



International Civil Aviation Organization

MIDANPIRG/23 & RASG-MID/13 Meetings

(Cairo, Egypt, 14 – 18 June 2026)

Agenda Item 4.3: Other Emerging Safety Matters

**UPDATE ON THE DEVELOPMENT OF REGIONAL SAFETY ADVISORY ON FATIGUE
MANAGEMENT IN AIRCRAFT MAINTENANCE ENVIRONMENTS**

(Presented by the United Arab Emirates)

SUMMARY

A Draft Regional Safety Advisory on Fatigue Management in Aircraft Maintenance Environments is being developed by the United Arab Emirates General Civil Aviation Authority, in collaboration with the Kingdom of Saudi Arabia, the ICAO MID Regional Office, IATA and IFALPA, as a follow-up to RASG-MID Conclusion 12/10 related to Fatigue Risk Management (FRM) for maintenance licensed personnel.

The draft RSA has been developed to provide practical guidance to Civil Aviation Authorities and maintenance organizations on the identification, assessment, mitigation and monitoring of fatigue-related risks within aircraft maintenance environments.

The paper provides an overview of the development activities undertaken, the scope and content of the draft RSA, and the proposed way forward, including review through the upcoming meeting of the Safety Enhancement Implementation Group (SEIG/8) prior to submission to a future RASG-MID meeting for consideration

Action by the meeting is at paragraph 3

REFERENCE

- RASG-MID Conclusion 12/10 – SARPs and Guidance Related to Fatigue Risk Management (FRM) for Maintenance Licensed Personnel
- ICAO Doc 9966 – Manual for the Oversight of Fatigue Management Approaches
- ICAO Annex 19 – Safety Management
- UAE GCAA Safety Decision 2025-01 – Fatigue in Aviation Maintenance Environment

1. INTRODUCTION

1.1 Aircraft maintenance activities are frequently conducted within demanding operational environments involving night shifts, extended duty periods, aircraft-on-ground (AOG) recovery activities, remote maintenance support, operational disruptions and high workload conditions. These

operational circumstances may contribute to fatigue and degraded human performance, increasing the risk of maintenance errors and safety occurrences.

1.2 Recognizing the importance of fatigue management within aircraft maintenance environments, RASG-MID/12 adopted Conclusion 12/10 related to the development of guidance material concerning fatigue management practices applicable to maintenance personnel.

1.3 In support of this Conclusion, the United Arab Emirates General Civil Aviation Authority initiated the development of regional guidance material addressing fatigue management within aircraft maintenance environments.

1.4 The work has been undertaken through a collaborative effort involving the Kingdom of Saudi Arabia, the ICAO MID Regional Office, IATA) and the IFALPA.

2. DISCUSSION

2.1 A draft Regional Safety Advisory entitled “Guidance Material for Fatigue Management in Aircraft Maintenance Environments” has been developed.

2.2 The draft RSA adapts relevant fatigue management principles and oversight concepts contained in ICAO Doc 9966 to the maintenance environment and supports the implementation of safety management principles consistent with ICAO Annex 19.

2.3 The guidance material is intended to support:

- a) Civil Aviation Authorities (CAAs);
- b) Approved Maintenance Organizations (AMOs/MROs);
- c) Continuing Airworthiness Management Organizations (CAMOs);
- d) Operators managing maintenance activities; and
- e) Maintenance personnel involved in safety-related maintenance functions.

2.4 The draft RSA provides practical guidance covering:

- a) fatigue hazard identification and reporting;
- b) fatigue risk assessment and mitigation;
- c) duty, rest and workload considerations;
- d) fatigue management during special operational scenarios, including AOG recovery and remote maintenance activities;
- e) fatigue reporting culture and safety promotion;
- f) fatigue-related safety performance monitoring;
- g) training and competency considerations; and
- h) oversight considerations for Civil Aviation Authorities.

2.5 The guidance material promotes a practical, proportionate and risk-based approach to fatigue management and supports the integration of fatigue-related hazards into existing organizational safety management processes.

2.6 The development of the RSA also supports regional harmonization, knowledge sharing and the enhancement of safety oversight capabilities related to maintenance human factors and fatigue management.

2.7 The draft RSA will be submitted to the upcoming Safety Enhancement Implementation Group (SEIG/8) for technical review and refinement. Subject to the outcome of the SEIG review, the finalized RSA may subsequently be presented to a future RASG-MID meeting for consideration as regional guidance material.

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information contained in this paper.



RASG-MID SAFETY ADVISORY – XX

(RSA-XX)

[Insert date]

MID-Region

Guidance Material for Fatigue Management in Aircraft Maintenance Environments

**for Civil Aviation Authorities and Maintenance Organizations on the
Establishment and Oversight of Fatigue**

Risk Management Practices for Maintenance Personnel

Date of Issue:	[Month Year]
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These guidelines are based on work initiated by the United Arab Emirates General Civil Aviation Authority (GCAA) and subsequently developed through a collaborative effort involving the United Arab Emirates (UAE), the Kingdom of Saudi Arabia (KSA), the ICAO Middle East (MID) Regional Office, the International Air Transport Association (IATA), the International Federation of Air Line Pilots' Associations (IFALPA), and the Regional Aviation Safety Group – Middle East (RASG-MID).

Disclaimer

This document is intended to provide guidance for Civil Aviation Authorities (CAAs) and aviation industry stakeholders on the management of fatigue risks in aircraft maintenance environments. It supports regional safety enhancement initiatives under the RASG-MID framework and promotes harmonized implementation across MID States. It is not intended to supersede or replace existing State regulations, ICAO Standards and Recommended Practices (SARPs), approved manuals, or other advisory material. To the extent of any inconsistency between this document and national or international regulations, standards, recommendations or advisory publications, the content of the applicable national/international requirements shall prevail.

Related Documents

- ICAO Doc 9966, Manual for the Oversight of Fatigue Management Approaches, Second Edition, 2016
- ICAO Doc 9859, Safety Management Manual (SMM)
- ICAO Annex 19, Safety Management
- ICAO Annex 8, Airworthiness of Aircraft
- ICAO Annex 6, Operation of Aircraft, as applicable to fatigue management principles
- Applicable State civil aviation regulations for approved maintenance organizations, continuing airworthiness management organizations, aircraft maintenance engineer licensing and SMS
- UAE GCAA Safety Decision 2025-01, Fatigue in Aviation Maintenance Environment

Description and Objective

Fatigue is a physiological state of reduced mental or physical performance capability resulting from sleep loss, extended wakefulness, circadian phase, and/or workload. In aircraft maintenance, fatigue can impair vigilance, communication, decision-making, inspection accuracy, procedural compliance and the ability to perform safety-related maintenance tasks. Maintenance errors may remain latent until the aircraft is released to service and operated, which makes fatigue management an important airworthiness and safety management subject.

The objective of this Regional Safety Advisory is to provide practical and implementable guidance to MID States and maintenance organizations for establishing effective fatigue management practices applicable to aircraft maintenance personnel within a State safety oversight framework. The advisory adapts the scientific principles and oversight concepts contained in ICAO Doc 9966 to the maintenance environment and reflects the practical approach used in the UAE GCAA Safety Decision on fatigue in aviation maintenance environments.

The guidance supports States and organizations in integrating fatigue into safety management systems, internal occurrence reporting, training, work planning, special operational scenarios, and oversight activities.

Scope and Applicability

This advisory may be considered by MID States for application to the following organizations and personnel, as applicable to the State regulatory framework:

- Approved Maintenance Organizations (AMOs/MROs), including line, base, component and engine maintenance organizations.
- Continuing Airworthiness Management Organizations (CAMOs) when their planning, defect control, AOG coordination or maintenance control activities may affect maintenance personnel fatigue.
- Operators that contract or control maintenance activities, including maintenance control centres and technical operations departments.
- Maintenance training organizations where fatigue awareness is relevant to maintenance human factors training.
- Licensed aircraft maintenance engineers, certifying staff, support staff, mechanics, inspectors, planners, supervisors, maintenance controllers, quality/safety personnel and managers involved in maintenance activities.

Background

Fatigue in maintenance environments is recognized as a latent threat, where errors may not be immediately detected and may manifest during aircraft operations, thereby increasing systemic risk within the aviation system.

A review of maintenance-related occurrences and contributing factors in several systems has highlighted fatigue as a recurring human factor that may contribute to maintenance errors, reduced situational awareness, incomplete task performance, poor shift handover, and weakened independent inspection. The UAE GCAA Safety Decision 2025-01 identified fatigue as a critical contributing factor in reported incidents and required maintenance organizations to develop, implement and maintain a process to manage fatigue risks.

Aircraft maintenance is often performed in a 24/7 operational environment, including night shifts, extended duties, shift rotations, on-call assignments, AOG recovery, remote station support, travel across time zones, and high workload during operational disruptions. These conditions can restrict sleep opportunities, affect circadian rhythms, and increase the likelihood of human performance degradation.

ICAO Doc 9966 explains that fatigue cannot be eliminated in aviation and therefore must be managed through scientific principles, operational experience, shared responsibilities and either prescriptive or performance-based approaches. Although existing ICAO fatigue management guidance is mainly developed for flight crew, cabin crew and air traffic controllers, the underlying scientific principles are directly relevant to maintenance personnel performing safety-related duties.

Key Terms

Term	Maintenance-tailored meaning
Fatigue	A physiological state that reduces the mental or physical capability of maintenance personnel due to sleep loss, extended wakefulness, circadian phase and/or workload, impairing the safe performance of maintenance duties.
Maintenance duty period	A defined period that starts when maintenance personnel are required to report for duty or commence assigned work, including technical work, certification, supervision, standby conversion, travel required by the

	organization and administrative safety-related duties, and ends when the person is free from all duties.
Rest period	A continuous and defined period before or after duty during which the person is free of all work duties and has an opportunity to obtain sleep.
AOG/remote maintenance scenario	Unplanned maintenance activity required to recover an aircraft, often under time pressure, away from the main base or with travel/positioning requirements.
Fatigue report	A confidential or protected report submitted by personnel when fatigue exists, has affected a task, could affect a task, or contributed to an event or hazard.
Fatigue risk management	A process to identify, assess, mitigate and monitor fatigue-related hazards using SMS processes or, where accepted by the State, a dedicated FRMS approach.

Scientific Principles Relevant to Maintenance

States and organizations should ensure that fatigue management in maintenance is based on the following principles:

- **Sleep is essential:** Adequate quantity and quality of sleep are required to restore alertness, physical performance, mental performance and mood.
- **Sleep loss accumulates:** Restricted sleep over consecutive nights or long periods of wakefulness can progressively reduce performance and increase the risk of errors.
- **Circadian timing matters:** Night duty, early starts, rapidly rotating shifts and work during the window of circadian low can reduce alertness and increase sleepiness.
- **Workload interacts with fatigue:** High workload may exceed the capacity of a fatigued person, while low workload can unmask sleepiness during monitoring, inspection or repetitive tasks.
- **Operational context matters:** Fatigue risk must be assessed in relation to task criticality, complexity, environmental conditions, time pressure and the consequences of maintenance error.

Recommended State Actions

MID States are encouraged to consider the following actions when developing or enhancing fatigue management expectations for maintenance environments:

1. Recognize fatigue as a safety hazard within the State Safety Programme and within airworthiness/maintenance oversight activities.
2. Develop regulatory or advisory material requiring maintenance organizations to manage fatigue risks through SMS, internal procedures or an accepted FRMS approach, as appropriate.
3. Ensure that approved organizations have policies and procedures covering duty planning, rest, shift handover, fatigue reporting, fatigue risk assessment, special operational scenarios and training.
4. Promote non-punitive fatigue reporting and protect safety information in accordance with applicable State safety data protection principles.
5. Encourage collection and analysis of fatigue-related data to support safety performance monitoring and regional learning.
6. Include fatigue management in airworthiness inspector training and in oversight checklists for AMOs, CAMOs and operators.

7. Consider regional collaboration through RASG-MID to share de-identified trends, implementation challenges and best practices.

Recommended Organization Actions

Maintenance organizations should develop, implement and maintain a fatigue management process proportionate to the size, complexity and nature of their maintenance activities. The process should be documented, implemented, monitored and subject to continuous improvement.

Organizations Required to Implement SMS

Organizations required to implement SMS should manage fatigue as part of their existing SMS processes. As a minimum, they should:

- Include fatigue in the safety policy as a hazard to be managed.
- Identify fatigue hazards using predictive, proactive and reactive methods.
- Assess and mitigate fatigue-related risks using the organization’s safety risk management process.
- Include fatigue-related indicators in the safety performance monitoring framework, where appropriate.
- Include fatigue management in SMS and human factors training.
- Incorporate fatigue topics into internal safety communications.
- Ensure the reporting process enables personnel to report fatigue without fear of punishment.
- Integrate fatigue into the internal occurrence/hazard reporting system and encourage reporting by maintenance staff.

Organizations Not Required to Implement SMS

Organizations not required to implement SMS should nevertheless include fatigue management in their internal procedures. This may include documented duty and rest arrangements, a simple fatigue reporting process, basic fatigue risk assessment, internal communications and training, and quality monitoring of compliance with internal procedures.

Fatigue Hazard Identification in Maintenance

Organizations should use a combination of predictive, proactive and reactive approaches to identify fatigue hazards.

Approach	Examples for maintenance environment
Predictive	Review planned rosters, consecutive night shifts, early starts, extended shifts, standby/on-call arrangements, AOG recovery plans, travel time to remote stations, overtime plans, seasonal workload and planned heavy maintenance inputs.
Proactive	Conduct fatigue surveys, review self-assessments, monitor overtime and roster changes, discuss fatigue during safety meetings, review handover quality, observe task performance and assess maintenance error precursors.
Reactive	Investigate fatigue contribution following maintenance errors, missed inspections, incorrect certification, incomplete task cards, tool control events, repeated defects, shift handover failures, ground damage, rework, or any reported fatigue event.

Fatigue Risk Assessment

Fatigue risk assessment should consider both the likelihood that personnel are fatigued and the severity of the potential maintenance outcome. The assessment should be linked to task criticality and not limited to duty hours alone.

- **Fatigue likelihood factors:** sleep opportunity, consecutive duties, night/early duty, time awake, standby activation, overtime, commuting, travel across time zones, workload, environmental conditions, heat and interruptions.
- **Consequence factors:** criticality of maintenance task, independent inspection needs, aircraft release implications, error detectability, supervision, human factors barriers, and potential operational impact.
- **Control effectiveness:** availability of rested personnel, task deferral options, additional inspection, supervision, breaks, handover controls, and management acceptance of residual risk.

Suggested Mitigations

Organizations should select mitigations proportionate to the assessed risk. Examples include:

- Design rosters to provide adequate sleep opportunity and recovery between duties.
- Manage consecutive night duties and rapidly rotating shifts, with specific attention to tasks performed during the window of circadian low.
- Control extended duties and overtime, particularly when linked with critical certification or inspection tasks.
- Provide planned breaks during long duty periods and consider controlled rest opportunities where suitable and safe.
- Use additional supervision or independent inspection for critical tasks performed during high fatigue risk periods.
- Defer non-urgent tasks when fatigue risk cannot be reduced to an acceptable level.
- Ensure effective shift handover, including status of incomplete tasks, deferred items, tools, open panels and independent inspection requirements.
- Provide facilities and procedures that support recovery, hydration, rest breaks and fatigue reporting.
- Monitor and manage environmental contributors such as heat, noise, lighting and high workload during peak maintenance activity.

Special Operational Scenarios

Maintenance organizations and operators should give special attention to operational scenarios that can create elevated fatigue risk:

Scenario	Expected fatigue controls
AOG at remote station	Pre-plan recovery teams where possible; consider total time awake, travel/positioning time, local conditions, task criticality and rest before release certification. Use additional inspection or second-person verification when risk is elevated.
Riding engineer / maintenance personnel travelling with aircraft	Include travel/flight time in fatigue assessment and duty planning where it affects alertness. Provide suitable rest before critical maintenance or certification tasks.

Time-zone crossing	Consider circadian disruption and local time adaptation. Avoid assigning critical maintenance immediately after significant transmeridian travel unless risk controls are applied.
Operational disruption or peak workload	Use management approval for overtime, monitor cumulative duty, prioritize safety-critical tasks, and defer non-essential work where appropriate.
Night shift heavy maintenance	Apply controls for WOCL exposure, handover, lighting, supervision, independent inspection and break planning.
On-call/standby activation	Assess prior wakefulness and sleep opportunity before assigning critical tasks. Define when standby converts to duty and how rest is protected afterwards.

Fatigue Reporting and Safety Culture

Fatigue can be difficult to identify if personnel are unwilling or unable to report it. A trusted reporting process is therefore essential. Organizations should ensure that fatigue reports can be submitted without fear of punishment, while retaining the ability to address wilful misconduct or intentional disregard of procedures in accordance with just culture principles.

Fatigue reporting should allow personnel to report:

- Being too fatigued to safely perform or certify a safety-related maintenance task.
- A schedule, roster or shift pattern that creates fatigue risk.
- A fatigue-related hazard, including excessive overtime, inadequate rest or repeated night duties.
- A maintenance event where fatigue may have been a contributing factor.
- Concerns about other personnel showing signs of fatigue, in a constructive and safety-focused manner.

Safety Performance Monitoring

Organizations should monitor fatigue management effectiveness through qualitative and quantitative data. Possible indicators include:

Area	Example indicators
Reporting	Number and trend of fatigue reports; reporting rate by department; quality of fatigue narratives; closure time for fatigue actions.
Rostering and workload	Overtime hours; consecutive night duties; extended duties; standby activations; rest-period reductions; short-notice roster changes.
Events and investigations	Maintenance errors where fatigue was considered; repeated task card errors; handover-related findings; certification errors; rework linked to night/extended duties.
Training and promotion	Completion rate of fatigue training; fatigue campaign activities; safety meeting discussions; survey participation.
Assurance	Audit findings related to fatigue procedures; effectiveness of mitigations; management review decisions.

Training and Promotion

Fatigue management training should be tailored to the responsibilities of the target group. It should be included in human factors/SMS training and refreshed periodically.

Target group	Recommended training topics
Maintenance personnel and certifying staff	Scientific principles of fatigue; recognizing fatigue in self and others; reporting fatigue; fitness for duty; personal sleep strategies; effects of night work, time awake, heat and workload; when to stop or escalate a task.
Supervisors and planners	Roster design, overtime control, task allocation, break planning, handover management, critical task risk assessment, standby/AOG planning, and responding to fatigue reports.
Safety/quality personnel	Fatigue hazard identification, investigation of fatigue contribution, safety performance indicators, audit techniques, data protection and trend analysis.
Senior management/accountable managers	Shared responsibility, safety culture, resources, policy approval, performance monitoring and management of residual risk.
CAA inspectors	Oversight of fatigue management processes, review of evidence, interview techniques, fatigue-related findings, and assessment of SMS integration.

CAA Oversight Considerations

During certification, surveillance, inspections and audits, CAAs may consider whether the organization:

- Has a documented fatigue management policy and procedure proportionate to its scope of work.
- Has defined duty, rest, standby/on-call and overtime controls, or an equivalent risk-based process.
- Can demonstrate that fatigue is included in SMS hazard identification, risk assessment and safety assurance.
- Has a functioning non-punitive fatigue reporting process.
- Considers fatigue in occurrence investigations and root cause/contributing factor analysis.
- Provides fatigue management training to relevant personnel and management.
- Applies controls for special scenarios such as AOG, remote maintenance, night shift maintenance and travel across time zones.
- Uses fatigue-related data to monitor trends and improve controls.
- Maintains records sufficient to demonstrate effective implementation, not only procedure compliance.

Recommended Implementation Roadmap

Phase	Action	Expected output
1. Gap assessment	Review current procedures, rosters, reporting systems, SMS processes and training against this advisory.	Gap analysis and action plan.
2. Policy and procedures	Define fatigue policy, responsibilities, reporting process, risk assessment method and special scenario controls.	Approved fatigue management procedure.
3. Training and communication	Deliver targeted training and safety communication to management, planners, supervisors and maintenance personnel.	Training records and communication material.
4. Implementation	Apply controls in daily operations, including rosters, AOG planning, reporting and investigations.	Operational evidence and fatigue reports/actions.

5. Monitoring and improvement	Review indicators, audit results, occurrence trends and staff feedback; update controls as needed.	Management review outputs and continuous improvement actions.
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Appendix A: Sample Maintenance Fatigue Policy Statement

The organization recognizes fatigue as a hazard that can impair the ability of maintenance personnel to perform safety-related duties. The organization is committed to managing fatigue risks through appropriate duty planning, rest opportunities, reporting, training, risk assessment and continuous monitoring. Management, supervisors, planners and maintenance personnel share responsibility for managing fatigue. Personnel are encouraged to report fatigue hazards or fitness-for-duty concerns without fear of punishment, in accordance with the organization’s just culture and safety reporting policy.

Appendix B: Suggested Fatigue Report Data Fields

Field	Examples/Guidance
Reporter details	Name or confidential/anonymous option, department, role.
Date/time/location	Date and time of report, duty period, station, hangar, line/base/component shop.
Task/activity	Maintenance task, inspection, certification, troubleshooting, AOG, standby activation, planning/control activity.
Fatigue context	Sleep in previous 24/48 hours, time awake, consecutive duties, night/early duty, overtime, travel/commute, workload, environmental conditions.
Safety concern	Potential or actual effect on task performance, communication, handover, inspection, certification or decision-making.
Immediate action	Stopped task, escalated to supervisor, took break, reassigned task, additional inspection, deferred work.
Follow-up	Investigation outcome, corrective action, roster review, training/communication, procedure change.

Appendix C: Fatigue Risk Assessment Prompt for Maintenance Tasks

The following prompt may be used by supervisors, planners or safety personnel before assigning or continuing a safety-critical task under elevated fatigue risk conditions:

- What is the maintenance task and how safety-critical is it?
- How long has the assigned person been awake and on duty?
- How much sleep opportunity did the person have before duty?
- Is the task during the night, early morning, or following consecutive duties?
- Is there time pressure, environmental stress, high workload or interruption risk?
- Can the task be delayed without increasing operational risk?
- Is a rested competent person available?
- Is additional supervision or independent inspection required?
- What is the residual risk and who accepts it?
- How will the decision and controls be recorded?

Appendix D: CAA Oversight Checklist

Item	Oversight question	Evidence
Policy	Is fatigue recognized as a hazard and linked to safety policy/SMS?	Policy, exposition/manual, SMS records.
Responsibilities	Are responsibilities defined for management, planners, supervisors and personnel?	Procedure, job descriptions, training records.
Duty/rest controls	Are duty, rest, standby, overtime and travel considerations documented?	Rosters, time records, procedure.
Hazard identification	Are predictive, proactive and reactive methods used?	Risk registers, reports, surveys, investigations.
Risk assessment	Is fatigue risk assessed for critical tasks and special scenarios?	Risk assessments, AOG records, supervisor approvals.
Reporting	Can personnel report fatigue without fear of punishment?	Reporting system, safety communications, sample reports.
Training	Is fatigue training tailored and recurrent?	Syllabi, attendance, competency checks.
Assurance	Are indicators monitored and reviewed by management?	SPIs, audits, management review minutes.
Improvement	Are corrective actions effective and closed?	CAPA records, trend analysis, follow-up audits.

Appendix E: Example Maintenance Fatigue Hazards and Controls

Hazard	Potential consequence	Possible controls
Extended duty after AOG call-out	Incorrect troubleshooting, missed steps, certification error.	Rested replacement, task deferral, second inspection, supervisor approval, post-task review.
Consecutive night shifts on heavy maintenance	Inspection misses, poor handover, reduced vigilance.	Limit consecutive nights, planned breaks, enhanced lighting, independent inspection, fatigue survey.
Short rest after overtime	Cumulative sleep debt and reduced alertness next duty.	Minimum rest protection, overtime monitoring, roster adjustment.
Travel across time zones before maintenance task	Circadian disruption and reduced performance.	Recovery time, local acclimatization, avoid critical certification immediately after travel.
Low workload monitoring task at night	Micro-sleeps, missed indications.	Task rotation, breaks, peer checks, environment management.
High heat/humidity during line maintenance	Physical fatigue and decision errors.	Hydration, shade/cooling, work-rest cycles, supervision.

Appendix F: Acronyms

Acronym	Meaning
AMO	Approved Maintenance Organization
AOG	Aircraft on Ground
CAA	Civil Aviation Authority

CAMO	Continuing Airworthiness Management Organization
FRM	Fatigue Risk Management
FRMS	Fatigue Risk Management System
FSAG	Fatigue Safety Action Group
MID-RASP	Middle East Regional Aviation Safety Plan
MRO	Maintenance, Repair and Overhaul organization
RASG-MID	Regional Aviation Safety Group – Middle East
RSA	Regional Safety Advisory
SEIG	Safety Enhancement Implementation Group
SMS	Safety Management System
SPI	Safety Performance Indicator
WOCL	Window of Circadian Low