air carrier of hazards that they deem to be isolated or minor. The ORA will continuously monitor available data sources to identify events, trends, or patterns that indicate potential safety problems. The ORA will review issues that are already entered into the automation

system to avoid duplication and to identify any issues that may be related.

**(b) Evaluating Potential Consequences.** The PI or designated representative, with ORA support, evaluates the hazard condition for potential consequences. The potential consequences should address human error, equipment failure, or process breakdown that will be the direct result if the hazard is left alone. The PI or designated representative selects a potential consequence from a menu and provides additional detail if desired.

**(2) Risk Analysis.** The second step in the analysis process is risk analysis. Risk is described in terms of severity, likelihood, and factors affecting each of them. The ORA and other CMT members analyze hazards to identify factors that affect the severity of the potential consequence and the likelihood of the consequence actually occurring. The air carrier may be able to provide data or other information to help identify risk factors affecting the hazard.

**(a) Risk Factors.** Identification of risk factors assists in risk assessment and provides specific targets for action plans. Factors are typically situational factors (e.g., specific make-model of airplanes, specific locations, etc.) or deficiencies in design or performance related to safety attributes (e.g., missing procedures or procedures not complied with). An effective action plan should address risk factors by eliminating them or by reducing their impact.

- ***Risk Factors:*** If present, these factors may affect the severity of the potential consequence and the likelihood of the consequence actually occurring.

**(b) Severity and Likelihood Values**

- ***Severity Value***: Severity is assessed along the levels in the standard AFS-900 risk matrix (High, Medium, Low). Severity assessments are produced using a combination of available data and expert judgement. Severity is defined using the following scale:

High - Potential loss (or breakdown) of an entire system or sub-system; accident, or serious incident.
Medium – Potential moderate damage to an aircraft; partial breakdown of an air carrier system; violation of regulations or company rules.
Low - Potential poor air carrier performance or disruption to the air carrier.

- ***Likelihood Value***: Likelihood is assessed along the levels in the standard AFS-900 risk matrix (Frequent, Probable, Occasional, Remote). Likelihood assessments are produced using a combination of available data and expert judgement. Likelihood values are defined as follows:

Frequent - Continuously experienced
Probable - Will occur often
Occasional - Will occur several times
Remote - Unlikely, but can reasonably be expected to occur

**(3) Risk Assessment.** The final step in the safety issue analysis process is risk assessment. The automation computes an overall risk assessment number based on the matrix below. The automation uses the severity and likelihood values approved by

the PI. The assessment number (1 through 12) determines the overall risk category (high, medium, or low overall risk), as noted below the matrix. This assessment is provided to assist the PI in decision making, FAA action planning, and evaluation of air carrier actions.

| | High | Medium | Low |
|---|---|---|---|
| **Frequent** | **1** | **3** | **5** |
| **Probable** | **2** | **6** | **8** |
| **Occasional** | **4** | **9** | **11** |
| **Remote** | **7** | **10** | **12** |

**Overall Risk Categories:**

**1-3 (Red) = High Overall Risk**
**4-9 (Yellow) = Medium Overall Risk**
**10-12 (Blue) = Low Overall Risk**

**(4) Air Carrier Notification.** After the risk assessment step, the PI should inform the air carrier of the hazard and associated risk factors. PIs determine the scope and specific content of any information made available to the air carrier about the hazard. Any information included is intended to help the air carrier determine the appropriate action for the hazard.

**(5) Action on Hazards and Associated Risk Factors.** Following analysis, the system safety process proceeds to decision-making and action planning steps. These steps are covered in Chapter 8, Implementation.

**d. Other Analysis Tasks.** In support of the CMT's analysis activities, various studies will be conducted. This section describes development of data collection plans and planning of focused inspections conducted by the CMT. The ORA and assigned ASI's, at the direction of the PI, will conduct these studies either in conjunction with routine CSP planning or in response to identified safety issues.

**(1) Data Sampling Techniques for Data Collection Plans.** Analyses that support decision-making should use data that are representative of the air carrier's systems and processes. This requires that enough valid data are collected to ensure that conclusions represent systemic, rather than isolated issues. A representative sampling of observations should be done by the CMT.

**(a)** Situations that can affect performance may vary at different locations, in different fleets, or with different outsource contractors. The data collection plan should account for these factors. This may entail taking multiple samples at multiple locations, times of day, etc.

**(b)** Sampling of data does not, however, always mean that a large number of observations must be taken in all cases. If a limited number of observations at selected locations provide data that are representative of the carrier's performance, visits to all locations may not be necessary, resulting in a savings of resources.

**(c)** The CMT ORA helps develop data collection plans, both in the case of the CSP and in the case of focused surveillance that addresses special issues. Additional information is contained in the *Data Collection Planning Guide.*

**(2) Conducting Special Studies and Analysis.** The PI may initiate a special study when the CMT determines that it needs to address an issue that is outside of the topics covered on standard SAI, EPI, or ConDOR tools. These studies may be used to support action items in an Implementation

Process, System Analysis Team (SAT) effort, or other CMT requirements. A special study should follow the steps of the traditional research process. Assigned CMT members, with assistance of the ORA, should prepare an analysis plan.

**(a)** The first step defines the problem issue. The CMT must determine what it is that it needs to know about the air carrier's processes, programs, performance, compliance in a particular area, etc. The ORA can help to scope this into a question that can be addressed through data collection and analysis.

**(b)** Second, the CMT should develop a data collection tool. In most cases, this is a set of instructions or questions to be captured on a DOR.

**(c)** Third, the CMT should develop a data collection plan, as in paragraph a., above. DEPMs need to be aware of the objective of the plan, the information desired, and the requirements of the data collection plan.

**(d)** The ORA should develop an appropriate analysis method at the same time that the first three steps are being completed. The methodology in the study should have a specific problem definition, data collection method, data collection plan, and analysis methodology that are compatible. If statistical analysis is needed, the ORA can develop a statistical hypothesis. If qualitative analysis is to be used, the PI should define decision criteria.

**(e)** Analysis may require a joint effort on the part of the ORA and other assigned CMT members. If analysis requires interpretation of comments, the PI should assign inspectors of appropriate disciplines to help in reducing and analyzing data.

**(f)** If a formal report is required, such as to make a presentation to the air carrier to address a safety issue, the ORA should develop a format in the analysis plan, including design of appropriate graphical displays.

**(g)** More information on these tasks can be obtained in the *System Data Analysis Guide, the Special Studies Analysis Guide, and the Data Collection Planning Guide.*

**705. CONTROLS.**

**a.** The ORA and PIs conduct a review of open hazards on a regular basis. The CMT develops and implements a schedule for these reviews. The ORA also conducts a review of all deficiencies identified in the data repository that are not connected to an open hazard in conjunction with these reviews. Periodic reviews of closed or accepted items are also conducted to ensure that the status of these hazards has not changed.

**b.** The CMT enters and maintains hazards and associated process impacts, factors impacting risk severity and likelihood, and final risk assessments and related rationale in the automated system. The CMT uses the automation system as a means of documenting and tracking hazards.

**c.** Automation requires entry of system, subsystem, and/or elements associated with each hazard to ensure that a systemic focus is maintained. Analysts and PIs also review issues to ensure that only systemic problems are tracked through the system.

**706. PROCESS MEASURES.**

**a.** The automation system maintains completed Risk Management Process analyses in accordance with ATOS automation archival policies.

**b.** The CMT members review RMPs periodically for status in accordance with a schedule they establish.

**c.** The analysis process is subject to periodic reviews by the CHDO manager or assigned designee.

**707. INTERFACES.** The ATOS Process Module 7 (Analysis) interfaces with ATOS Process Module 6 (Evaluation) for receipt of ATOS data and ATOS Process Module 8 (Implementation) for resolution and tracking of the Risk Management Process.

**708. – 799. RESERVED.**