

FAA/HSAC PART 135 SYSTEM SAFETY RISK MANAGEMENT SAFETY ELEMENT 1.3.20 - ENGINE CONDITION MONITORING (AW) JOB AID

The Federal Aviation Administration (FAA) is proactively moving away from compliance-based safety surveillance programs to Systems Safety Risk Management programs to eliminate air carrier's accidents and incidents. System Safety Risk Management programs was initial implemented with all CFR Part 121 air carriers and are now being applied to CFR Part 135 air carriers.

The FAA reached the limit of its ability of utilizing compliance-based oversight programs in 1996 for CFR Part 121 air carriers. Compliance-based oversight program repeated the same surveillance activities without identifying the actual root causes that could lead to an unsafe operating practice and/or accident. It was based on only looking at meeting the minimum standards established by the rules and regulations. To react to any identified unsafe condition, new rules and regulations had to be enacted, which could expand over many years. The compliance-based oversight system was not an effective means in reducing the causal factors that lead to air carrier accidents.

System Safety Risk Management program, known as Surveillance Evaluation Program (SEP), was implemented in 2001, for CFR Part 121 air carriers to assess how an air carrier operations and maintenance organizations were operating as an integrated whole safety system. For their system to be considered safe, they have to be proactive in identifying potentially unsafe hazards and risk and mitigate it to a safe state. Safety must be built into the air carriers systems by addressing the FAA's primary seven System Elements and their associated sub-elements. Each System Element identifies questions regarding the effectiveness of that system by addressing the following topics of: Responsibility, Authority, Procedures, Control, Process Measurement, and Interfaces.

In 2004 the FAA and the Helicopter Safety Advisory Conference (HSAC) established a workgroup to assess the reasons for the increase of helicopter accidents occurring in the Gulf of Mexico and develop intervention strategies. From this workgroup four of the primary root causes of Gulf of Mexico Helicopter accidents were; "Failure of Equipment/Components", "Lack of Maintenance Supervision", "Lack of Proper Procedures – Maintenance", and "Not Following Proper Procedures – Maintenance". These root causes resulted in the development of intervention questions for each of the applicable System Safety Attributes under System Safety Element 1.3.20 Engine Condition Monitoring (powerplant performance monitoring) Requirements.

The primary Safety Attribute questions defined within the System Safety Element will determine if an Operator's Policies and Procedures are adequately defined in having a System Safety program; the ability to identify Risk in its daily operations; and being able to mitigate that risk to prevent the future occurrences and/or accidents.

**FAA/HSAC PART 135 SYSTEM SAFETY RISK MANAGEMENT
SAFETY ELEMENT 1.3.20 - ENGINE CONDITION MONITORING (AW) JOB AID**

ELEMENT SUMMARY INFORMATION

A “YES” response to the questions means compliance with the statement or indicates the requirements were met. A “NO” response always indicates a negative response to the question and also means the requirements were not met. The air carrier is not complying with the requirements of the Safety Attribute question or the system is weak or inadequate in the area being evaluated. An explanation should always occur with a “NO” response.

Specific Regulator Requirements (SRR):

- 135.411(a)(2) and (b) Applicability of Maintenance Programs
- 135.413 Responsibility For Airworthiness
- 135.419 Approved Aircraft Inspection Programs
- 135.431(a,b) Continuing Analysis and Surveillance

Other CFRs and/or FAA Guidance:

FAA Order 8300.10, Vol. 2, Chapter 3, “Evaluate Category I/II/IIA Landing Minimum Maintenance/Inspection Programs”

FAA Order 8300.10, Vol. 2, Chapter 66 “Approve a Engine Condition Monitoring”

FAA Order 8300.10, Vol. 2, Chapter 67 “Approve a Contract Engine Condition Monitoring”

FAA Order 8300.10, Vol. 2, Chapter 80 “Evaluate Short-Term escalation Procedures”

FAA Order 8300.10, Vol. 2, Chapter 84 “FAR Part 121/135 Operation Specifications”

FAA Order 8300.10, Vol. 3, Chapter 38 “Inspection Approved Engine Condition Monitoring”

FAA Order 8300.10, Vol. 4, Appendix 3 “Handbook Bulletins”

FAA Order 8300.10, Vol. 4, Appendix 4 “Airworthiness Flight Standards Information Bulletins”

AC 120-17A “Maintenance Control by Engine Condition Monitoring Methods”

AC 120-16C, Paragraph 6 – as revised “Continuous Airworthiness Maintenance Programs”

FAA/HSAC PART 135 SYSTEM SAFETY RISK MANAGEMENT
1.3.20 ENGINE CONDITION MONITORING (AW)
SECTION 1 – RESPONSIBILITY ATTRIBUTE

Objective: To determine if there is a clearly identifiable qualified and knowledgeable individual who is accountable for the quality of the process.

To meet the objective, the auditor will accomplish the following task:

1. Identify the individual who is responsible for the quality of the Engine Condition Monitoring processes.
2. Review the description in the manual that delineates the duties and responsibilities of the individual.
3. Evaluate the individual’s qualifications and work experience (or resume if appropriate).
4. Review the appropriate organizational chart.
5. Discuss the Engine Condition Monitoring processes with the individual.

To meet the objective, the auditor will determine and record answers to the following questions:

1. Is there a clearly identifiable individual in management who is answerable for quality of the Engine Condition Monitoring processes?	Yes No (explain)
2. Does the individual understand the Procedure Attributes associated with the Engine Condition Monitoring processes?	Yes No (explain)
3. Does the individual understand the Control Attributes associated with the Engine Condition Monitoring processes?	Yes No (explain)
4. Does the individual understand the Process Measurement Attributes associated with the Engine Condition Monitoring processes?	Yes No (explain)
5. Does the individual understand the Interface Attributes associated with the Engine Condition Monitoring processes?	Yes No (explain)
6. Are the duties and responsibilities for this position clearly documented in the air carrier’s manual(s)?	Yes No (explain)
7. Are the qualification standards for this position clearly documented?	Yes No (explain)
8. Are the qualification standards for this position appropriate for the duties that are assigned?	Yes No (explain)
9. Does the individual meet the qualification standards?	Yes No (explain)
10. Does the individual acknowledge who has the responsibility for the Engine Condition Monitoring processes?	Yes No (explain)
11. Does the individual know who has authority to establish and modify the Engine Condition Monitoring processes?	Yes No (explain)

FAA/HSAC PART 135 SYSTEM SAFETY RISK MANAGEMENT
1.3.20 ENGINE CONDITION MONITORING (AW)
SECTION 2 – AUTHORITY ATTRIBUTE

Objective: To determine if there is a clearly identifiable qualified and knowledgeable individual who has the authority to establish and modify the Engine Condition Monitoring processes.

To meet the objective, the auditor will accomplish the following task:

1. Identify the individual who has the authority to establish or modify the Engine Condition Monitoring processes.
2. Review the description in the Manual that delineates the duties and responsibilities of the individual.
3. Evaluate the individual's qualifications and work experience (or resume' if appropriate).
4. Review the appropriate organizational chart.
5. Discuss the Engine Condition Monitoring processes with the individual.

To meet the objective, the auditor will determine and record answers to the following questions:

1. Is there a clearly identifiable individual who has authority to establish and modify the air carrier's policies for the Engine Condition Monitoring processes?	Yes No (explain)
2. Does the individual understand the Procedure Attributes associated with the Engine Condition Monitoring processes?	Yes No (explain)
3. Does the individual understand the Control Attributes associated with the Engine Condition Monitoring processes?	Yes No (explain)
4. Does the individual understand the Process Measurement Attributes associated with the Engine Condition Monitoring processes?	Yes No (explain)
5. Does the individual understand the Interface Attributes associated with Engine Condition Monitoring processes?	Yes No (explain)
6. Is the authority of this position clearly documented in the air carrier's Manual(s)?	Yes No (explain)
7. Are the qualification standards for this position clearly documented?	Yes No (explain)
8. Are the qualification standards for this position appropriate for the duties that are assigned?	Yes No (explain)
9. Does the individual acknowledge that he/she has authority for the Engine Condition Monitoring processes?	Yes No (explain)
10. Does the individual know who has the responsibility for the Engine Condition Monitoring processes?	Yes No (explain)
11. Are the procedures for delegation of authority clearly documented for the Engine Condition Monitoring processes?	Yes No (explain)

FAA/HSAC PART 135 SYSTEM SAFETY RISK MANAGEMENT
1.3.20 ENGINE CONDITION MONITORING (AW)
SECTION 3 – PROCEDURES ATTRIBUTE

Objective: To determine if the company has documented procedures for accomplishing Engine Condition Monitoring processes.

To meet the objective, the auditor will accomplish the following task:

1. Review the documented instructions and information related to the Engine Condition Monitoring processes to ensure that they contain who, what, where, when, and how.
2. Review the FAA Guidance and Specific Regulatory Requirements (SRR) included in the supplemental information section of this SAI.
3. Discuss the Engine Condition Monitoring processes with appropriate individual to gain an understanding of the procedures.
4. Observe the Engine Condition Monitoring processes with appropriate individual to gain an understanding of the procedures.

To meet the objective, the auditor will determine and record answers to the following questions:

1. Does the data collection system specify the type of source documents that will be utilized, i.e., Unscheduled Removals, Confirmed Failures, Pilot Information, Service Difficulty Reports, Mechanical Interruption Summaries, Shop Wear Findings, Bench Checks, Health Usage Monitoring System, Vibration Health Monitoring, Daily Oil Consumption Rates and other sources the operator considers appropriate.	Yes No (explain)
2. Does the Engine Condition Monitoring Data Collection system specify the flow of information from the source documents to the data entry system for analysis?	Yes No (explain)
3. Do written procedures provide detailed information and instructions for Engine Condition Monitoring Data Analysis process to prevent in-flight engine shutdowns/failures?	Yes No (explain)
4. Does the Engine Condition Monitoring program describe the format and content of the Engine Condition Monitoring Reports?	Yes No (explain)
5. Are the performance standards or norms clearly defined in the analysis process (The standard or norm may be running average, mean average, manufacturer’s standard, history or experience rate, tabulation, graphs, charts, or any other means measure performance against)?	Yes No (explain)
6. Does Engine Condition Monitoring data analysis system utilize statistical performance standards and “Alert Values” for the engine components?	Yes No (explain)
7. Does Engine Condition Monitoring data analysis systems utilize other non-alerting type programs for a basis for continuous mechanical performance and if so can it be summarized to arrive at norms and negative trends i.e. component removal rates, repeated write-ups, increase in oil consumption, chip detection, etc.?	Yes No (explain)
8. Do written procedures identify the frequency that management will convene a meeting to address Engine Condition Monitoring Reports?	Yes No (explain)
9. Do written procedures identify a Engine Condition Monitoring program meeting processes i.e. previous monthly meeting minutes, discuss items with over-alerts, actions being taken, adjustments to engine maintenance intervals, special engine inspections, or other changes to the engine maintenance program to reduce the alerts?	Yes No (explain)

FAA/HSAC PART 135 SYSTEM SAFETY RISK MANAGEMENT**1.3.20 ENGINE CONDITION MONITORING (AW)****SECTION 3 – PROCEDURES ATTRIBUTE**

10. Does written procedures identify the persons or persons responsible for reviewing Engine Condition Monitoring Reports and the process for assigning the action to person(s) to develop a plan to correct the deficiencies within a defined period?	Yes No (explain)
11. Do written procedures explain the method for validating the results of the corrective actions after they have been implemented?	Yes No (explain)
12. Do written procedures define how the Engine Condition Monitoring deficiencies are tracked?	Yes No (explain)
13. Do written procedures describe methods for adjusting maintenance inspections and overhaul intervals?	Yes No (explain)
14. Do the written procedures identify: who what, where, when, and how?	Yes No (explain)
15. Does the air carrier have the resources to support the written procedures for the Engine Condition Monitoring program?	Yes No (explain)
16. Are the procedures published in different manuals relating to the Engine Condition Monitoring program consistent?	Yes No (explain)
17. Does the air carrier have a documented process in their manual(s) to assess the impact of changing procedures for the Engine Condition Monitoring process?	Yes No (explain)
18. Were all observations unrelated to the Engine Condition Monitoring process satisfactory?	Yes No (explain)

FAA/HSAC PART 135 SYSTEM SAFETY RISK MANAGEMENT
1.3.20 ENGINE CONDITION MONITORING (AW)
SECTION 4 – CONTROL ATTRIBUTE

Objective: To determine if checks and restraints are designed into the Engine Condition Monitoring processes to ensure a desired result is achieved.

To meet the objective, the auditor will accomplish the following task:

1. Review the documented instructions and information related to the Engine Condition Monitoring processes.
2. Discuss the Engine Condition Monitoring processes with appropriate individual to gain an understanding of the controls.
3. Observe the Engine Condition Monitoring processes to gain an understanding of the controls.

To meet the objective, the auditor will determine and record answers to the following questions:

1. Are the following checks and restraints built into the Engine Condition Monitoring processes:	
1.1. Does the Engine Condition Monitoring Data Collection system collect all the necessary source documents, for data entry, within the prescribed time frames?	Yes No (explain)
1.2. Are the pilots performing Engine Performance Power Checks and documenting the results as required by the air carriers program?	Yes No (explain)
1.3. Are the Engine Condition Monitoring data analysis reports published within the prescribed time frames?	Yes No (explain)
1.4. Is the Engine Condition Monitoring data analysis process detecting deterioration in performance at an early stage to allow for an effective corrective action?	Yes No (explain)
1.5. Does the Engine Condition Monitoring program tracking time and cycles, times since last inspection and shop visits?	Yes No (explain)
1.6. Do written procedures place deadlines on implementing corrective action plans for all Engine Condition Monitoring program deficiencies?	Yes No (explain)
1.7. Does the Engine Condition Monitoring program track the maintenance actions taken to improve engine performance upon detecting performance deterioration?	Yes No (explain)
1.8. Is the Engine Condition Monitoring analysis process standard mean deviations or standard norms being adjusted to prevent alerts or spikes in the reports?	Yes No (explain)
1.9. Does the Engine Condition Monitoring group have a chairperson that is at the highest maintenance position to administrator the program and has final Authority for the Engine Condition Monitoring program?	Yes No (explain)
1.10. Does the Air Carrier's Engine Condition Monitoring program make adjustments to the engine maintenance inspection intervals and/or maintenance processes to improve engine performance?	Yes No (explain)
1.11. Does the Air Carrier have an organizational chart, including maintenance providers, in the Engine Condition Monitoring Document(s)?	Yes No (explain)
1.12. Does the Air Carrier have method for interfacing with the manufacture to address engine performance deteriorations, necessary maintenance to improve performance, and maintenance findings on engine parts/components?	Yes No (explain)
2.0. Does the checks and restraints ensure the desired results are achieved for the Engine Condition Monitoring program?	Yes No (explain)
3.0. Does the Air Carrier have a document process in their Manual(s) to assess the impacts of changing the checks and restraints for the Engine Condition Monitoring processes?	Yes No (explain)
4.0. Were all observations unrelated to the Engine Condition Monitoring process satisfactory?	Yes No (explain)

FAA/HSAC PART 135 SYSTEM SAFETY RISK MANAGEMENT**1.3.20 ENGINE CONDITION MONITORING (AW)****SECTION 5 – PROCESS MEASUREMENT ATTRIBUTE**

Objective: To determine if operator measures and assesses the Engine Condition Monitoring processes to identify and correct problems or potential problems.

To meet the objective, the auditor will accomplish the following task:

1. Review the documented instructions and information related to the Engine Condition Monitoring processes.
2. Discuss the Engine Condition Monitoring processes with appropriate individual to gain an understanding of the controls.
3. Observe the Engine Condition Monitoring processes to gain an understanding of the controls.

To meet the objective, the auditor will determine and record answers to the following questions:

1. Does the air carrier's Engine Condition Monitoring processes include the following Process Measurements?

1.1. Does the air carrier document their Process Measurement methods and results?	Yes No (explain)
1.2. Does the air carrier audit process define the decision-making process for action plans to mitigate the identified Hazards and Risk?	Yes No (explain)
1.3. Does the air carrier take corrective action in response to failures detected during audits?	Yes No (explain)
1.4. Does the air carrier re-evaluate the corrective actions to determine the following; the original hazard, consequence, severity and likelihood have been mitigated effectively?	Yes No (explain)
1.5. Does the air carrier conduct an independent audit of the Engine Condition Monitoring program at least biannually to ensure that it meet its intended function (audits conducted by persons not associated with Engine Condition Monitoring program)?	Yes No (explain)
1.6. Does the air carrier conduct at least 20% of its audits in a random, unannounced fashion?	Yes No (explain)
2. Does the air carrier audit the Engine Condition Monitoring data collection system for quality of content per its' written procedures?	Yes No (explain)
3. Does the air carrier audit the Engine Condition Monitoring data analysis process for quality of content per its' written procedures?	Yes No (explain)
4. Does the air carrier audit the Engine Condition Monitoring Reports for quality of content per its' written procedures?	Yes No (explain)
5. Are the maintenance corrections actions effective in improving engine performance after engine deterioration has been detected?	Yes No (explain)
6. Are the process measurement results available to the FAA?	Yes No (explain)
7. Does the air carrier have a documented process to reflect the reasons why the engine maintenance program was adjusted to improve engine performance?	Yes No (explain)
8. Does the Process Measurement adequate evaluate the system element interfaces that are associated with Engine Condition Monitoring processes?	Yes No (explain)
9. Does the air carrier have a documented process in their Manual(s) to assess the impacts of changing procedures for the Engine Condition Monitoring processes?	Yes No (explain)
10. Were all observations unrelated to the Engine Condition Monitoring processes satisfactory?	Yes No (explain)
11. Does the Process Measurement methods appear to be affective?	Yes No (explain)

FAA/HSAC PART 135 SYSTEM SAFETY RISK MANAGEMENT**1.3.20 ENGINE CONDITION MONITORING (AW)****SECTION 5 – PROCESS MEASUREMENT ATTRIBUTE**

12. Does the air carrier use their Process Measurement results to improve their programs?	Yes No (explain)
13. Does the organization that conducts the process measurement have direct access to the person(s) with the responsibility and authority for the Engine Condition Monitoring program?	Yes No (explain)
14. Does the air carrier have the resources to support the Process Measurement for the Engine Condition Monitoring program?	Yes No (explain)
15. Were all observations unrelated to the Process Measurement satisfactory?	Yes No (explain)
16. Best practices/favorable comments:	

FAA/HSAC PART 135 SYSTEM SAFETY RISK MANAGEMENT
1.3.20 ENGINE CONDITION MONITORING (AW)
SECTION 6 – INTERFACES ATTRIBUTE

Objective: To determine if operator identifies and manages the interactions between the Engine Condition Monitoring processes includes safety attributes.

To meet the objective, the auditor will accomplish the following task:

1. Review the documented instructions and information related to the Engine Condition Monitoring processes.
2. Discuss the Engine Condition Monitoring processes with appropriate individual to gain an understanding of the interfaces.
3. Observe the Engine Condition Monitoring processes to gain an understanding of the controls.

To meet the objective, the auditor will determine and record answers to the following questions:

1. Are the following interfaces identified for the Engine Condition Monitoring processes:

1.1. Appropriate Operational Equipment (Element 1.1.2)	Yes No (explain)
1.2. Major Repairs and Alterations (Element 1.2.2)	Yes No (explain)
1.3. Maintenance Log/Recording Requirements (Element 1.2.3)	Yes No (explain)
1.4. MIS Reports (Element 1.2.4)	Yes No (explain)
1.5. Mechanical Engine Condition Monitoring Reports (Element 1.2.5)	Yes No (explain)
1.6. Maintenance Program (Element 1.3.1)	Yes No (explain)
1.7. Inspection Program (Element 1.3.2)	Yes No (explain)
1.8. MEL/CDL/Deferred Maintenance (Element 1.3.5)	Yes No (explain)
1.9. Outsource Organization (Element 1.3.7)	Yes No (explain)
1.10. Engineering/Major Repairs and Alterations (Element 1.3.9)	Yes No (explain)
1.11. Parts/Material Control/SUP (Element 1.3.10)	Yes No (explain)
1.12. Continuous Analysis and Surveillance (CAS) (Element 1.3.11)	Yes No (explain)
1.13. GMM/Equivalent (1.3.14)	Yes No (explain)
1.14. Other Programs Approved by Operations Specifications	Yes No (explain)
1.15. Content Consistency Across Manuals (Element 2.1.2)	Yes No (explain)
1.16. Maintenance Training Program (Element 4.2.1)	Yes No (explain)
1.17. RII Training Requirements (Element 4.2.2)	Yes No (explain)

FAA/HSAC PART 135 SYSTEM SAFETY RISK MANAGEMENT
1.3.20 ENGINE CONDITION MONITORING (AW)
SECTION 6 – INTERFACES ATTRIBUTE

1.18. Director of Maintenance (Element 7.1.1)	Yes No (explain)
1.19. Chief Inspector (Element 7.1.2)	Yes No (explain)
2. List any additional interfaces identified.	Yes No (explain)
3. Are there procedures to ensure that interfaces occur?	Yes No (explain)
4. Are there controls to ensure that interfaces occur?	Yes No (explain)
5. Are the interfaces between the Engine Condition Monitoring process and other processes treated consistently in the Manual(s)?	Yes No (explain)
6. Were all observations unrelated to the RII Personnel process satisfactory?	Yes No (explain)
7. Best practices/favorable comments:	Yes No (explain)