CIVIL AVIATION AUTHORITY

CIVIL AVIATION PUBLICATION

SMS-01

SAFETY MANAGEMENT SYSTEMS

FOR

AVIATION SERVICE PROVIDERS

Effective: 30th September 2021

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CIVIL AVIATION PUBLICATION (CAP)

Table of Contents – Safety Management Systems SMS-01

CIVIL AVIATION PUBLICATION (CAP)

GENERAL

Civil Aviation Publications (CAPs) are issued by the Civil Aviation Authority of Oman (DGCAR) from time to time to provide practical guidance or certainty in respect of the statutory requirements for aviation safety. CAPs contain information about standards, practices and procedures acceptable to the CAA. A CAP may be used, in accordance with the Civil Aviation Law (Royal Decree 76/2019) Article 7, and CAR-11 to demonstrate compliance with a statutory requirement.

PURPOSE

This CAP provides guidance on the key concepts and components for effective implementation of an SMS, as required under CAR-100. This CAP complements other guidance material issued by the CAA on safety management-related subjects.

APPLICABILITY

This CAP applies to all holders of an Oman Air Operator Certificate (AOC), CAR-145 Approved Maintenance Organisations, Aviation Training Organisations (ATOs) approved by the CAA that are exposed to safety risks during the provision of their services, the air navigation service provider in Oman, the operators of certified aerodromes in Oman, and the Aeronautical Meteorological Service Provider.

CANCELLATION

This CAP is current from the date of issue until otherwise cancelled or reviewed by the CAA.

EFFECTIVE DATE

This CAP is effective from 28th June 2021.

REFERENCES

- ICAO Annex 19.
- ICAO Safety Management Manual (Doc 9859).
- Oman Airworthiness Requirements CAR-145.
- CAR OPS-1 – Commercial Air Transport.
- See Appendix C for further sources of information.

DEFINITIONS AND TERMS USED

Accountable Executive (or manager). A single, identifiable person having responsibility for the effective and efficient performance of the service provider's SMS.

Contractor. An organisation holding a CAA approval and engaged by another organisation to perform work that is within the scope approved by CAA.

Defences. Specific mitigating actions, preventive controls or recovery measures put in place to prevent the realisation of a hazard or its escalation into an undesirable consequence.

Error. An action or inaction by an operational person that leads to deviations from organisational or the operational person's intentions or expectations.

Hazard. A condition or an object with the potential to cause or contribute to an aircraft incident or accident.

Risk mitigation. The process of incorporating defences or preventive controls to lower the severity and/or likelihood of a hazard's projected consequence.

Safety. The state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level.

Safety data. A defined set of facts or set of safety values collected from various aviation-related sources, which is used to maintain or improve safety.

Safety information. Safety data processed, organised or analysed in a given context so as to make it useful for safety management purposes.

Safety Management System. A systematic approach to managing safety, including the necessary organisational structures, accountability, responsibilities, policies and procedures.

Safety performance. A State or service provider´s safety achievement as defined by its safety performance targets and safety performance indicators.

Safety performance indicator. A data-based safety parameter used for monitoring and assessing safety performance.

Safety performance target. The service provider's planned or intended target for a safety performance indicator over a given period that aligns with the safety objectives.

Safety risk. The predicted probability and severity of the consequences or outcomes of a hazard.

Serious injury. An injury which is sustained by a person in an accident and which:

(a) requires hospitalisation for more than 48 hours, commencing within seven days from the date the injury was received; or
(b) results in a fracture of any bone (except simple fractures of fingers, toes or nose); or
(c) involves lacerations which cause severe haemorrhage, nerve, muscle or tendon damage; or
(d) involves injury to any internal organ; or
(e) involves second- or third-degree burns, or any burns affecting more than 5 per cent of the body surface; or
(f) involves verified exposure to infectious substances or injurious radiation.

State safety programme. An integrated set of regulations and activities aimed at improving safety.

Subcontractor. A third-party organisation that is engaged by a CAA-approved organisation to carry out the work under the responsibility of the CAA-approved organisation.

Safety Management Systems for Aviation Service Providers

1. INTRODUCTION

1.1. This CAP describes the safety outcomes and the key elements of a SMS. It is based around the SMS Framework recommended by ICAO.

1.2. ICAO Annex 19 – Safety Management defines SMS as ***"a systematic approach to managing safety, including the necessary organisational structures, accountability, responsibilities, policies and procedures"***. ICAO Doc 9859 – Safety Management Manual further elaborates that the SMS should assist the service provider to continuously improve safety through identifying hazards, collecting and analysing safety data and safety information and continuous assessment of safety risks. This will enable the service provider to proactively contain or mitigate risks before they result in aviation accidents and incidents.

1.3. Certain terms, definitions and concepts are subject to change, as these evolve in the context of ICAO's ongoing revision and review processes.

1.4. A successful SMS provides – amongst other things a systematic, explicit and comprehensive process for identifying hazards and the risks they bring, and for minimising those hazards. As with all management systems, it involves goal setting, planning, documentation and the measuring of performance goals.

1.5. The implementation of an SMS should consider interfaces with key stakeholders, industry partners and corporate activities such as finance, human factors and legal. The integration of human factors (HF) into the SMS should be a key objective of any SMS program.

1.6. The organisational culture and the way people go about their work will have a significant impact upon the success of the SMS. Indeed, it is unlikely that the SMS will achieve its full potential for mishap prevention without a full understanding and application of HF principles by the entire organisation's staff, supported by a positive safety culture.

1.7. A definition of terms used in this CAP may be found in ***Definitions and Terms*** (page 4).

2. INTEGRATING AN SMS INTO EXISTING SYSTEMS

2.1. **Introduction**

2.1.1. SMS goes beyond a traditional QMS by focussing on the safety, human and organisational aspects of an operation. Within an SMS, there is a distinct focus on operational safety, and the human element in the system. This underlines the importance of integrating HF through all parts of the SMS.

2.1.2. In civil aviation today, there are various control systems existing within an organisation. Examples of this include:

- International Organisation for Standardisation (ISO) 9000 system;
- QMS;

- HF and Error Management System;
- Fatigue Risk Management System (FRMS);
- Environment Management System;
- Occupational Health and Safety Management System; and
- Security Management System.

2.1.3. There may be organisational benefits in coordinating some/all of these systems. These include:

- Reducing resource duplication, and therefore, cost;
- Integration and processing of cross-functional safety related data; and
- Reducing potentially conflicting objectives and relationships.

2.1.4. Although the co-ordination and integration process may be a challenging task for many organisations, and could impact on the ability to successfully implement an SMS program in the short to medium term, an alternative would be to plan for the integration once the SMS is established within the organisation (a phased approach).

2.1.5. If there is a strategy to integrate some or all of these programs, then the SMS should provide the organisational overview of all the various organisational systems from the operational safety perspective.

2.2. Delivering an effective SMS organisational program

2.2.1. Key components and elements for delivering an effective SMS are outlined in the SMS Framework.

2.2.2. The SMS framework comprises four components and the associated elements as reflected in the table below. Details of each element are explained in subsequent paragraphs. To implement an SMS, an organisation needs to translate these components and elements into how it manages safety that commensurate with the size and complexity of its operations.

COMPONENT	ELEMENT
1. Safety policy and objectives	1.1 Management commitment
	1.2 Safety accountability and responsibilities
	1.3 Appointment of key safety personnel
	1.4 SMS implementation plan
	1.5 Third party interface
	1.6 Coordination of emergency response planning
	1.7 SMS documentation
2. Safety risk management	2.1 Hazard identification
	2.2 Safety risk assessment and mitigation
3. Safety assurance	3.1 Safety performance monitoring and measurement
	3.2 The management of change
	3.3 Continuous improvement of the SMS
	3.4 Internal safety investigations
4. Safety promotion	4.1 Training and education
	4.2 Safety communication

3. SMS FRAMEWORK – SAFETY POLICY, OBJECTIVES & PLANNING

3.1. Introduction

3.1.1. The Safety Policy and Objectives set out the commitment against high-level directions for safety management and safety performance improvement. This section covers these elements:

- Management commitment and responsibility;
- Safety accountabilities of managers;
- Appointment of key safety personnel;
- SMS implementation plan;
- Third-Party interface – contracted activities;
- Coordination of the emergency response plan; and
- Documentation.

3.2. Management Commitment and Responsibilities

3.2.1. Management's commitment to safety should be formally expressed in a safety policy statement, which captures the organisation's philosophy on safety management, and its key safety objectives. The safety policy, endorsed by the Accountable Executive and senior management, should minimally reflect management's commitment to:

(a) Continually improve safety performance;

(b) Provide necessary resources, such as financial, manpower and training, for safety management;

(c) Comply with applicable regulations and guidance;

(d) Prioritise safety as a primary responsibility of all personnel; and

(e) Promote and maintain a positive safety culture within the organisation.

3.2.2. Safety objectives should be established considering the organisation's safety policy, safety priorities and identified significant safety risks. The safety objectives would form the basis for the subsequent setting of safety performance indicators (SPIs) and safety performance targets (SPTs) which are further elaborated in subsequent paragraphs.

3.2.3. The organisation should clearly communicate the safety policy and objectives to all personnel, and regularly review them to ensure that they remain relevant and appropriate.

3.2.4. Senior management should develop an organisational structure that has the responsibility, authority and accountability assigned to it to ensure the SMS will function as planned. This would include an organisation chart that depicts the organisation structure inclusive of the SMS that establishes a clear line of communication from the Safety Manager (SM) directly to the CEO.

Safety Policy

3.2.5. Management commitment to safety needs to be clearly expressed in a statement of the organisation's safety policies.

3.2.6. A Safety Policy outlines what the organisation will do to achieve the desired safety outcomes. They serve as a reminder as to 'how we do business around here'.

3.2.7. Safety policy statements may take different forms but will typically include:

- The overall safety objective of the organisation;
- The commitment of senior management to the goal of ensuring that all aspects of the operation meet safety performance targets;
- Determination by the organisation to provide the resources necessary for the effective safety management;
- The organisation's policies concerning responsibility and accountability for safety at all levels of the organisation; and
- Management's explicit support of a 'just culture', as part of the overall safety culture of the organisation.

3.2.8. An SMS safety policy may refer to other programs, for instance: Occupational Health and Safety, QMS, environmental management systems, security management systems.

Just Culture

3.2.9. A 'just culture' provides clear boundaries about confidentiality, reporting requirements, and individual responsibilities in relation to the SMS as far as management and staff are concerned. However, in a 'just culture' policy, a clear distinction is required between what is acceptable behaviour and what is unacceptable, and that people are treated accordingly. 'Just culture' is a necessary evolution from the 'blame free' culture of the past.

Where it is necessary in the interests of safety to limit or curtail the exercise of a person's aviation privileges until it can be shown that the person is able and willing to exercise those privileges safely, such action does not constitute discipline or punishment.

The CAA's approach to a 'just culture', and the approach the CAA expects to see reflected in an organisation's safety management practices, is consistent with the safety management standards adopted by the International Civil Aviation Organization (ICAO), the European regulations (EASA) governing safety occurrence reporting and the US Federal Aviation Administration's (FAA) Compliance Philosophy.

Safety Objectives

3.2.10. The safety objectives should state an intended safety outcome. These objectives may be expressed in terms of short, medium and long-term safety objectives.

3.2.11. To be able to measure the effectiveness of operational safety objectives, they should be **S**pecific, **M**easurable, **A**chievable and **R**ealistic; and have a specified **T**imeframe (**SMART**) within which they are to be achieved.

3.2.12. The operator should have documented plans of action to achieve each specified safety objective, and these should ideally be included within the implementation plan.

3.3. Safety accountability and responsibilities

3.3.1. The service provider/organisation is to appoint an Accountable Executive to hold overall accountability for the implementation and maintenance of the SMS. Depending on the structure, size and complexity of the service provider, the Accountable Executive may be the chairperson of the board of directors, the chief executive, a member of the senior management, or the proprietor. The Accountable Executive should be responsible for the:

(a) Provision and allocation of adequate resources such as financial and manpower for the effective implementation of SMS;

(b) Promotion of a positive safety culture;

(c) Establishment and communication of the organisation's safety policy and safety objectives;

(d) Establishment, monitoring, review and improvement of safety performance; and

(e) Implementation and improvement of the SMS.

3.3.2. The roles, responsibilities and accountabilities of the positions outlined on the organisational chart should be explicit with respect to the SMS.

3.3.3. As the manager responsible for the SMS, the SM will need to work with the management team to meet the objectives of the SMS. The structure of the organisation needs to be documented so that everyone understands their role and responsibilities. The SM is responsible to the CEO, who is ultimately accountable for the operation of the SMS. When formalising the organisation structure, it is important to remember that the SM needs direct access to the CEO.

3.3.4. Further, the organisation should clearly define, document and communicate the accountability and responsibilities of the management and personnel (including relevant departmental and/or unit managers, and line managers) with respect to safety-related functions or duties. This could include being responsible for safety performance, ensuring appropriate mitigating measures and corrective actions are taken to address reported hazards and errors, as well as responding to accidents and incidents.

3.3.5. All management and supervisory positions in addition to the SM would be expected to show leadership and have included in their responsibilities/accountabilities a requirement to:

(a) Actively support and promote the SMS;

(b) Ensure that they and their staff comply with the SMS processes and procedures;

(c) Ensure resources are made available to achieve the outcomes of the SMS; and

(d) Continually monitor their area of responsibility, as outlined in the SMS Manual.

3.3.6. Where appropriate, the organisation should interface its SMS with other external organisation's SMS or relevant safety systems. For example, where products or services are provided or supported by an external organisation, such as a contractor or subcontractor, the organisation should ensure that the external organisation meets its safety requirements. Policies and procedures should be established to clearly define the safety accountability and authority flow between all the organisations.

3.4. Appointment of key safety personnel

3.4.1. Depending on the size of the organisation, the SM should possess operational management experience and an adequate technical background to understand the systems that support operations. Operational skills alone will not be sufficient. The SM should have a sound understanding of safety management principles, typically acquired through formal training and practical experience.

3.4.2. The organisation is to appoint a Safety Manager who is responsible for:

(a) Advising the Accountable Executive and line managers on safety management matters;

(b) Managing the implementation of the SMS and including;

(1) performing or facilitating hazard identification, and safety risk analysis;

(2) monitoring safety risk control and corrective actions and evaluating their results;

(3) providing periodic reports on the organisation's safety performance;

(4) maintaining aviation safety-related records and documentation;

(5) planning and facilitating personnel training related to aviation safety;

(6) monitoring safety concerns in the aviation industry and their perceived impact on the organisation's operations; and

(a) Coordinating and communicating with the CAA and other aviation authorities as necessary on issues relating to safety.

3.4.3. The Safety Manager may hold other concurrent appointments, provided there is no conflict of interest, and the Safety Manager should maintain a direct reporting line to the Accountable Executive to ensure independence of advice relating to the implementation and maintenance of a SMS.

3.4.4. An organisation should establish a senior management platform, chaired by the Accountable Executive and composed of senior managers responsible for functional and administrative areas. This platform is to provide strategic directions for safety policies and oversees the organisational safety performance, and it should:

(a) Monitor the effectiveness of the SMS and associated safety management processes;

(b) Assess safety performance against the organisation's safety policy and objectives;

(c) Ensure that any necessary safety risk control action is taken in a timely manner;

(d) Review the effectiveness of safety risk mitigation strategies; and

(e) Ensure that appropriate resources are allocated to achieve the desired safety performance.

3.4.5. To drive the SMS activities and implement safety strategies at the operational level, the organisation may establish safety action groups (SAGs) specific to functional units within the organisation. Each safety action group should be chaired by the functional manager and composed of other managers and/or front-line personnel, and the group should be reporting to the senior management platform. A safety action group should, in its functional area include the following:

(a) Oversee operational safety performance;

(b) Ensure that safety risk management activities, such as hazard identification, risk assessment and mitigation are carried out;

(c) Assess the impact of operational changes or new technologies to aviation safety;

(d) Coordinate and implement safety risk controls and corrective actions in a timely manner;

(e) Review the effectiveness of safety risk controls and corrective actions; and

(f) Coordinate safety promotion activities to raise awareness in safety matters.

3.4.6. The SM should be the catalyst to develop and mature the SMS over time, through engagement with the organisation's executive management at all levels and operational staff.

3.4.7. The SM is responsible for accomplishing tasks and functions of the SMS. The role and responsibilities of the SM are specified in the SMS Manual.

3.4.8. The SM needs to be 'independent' from the operational areas, and have the ability to report directly to the CEO. A formal reporting line direct to the CEO gives the SM the 'authority' to look across the organisation from the safety perspective. The SM may have staff to assist in this role.

3.4.9. Where possible, the SM should be assisted by safety representatives from each department or functional area.

Safety Responsibilities

3.4.10. The SM is not the sole person responsible for safety. Specific safety activities and functional or operational safety performance outcomes are the responsibility of the relevant operational or functional managers, and senior management should not hold the SM accountable for line managers' responsibilities.

The SM should monitor all cross-functional or departmental SMS activities to ensure their relevant integration. While the SM may be held accountable for the satisfactory administration and facilitation of the SMS itself, they should not be held accountable for the safety performance of the organisation — the CEO alone is accountable.

3.4.11. The SM is responsible for, but not limited to:

- Drafting the SMS Manual;
- Implementing, maintaining, reviewing and revision of the SMS;
- Regular evaluation, reviews and fine tuning of the safety programme;
- Providing safety advice to management and staff;
- Providing timely advice and assistance on safety matters to managers, staff and contractors at all levels;
- Communicating with Heads of Departments on safety related issues;
- Promoting safety awareness and a positive safety culture;
- Liaison with the CAA and the Oman Transport Safety Board (OTSB) on safety-related issues;
- Exchange of valuable lessons learned with other operators;

- Researching and sharing safety related information with other key safety personnel in the organisation;
- If delegated by the CEO, chairing the safety committee/Safety Review Board;
- Incident and accident investigations;
- Managing immunity-based reporting systems (confidential reports);
- Monitoring the progress of safety reports and ensuring that hazards are addressed in a timely manner;
- Maintaining an appropriate reporting system to identify hazards, which includes the ongoing identification and management of hazards;
- Overseeing the reduction of hazards to ensure that they are as low as reasonably practicable (ALARP);
- Maintaining safety documentation;
- Ensuring SMS induction and recurrent training are conducted in accordance with the SMS Manual;
- Identifying ongoing safety training requirements to support the SMS programme objectives;
- Overseeing the internal and external SMS audit programmes;
- Emergency response planning; and
- Maintaining the Emergency Response Plan (ERP). Qualifications

Qualifications

3.4.12. The SM's qualifications and attributes may include the following:

- Broad operational knowledge and experience in the functions of an aviation organisation (including engineering, cabin services, ground and flight operations);
- Sound knowledge of safety management principles and practices;
- Sound knowledge and understanding of HF;
- Good written and verbal communication skills;
- Well-developed interpersonal skills;
- Sound computer literacy; the ability to relate to all levels, both inside and outside the organisation;
- Organisational ability;
- Capable of working unsupervised;
- Good analytical skills;
- Leadership skills and an authoritative approach;
- Worthy of respect among peers and management;
- Instructional qualifications and experience e.g. a Certificate in Workplace Training and Assessment;
- Knowledge of documentation systems; and

- Good understanding of aviation operations.

Personal Traits

3.4.13. Ideally, the SM should possess qualities such as:

- Fairness;
- Assertiveness;
- Impartiality;
- Trustfulness;
- Integrity;
- Excellent communication skills; and
- Objective thinking.

3.4.14. The SM should be a person who is approachable, convincing, who remains composed in adverse situations and above all is tenacious. Successful safety culture change related to SMS implementation takes time and an ongoing commitment by the program manager.

3.4.15. If the SM lacks credibility, so will the SMS and the behaviour and attitude of staff will tend to be negative.

Training

3.4.16. The person selected as the SM will need to be familiar with most aspects of the organisation, its activities and personnel. These requirements may be met in-house or from external courses, however, much of the SM's knowledge will be acquired by self-education.

3.4.17. Areas where SM's may require formal training include:

- HF principles;
- Integration of HF into an SMS;
- Understanding the role of human performance in accident prevention and causation; familiarisation with different fleets, types of operations, routes, etc.;
- Development, implementation, operation and maintenance of an SMS;
- Accident and incident investigation;
- Crisis management and emergency response planning;
- Safety promotion;
- Communication skills;
- Computer skills such as word-processing, spreadsheets and database management; and
- Specialised training or familiarisation in, for example, Crew Resource Management (CRM), Threat and Error Management (TEM), Fatigue Risk Management Systems (FRMS), Line Operations Safety Audit (LOSA) and accident and incident investigation.

3.4.18. **Deputy SM**

3.4.18.1. Importantly, operators need to give due consideration to deputising the SM's role during periods of absence or depending on the size and complexity of the organisation.

3.4.19. **Safety Committee and Action Groups**

3.4.19.1. If the organisation is large and complex, then it is expected that there would be more than one group set up to support the SMS program objectives. Typically, this would be a high-level Safety Committee (Safety Review Board (SRB)) to oversee the SMS program, and one or more Safety Action Groups (SAGs) who take strategic direction from the Safety Committee. Smaller and less complex organisations may only need to establish a Safety Committee.

3.4.19.2. For the operational aspects of these groups, see the section of this CAP titled 'Safety Assurance' in Section 5.

3.4.20. **Safety Committee (Safety Review Board (SRB))**

3.4.20.1. A high-level Safety Committee or SRB would normally be necessary for functional or senior management involvement on safety policy, overall system implementation and safety performance review purposes. Membership and level of participation in the safety committee would depend on the size and structure of the organisation. The CEO, as the Accountable Manager, should chair (see note* following) this committee with representation from all relevant functional areas of the organisation.

3.4.20.2. A Safety Committee would typically consist of the Accountable Manager, the SM and other members of the senior management team. The objective of the Safety Committee is to provide a forum to discuss safety issues and the overall health and direction of the SMS. Terms of reference for the safety committee should be documented in the SMS manual. Roles of the Safety Committee may include:

(a) Making recommendations or decisions concerning safety policy and objectives;

(b) Defining safety performance indicators and setting safety performance targets for the organisation; reviewing safety performance and outcomes;

(c) Providing strategic directions to departmental SAGs – if established; and

(d) Directing and monitoring the initial SMS implementation process.

Note: Should the Accountable Manager choose to assign this task to an appropriate senior person, it should be clearly stated and substantiated in the SMS manual that they are performing the task on behalf of the Accountable Manager whose accountability for safety is not compromised and that the CEO remains accountable for all decisions of the Safety Committee/SRB.

3.4.20.3. The membership of the Safety Committee/SRB may, for example, comprise:

- CEO (chair);
- Head of Safety Department/Safety Manager (secretary).
- Key personnel required under the AOC; and/or
- Other specified senior managers as required.

3.4.21. **Safety Action Group**

3.4.21.1. Safety Action Groups are accountable to, and take strategic directions from, the Safety Committee. Managers and supervisors from a given functional area would be members of the SAG for that area. The functional head of that area should chair the SAG. The role of the SAGs would include:

- Overseeing operational safety within the functional area;
- Managing the area's hazard identification activities;
- Implementing mitigation or corrective actions relevant to the area;
- Assessing the impact of safety on operational changes and activating hazard analysis process as appropriate; maintenance and review of relevant performance indicators; and
- Managing safety training and promotion activities within the area.

3.4.21.2. Departmental SAGs may wish to appoint 'SMS Coordinators' to facilitate the department's SMS activities.

3.5. **SMS Implementation Plan**

3.5.1. The SMS implementation plan should detail all aspects of the development and implementation of the SMS. It is expected that the SMS program will mature over time through a process of continuous improvement.

3.5.2. The implementation plan should address all the areas covered in the SMS Manual, with particular attention being given to safety strategy, safety objectives, safety management processes and activities, resource implications, training, safety promotion and timelines.

3.5.3. The planning (or establishment) group may be able to build upon existing strengths by reviewing the organisation's current capabilities for safety management (including experience, knowledge, processes, procedures, resources, etc.). Shortcomings in safety management experience should be recognised and the resources to assist in development and implementation of the SMS are identified.

Many operational units may already have internal procedures in place for the investigation of incidents, hazard identification, safety monitoring, etc. These should be reviewed and perhaps modified for integration within the SMS. It is important that the organisation re-use as many existing procedures as practicable, as there is no need to replace known and effective procedures and processes. By building on such an experience base, the development of an SMS will be less disruptive.

During this review process, the planning group should also examine best industry practices for safety management by consulting with other organisations of similar size and mission.

3.5.4. An organisation should consider a phased approach to SMS implementation. A suggested approach is outlined in the table below.

ELEMENTS	PHASE 1	PHASE 2	PHASE 3
Safety Policy, Objectives and Planning			
Management commitment and responsibility	X		
Safety accountabilities of managers	X		
Appointment of key safety personnel	X		
SMS implementation plan	X – (including gap analysis)		
Third party interface		X	
Coordination of the Emergency Response Plan		X	
Documentation	X		
Safety Risk Management			
Hazard identification process		Proactive/predictive hazard identification	
Risk assessment and mitigation process	Reactive	Proactive and predictive	
Safety Assurance			
Safety performance monitoring and measurement	Reactive – incident and accident investigation		
Internal safety investigation	X		
The management of change			X
Continuous improvement of the safety system			X
Safety Promotion			
Training and education	Key personnel	All safety critical personnel	All safety critical personnel
Safety promotion and communication		X	X

Gap Analysis and Project Plan

3.5.5. Organisations would need to conduct a gap analysis of their system(s) to determine which components and elements of a safety management system are currently in place, and which components or elements should be added or modified to meet SMS as well as regulatory requirements. The review involves comparing the SMS components and elements against the existing systems in the organisation.

3.5.6. A checklist may be used to account for each component and their respective sub-elements. The checklist can provide for a 'Yes' and 'No' response, in terms of the compliance of the existing system, to the SMS requirements. Remarks for partial compliance or deviations should be made as well as actions required in order to meet the criteria. There should be a column for annotating existing organisation documentation where the requirement is addressed. (See Appendix B – SMS Checklist)

3.5.7. Once the gap analysis is complete and fully documented, the items identified as missing or deficient will form the basis of the SMS implementation plan. Organisations may format their implementation plan to suit their individual needs.

3.6. Third Party Interfaces – Contracted Activities

3.6.1. The provision of services supporting flight operations often involves third party interfaces (service providers, contractors, suppliers) in such areas as refuelling; catering and other aircraft ground services; aircraft, aircraft maintenance and overhaul; runway and taxiway construction and repair; crew training; flight planning, flight dispatch and flight following.

3.6.2. Whether a large corporate contractor or small business, the contracting authority (e.g. an airline) holds overall responsibility for the safety of services provided by the contractor. The contract or service level agreement (SLA) should specify the safety standards to be met. The contracting authority then has the responsibility for ensuring that the contractor complies with the safety standards prescribed in the contract.

3.6.3. A SMS should ensure that the level of safety of an organisation is not eroded by the inputs, services and supplies provided by external organisations.

3.6.4. The operator should consider the third party's previous safety record and any regulatory breaches. In addition, the operator should ensure that the third party understands the operator's SMS and their responsibilities relating to it. These factors should be given equal weight with other considerations like price, quality and timely delivery.

3.6.5. As a general guideline, a third-party contract should include the following as a minimum standard:

- any agreement for the provision of services should be supported by a written contract prior to services commencing;
- all third-party providers should hold the appropriate qualifications/credentials or approvals for the work being outsourced;
- all third parties should understand the operator's SMS, and their own responsibilities within the SMS program. The AOC Holder must have a demonstrable process to assure themselves that the third party is aware of, and meeting these requirements;
- all third-party organisations should be able to demonstrate their ability to provide trained and competent staff (training could be provided by the AOC holder). Where practicable, this training should include relevant Human Factors training and assessment as outlined in Appendix B;
- all written service level agreements should contain a schedule of oversight to monitor the third party's performance on a regular basis;
- all agreements should contain details on how any noted safety hazards and deficiencies will be addressed and the time frame for these actions (risk management process as outlined in this CAP); and
- where a service being provided is conducted under a licence or certificate approved by the CAA, the written agreement should contain a statement requiring the third party to advise the contracting organisation of any regulatory action undertaken by the CAA that may impact on the third party's ability to provide the required services.

3.7. Co-ordination of the Emergency Response Plan

3.7.1. An ERP is an integral part of the SMS, and is activated in the event of a major occurrence. The ERP is designed to ensure the following is in place prior to an adverse event occurring:

- orderly and efficient transition from normal to emergency operations;
- delegation of emergency authority;
- assignment of emergency responsibilities;

- authorisation by key personnel for actions contained in the plan; co-ordination of efforts to cope with the emergency;
- safe continuation of operations or return to normal operations as soon as possible;
- planned and co-ordinated action to ensure the risks attributable to a major safety event can be managed and minimised.

3.7.2. The ERP could be documented in a separate manual or incorporated into the organisation's SMS Manual.

3.7.3. The minimum elements to be included in an ERP are as follows:

- purpose of the ERP;
- activation of the organisational ERP;
- external agency interface (for example, aerodrome ERP, ATSB, CAA, coroner);
- passenger and crew welfare;
- casualty and next-of-kin co-ordination;
- accident investigation;
- organisation ERP response – accident site;
- preservation of evidence;
- media relations;
- claims and insurance procedures;
- aircraft wreckage removal; and
- emergency response training.

3.7.4. The ERP should be regularly tested through exercises and reviewed to maintain its relevance.

3.8. Documentation – SMS Manual

3.8.1. The component elements of the SMS manual should incorporate the requirements covered throughout this CAP. It is an important management function to provide direction and guidance to managers and staff in an organisation on how the organisation intends to conduct its business based on safety management principles.

3.8.2. Clear documentation and communication of safety policies, safety management processes and methodologies will help organisational personnel, partner organisations and the CAA in understanding how the organisation's SMS functions, and how the safety policy and objectives will be met.

3.8.3. The primary function of the safety management documentation is to provide management with the ability to effectively communicate the organisation's approach to safety to the whole organisation. The following components and elements need to be documented:

- Safety policy, objectives and planning:
  - management commitment and responsibility;
  - safety accountabilities of managers;

- appointment of key safety personnel;
- SMS implementation plan;
- third-party interfaces
- contracted activities;
- coordination of the emergency response plan; and
- documentation.

- Safety risk management:
  - hazard identification processes; and
  - risk assessment and mitigation processes.
- Safety assurance:
  - safety performance monitoring and measurement;
  - internal safety investigations;
  - the management of change; and
  - continuous improvement of the safety system.
- Safety training and promotion:
  - training and education; and
  - safety promotion.

3.8.4. The documentation should be written so that it reflects the intent and processes of the SMS. Thus, a change to the SMS will require an update of the SMS Manual.

3.8.5. To facilitate easy comprehension and application, the content of the SMS Manual should be concisely written.

3.8.6. Any information that changes regularly should be put into annexes/appendices. This includes, for example, names of personnel assigned specific safety responsibilities.

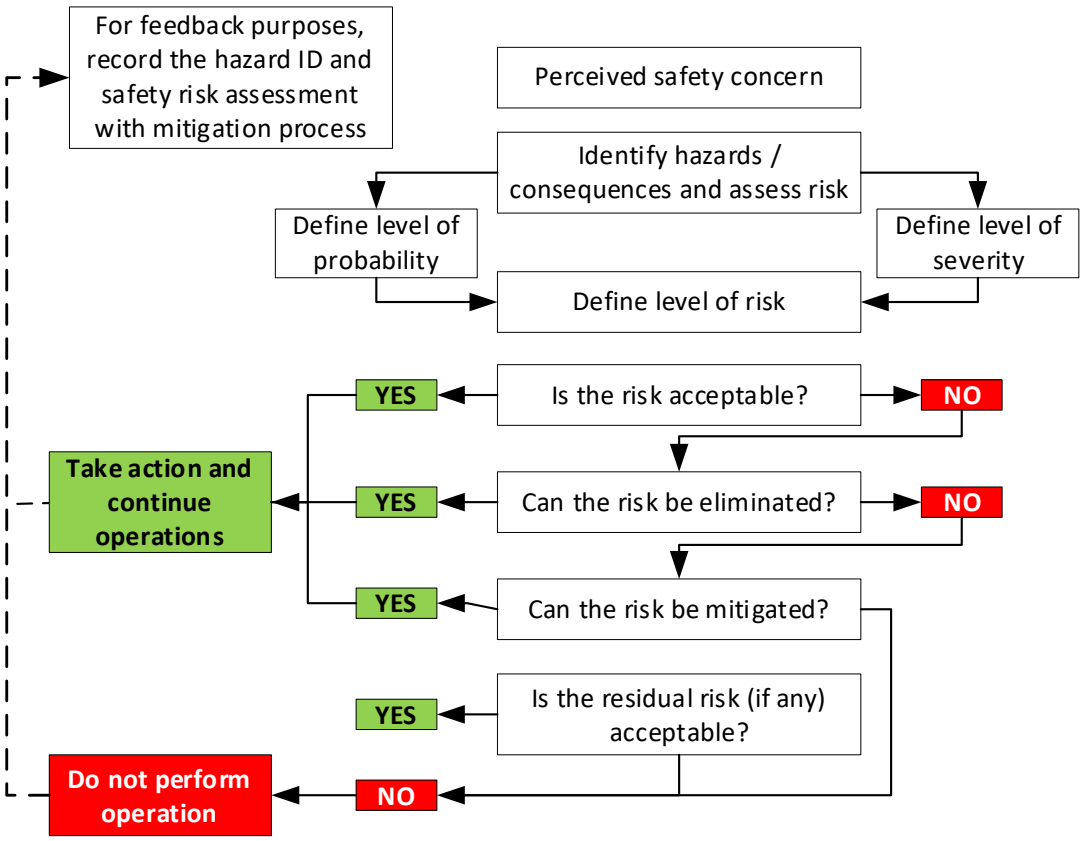
3.8.7. The amendment and distribution of SMS documentation needs to be controlled.

3.8.8. The CAA will provide a web-based Manual Authoring and Assessment Tool to assist organisations in the authoring of their SMS Manual

4. SAFETY RISK MANAGEMENT

4.1. Introduction

4.1.1. An organisation is to establish a safety risk management process which includes systematically identifying safety hazards, conducting of safety risk assessment and, if necessary, subsequent undertaking of remedial actions or mitigation measures. The following is an example of a safety risk management flowchart.



4.1.2. The process of risk management involves establishing an appropriate infrastructure and culture and applying a logical and systematic method of establishing the context, identifying, analysing, evaluating, treating, monitoring and communicating risks associated with any activity, function or process in a way that will enable organisations to minimise losses and maximise gains.

4.1.3. Risk management can be applied at many levels in an organisation. It can be applied at the strategic level and operational levels.

4.1.4. In very broad terms, the objective of risk management is to eliminate risk where practical or reduce the risk (probability/consequence) to acceptable levels, and to manage the remaining risk so as to avoid or mitigate any possible undesirable outcome of the particular activity. It is therefore integral to the development and application of an effective SMS.

4.1.5. Organisations pursuing a pro-active strategy for safety risk management believe that the risk of accidents or incidents can be minimised by identifying vulnerabilities and by taking the necessary actions to reduce the risk of adverse consequences arising from them.

4.1.6. Generic guidance provided in this CAP for managing operational risk and its integration into an SMS is essentially based upon internationally accepted ISO standards.

4.1.7. The specific design, integration and implementation of the safety risk management system will be influenced by, and dependent on, the requirements of the individual operator, its processes, policies, practices and SMS.

Risk criteria and the concept of 'ALARP'

4.1.8. Where risk is concerned, there is no such thing as absolute safety. Risk management systems are often premised on the concept of ALARP ***(As Low as Reasonably Practicable).*** In doing so, there is an acceptance that not all risk can or should be eliminated. There are practicable limits to which the aviation industry is able to go and the extent to which the industry and the community will pay to reduce adverse risks.

4.1.9. The principle of managing risk to a level that is ALARP is as follows:

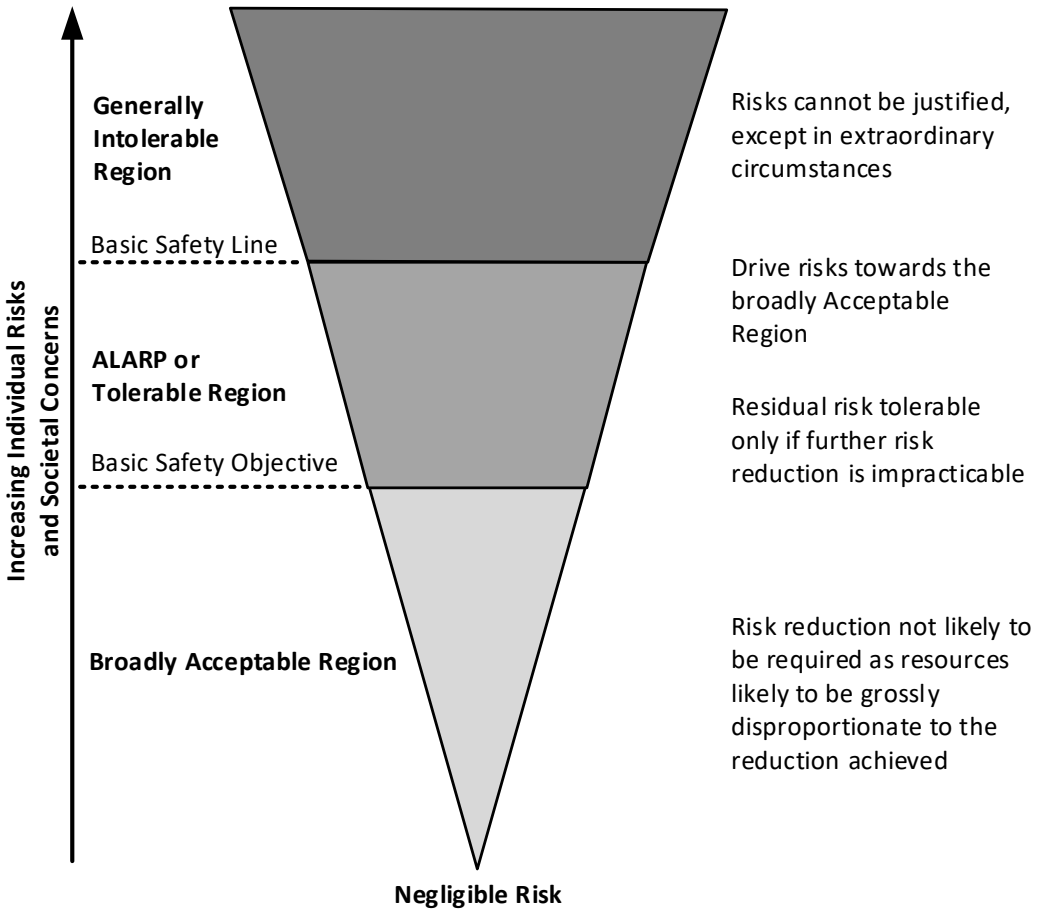
(a) There is an upper level of risk that is deemed to be intolerable. If a risk is found to be intolerable, risk reduction measures are essential, regardless of cost;

(b) There is a lower level of risk that is deemed to be broadly acceptable. At this risk level (and below), maintain current systems and monitor and review the risk. Further risk reduction may be made, but only if the cost is insignificant; and

(c) The ALARP region lies between the upper and lower levels of risk. If risk falls into this region, it should be reduced as much as is reasonably practicable.

4.1.10. In the ALARP region, risk reduction measures should be identified and evaluated in terms of cost and possible risk benefit. Any risk falling within the ALARP range should be assessed and reduced unless the cost of reducing the risk is grossly disproportionate to the benefit gained. This comparison may be a quantitative one, or based on qualitative arguments.

4.1.11. The ALARP principle is illustrated below.



As Low as Reasonably Practicable (ALARP)

4.1.12. The risk can only be said to be ALARP when it can be demonstrated that all justifiable risk reduction measures have been considered and the remaining mitigation strategies cannot be justified.

4.1.13. The ALARP principle operates in an environment of continuous improvement. Both the risks and the methods of control change and evolve over time and consequently require a continual reassessment as to which risk, and their respective treatments, are reasonable to sustain and which are not.

4.2. Hazard Identification Processes

4.2.1. Hazards can combine in unforeseeable ways, so that even apparently trivial hazards can result in undesirable outcomes which may have catastrophic results.

4.2.2. Consequently, the starting point for the whole safety risk management process should be establishment of the context and hazard identification. A systematic and comprehensive hazard identification process is critical, because hazards not identified at this stage may be excluded from further risk analysis and treatment.

4.2.3. Hazards can be identified from a range of sources including, but not limited to:

(a) brain-storming using experienced operational personnel;

(b) development of risk scenarios;

(c) trend analysis;

(d) feedback from training;

(e) flight data analysis programs;

(f) safety surveys and operational oversight safety audits;

(g) monitoring of normal operations;

(h) state investigation of accidents and serious incidents;

(i) information exchange systems (similar operators, regulators, etc.).

(j) design factors, such as equipment and task design;

(k) procedures and operating practices, such as documentation and checklists;

(l) communications, such as language proficiency and terminology;

(m) organisational factors, such as company policies for recruitment, training, remuneration and allocation of resources;

(n) operational environment factors, such as ambient noise and vibration, temperature, lighting, protective equipment and clothing;

(o) human factors, such as medical conditions, human performance limitations, and human-machine interface;

(p) regulatory compliance factors, such as the applicability of regulations and the certification of equipment, personnel and procedures; and

(q) organisational or safety systems interfaces.

Note: Hazards should not be confused with outcomes. For example, a runway incursion is an outcome, not a hazard. On the other hand, "unclear aerodrome signage" is a hazard

that could lead to an outcome of runway incursion, which could result in adverse consequences.

4.2.4. An organisation shall establish an Internal Reporting System (IRS) which over time, the 'database' of reported hazards enables the organisation to:

(a) identify 'hot spots' that need particular attention; and

(b) conduct trend analysis which can provide the basis for improvement of hazard identification.

Hazard and Occurrence Reporting

4.2.5. An organisation should develop and maintain processes to identify hazards that could affect aviation safety. This may be done through analysis of existing processes or various safety data and information sources such as mandatory reports, voluntary and confidential safety reports, audits and investigations.

4.2.6. Where appropriate and relevant, an organisation should implement policies, processes or initiatives that encourage the contribution, reporting or sharing of safety data and information from its personnel and relevant stakeholders, for hazards identification.

4.2.7. Every event is an opportunity to learn valuable safety lessons. The lessons will only be understood, however, if the event is analysed so that all employees, including management, understand not only what happened, but also why it happened. This involves looking beyond the event and investigating the contributing factors, the organisation and HF within the organisation that played a role in the event.

4.2.8. To enable analysis and organisational learning, the organisation should maintain procedures for the internal and external reporting and recording of incidents, hazards and other safety-related issues. The collection of timely, appropriate and accurate data will allow the organisation to react to information received and apply the necessary corrective action to prevent a recurrence of the event.

Statutory Reporting Requirements

4.2.9. Organisations are required to meet statutory reporting requirements under CAR-13. Reportable matters are categorised as Mandatory Occurrence Reports (MOR) and Voluntary Occurrence Reports (VOR).

4.2.10. MOR and VOR are required to be reported to the OTSB. MOR and VOR are events relating to an organisation's operations, and therefore need to be included in the organisation's internal reporting system.

4.2.11. Reportable Matters can be entered into the organisation's Internal Reporting System (IRS) database along with any other matters reported through the company's IRS (for example, hazards).

Key Elements – Internal Reporting System

4.2.12. An IRS is a method of gathering valuable safety information from the people who are probably aware of a range of hazards in an organisation – the staff.

4.2.13. An organisation's IRS should encompass the following fundamental elements:

(a) procedures for reporting occurrences (including MOR and VOR), hazards, or safety concerns;

(b) methods for the collection, storage and distribution of data (hazard register or log);

(c) procedures for analysing data, safety reports and any other safety related information;

(d) documentation of corrective action and risk reduction strategies;

(e) determination of the effectiveness of corrective action; and

(f) ongoing monitoring and review.

4.2.14. The IRS should be accessible by all operational safety critical personnel and be user-friendly.

4.3. Safety Risk Assessment and Mitigation

4.3.1. An organisation should develop a safety risk assessment model to determine the safety risks associated with identified hazards.

4.3.2. A typical safety risk assessment model combines the likelihood and severity assessments of an identified hazard to produce a safety risk index score. The following four Tables show an example of the risk assessment matrices that may be used to determine the overall safety risk. An organisation may customise the sample model or develop its own safety risk assessment model that suits its own context.

Classification of Safety Risk Likelihood

Likelihood	Meaning	Value
Frequent	Likely to occur many times (has occurred frequently)	5
Occasional	Likely to occur sometimes (has occurred infrequently)	4
Remote	Unlikely to occur, but possible (has occurred rarely)	3
Improbable	Very unlikely to occur (not known to have occurred)	2
Extremely improbable	Almost inconceivable that the event will occur	1

Classification of Safety Risk Severity

Severity	Meaning	Value
Catastrophic	Results in loss of life or destruction of equipment	A
Major	Results in serious injury to persons or major equipment damage	B
Moderate	Results in injury to persons or failure of significant operational processes or systems	C
Minor	Affects normal operating procedures or performance	D
Negligible	No significant impact to operational safety	E

4.3.3. Safety Risk Management is a formal process that is used to:

(a) identify hazards associated with an organisation's operations;

(b) analyse and assess the risks associated with those hazards;

(c) implement controls, to prevent future accidents, incidents or occurrences.

4.3.4. Based on the risk assessment, the organisation should take appropriate mitigation measures to eliminate or reduce the level of risks associated with hazards to an acceptable level. Typical risk mitigation measures include:

(a) cancelling the operation or activity because the risks exceed the benefits of continuing;

(b) reducing the frequency of the operation or activity; and

(c) acting to reduce likelihood/ severity of the risk(s) by enhancing existing defences or introducing new defences.

4.3.5. The main elements of the risk management process, as illustrated in the following Figure:

(a) ***Communicate and consult***
Communicate and consult with internal and external stakeholders as appropriate at each stage of the risk management process and concerning the process as a whole.

(b) ***Establish the context***
Establish the external, internal and risk management context in which the rest of the process will take place. Criteria against which risk will be evaluated should be established and the structure of the analysis defined.

(c) ***Identify risks***
Identify where, when, why and how events could prevent, degrade, and/or delay the achievement of safety objectives. Sometimes referred to as a Hazard Identification process, this encompasses a number of methodologies in identifying potential threats and past failures in order to determine the extent of the risks associated. Part of this process may include the establishment of a hazard log/register to ensure that hazards are tracked and treated as part of a formal process of prioritisation, documentation and assessment.

(d) ***Analyse risks***
Determine consequences and likelihood of the event and therefore the level of risk. Identify and evaluate existing controls (measures in place that control the hazard or reduce the likelihood of occurrence or consequence). This analysis should consider the range of potential consequences (both commercial and operational) and how these could occur. The determination may be the result of employing either qualitative, quantitative analysis techniques, or a combination of the two (semi-quantitative).

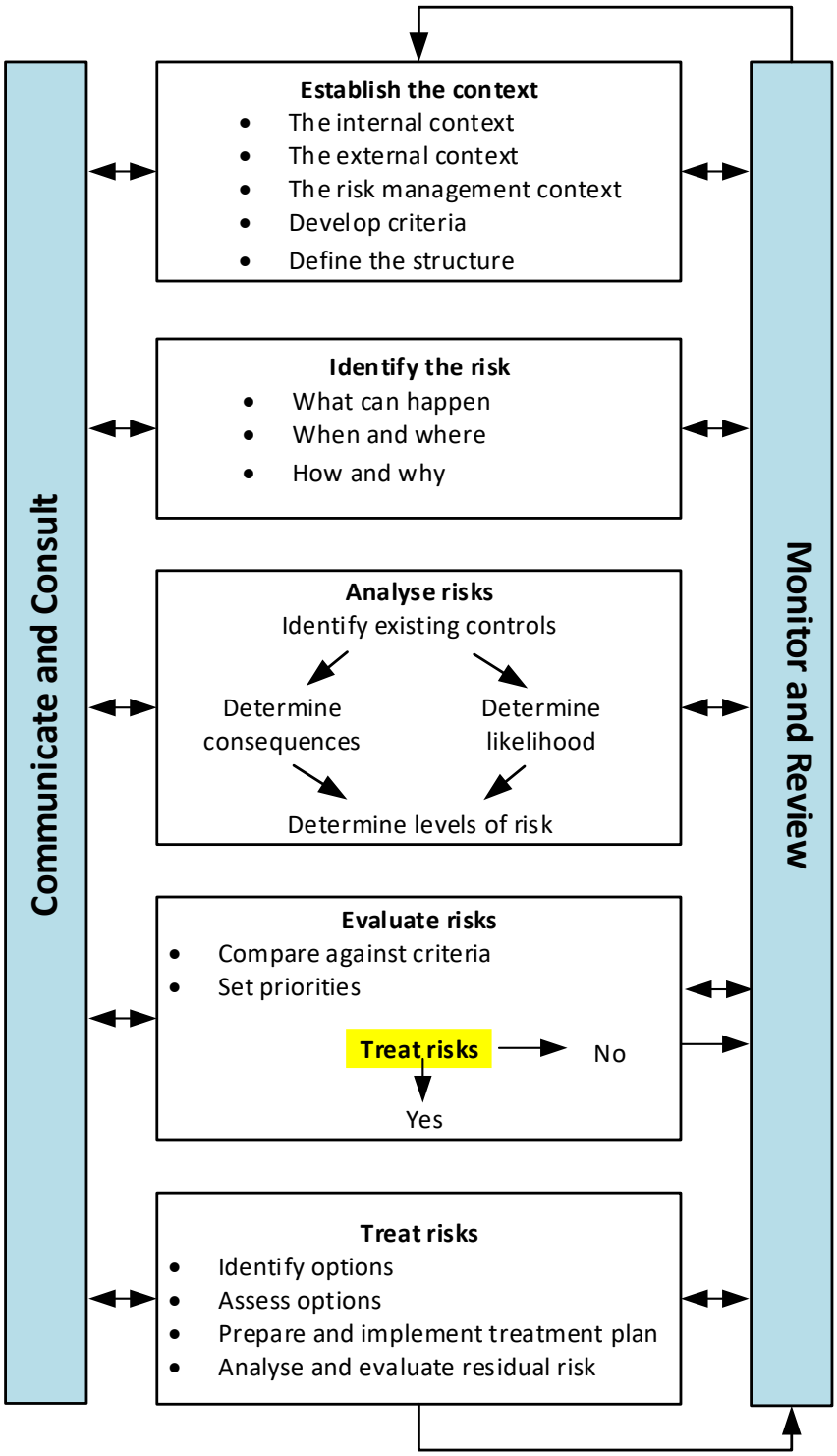
(e) ***Evaluate risks***
Compare estimated levels of risk against the pre-established criteria of acceptability and consider the balance between potential benefits and adverse outcomes. This enables decisions to be made about the extent and nature of treatments required and about priorities.

(f) ***Treat/Mitigate risks***
Develop and implement specific cost-effective strategies and action plans for increasing potential benefits and reducing potential costs and losses.

(g) ***Monitor and review***
It is necessary to monitor the effectiveness of all steps of the risk management process. This is important for continuous improvement. Risks and the

effectiveness of treatment measures need to be monitored to ensure changing circumstances do not alter priorities.

Risk management process – Overview



4.3.6. A consistent and systematic approach, such as developing a hazard register to record identified hazards and how they are addressed, should be implemented to document the process of safety risk assessment and mitigation.

Risk Tolerable Matrix

Risk Probability	Risk Severity				
	Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent (5)	5A	5B	5C	5D	5E
Occasional (4)	4A	4B	4C	4D	4E
Remote (3)	3A	3B	3C	3D	3E
Improbable (2)	2A	2B	2C	2D	2E
Extremely Improbable (1)	1A	1B	1C	1D	1E

Risk Tolerability Notes

Tolerability	Explanation
Unacceptable	The risk is unacceptable and operations should not take place until sufficient major risk mitigating measures have been implemented to reduce risk to an acceptable level.
Review	The risk is of concern and risk mitigating measures should be put in place to reduce the level of risk to as low as reasonably practicable. Where further risk reduction / mitigation is not practicable or viable, the risk may be accepted, provided endorsement is given by management.
Acceptable	The risk is considered acceptable.

5. SAFETY ASSURANCE

5.1. Introduction

5.1.1. Safety assurance refers to processes and activities that an organisation takes to determine whether its SMS is operating according to its expectations or specifications.

5.1.2. Safety assurance within the organisation should be monitored and reviewed by a range of formal safety review processes, initiated through senior management and the Safety Department/Safety Manager. This oversight can be used to confirm the effective functioning of the SMS as documented.

Systems to Achieve Safety Oversight

5.1.3. The following elements are desirable:

(a) a system for analysing flight recorder data for the purpose of monitoring flight operations and for detecting unreported safety events[1];

[1] Note: For all aeroplane operations above 27,000 kg Maximum Certified Take-Off Mass operators shall establish and maintain a Flight Data Analysis Program (FDAP). The flight data analysis program should contain adequate safeguards to protect the source(s) of data, and ensure no punitive action is taken against a person who reports data.

(b) an organisation-wide system for the capture of written safety event/issue reports;

(c) a planned and comprehensive safety audit review system which has the flexibility to focus on specific safety concerns as they arise;

(d) a published system for the conduct of internal safety investigations, the implementation of remedial actions, and the communication of such information;

(e) systems for effective use of safety data for performance analysis and for monitoring organisational change as part of the risk management process;

(f) arrangements for ongoing safety promotion based on the measured internal safety performance and assimilation of experience of other operations;

(g) periodic review of the continued effectiveness of the safety management system by an internal, independent body; and line managers monitoring work in progress in all safety critical activities to confirm compliance with all regulatory requirements, organisational standards and local procedures.

5.2. Safety performance monitoring and measurement

5.2.1. An organisation should perform internal audits to ensure regulatory compliance and proper implementation of its SMS and safety-related operations and processes to meet its desired level of safety performance.

5.2.2. In addition, an organisation should establish lagging and leading SPIs relevant to its operations to measure and monitor its safety performance, and validate the effectiveness of its safety risk control measures. Where appropriate, safety performance targets (SPTs) and safety triggers should also be set for these SPIs. An organisation should be able to demonstrate how the SPIs together with SPTs and safety triggers support the organisation in achieving its safety objectives and management's decision-making. This could include developing new safety risk control measures to address deteriorating safety performance, or initiatives to achieve better safety performance.

5.2.3. ***Lagging SPIs*** refer to indicators that measure events that have occurred and are "outcome-based", e.g. number of wildlife strikes, or rate of runway incursion.

5.2.4. ***Leading SPIs*** refer to indicators that measure processes and inputs implemented to improve or maintain safety and are "activity- or process-based", e.g. number of inspections conducted, or number of recurrent training conducted.

5.2.5. ***Safety performance targets (SPTs)*** are desired achievements that the organisation sets with respect to its SPIs. An SPT may be set based on a reasonable level of safety improvement, e.g. 5% improvement from past 12-months average, or to achieve a certain level of safety performance, (e.g. not more than 3 hours of unplanned downtime, or more than 50% of staff trained in safety risk assessment). For certain SPIs, it may also not be appropriate to set SPTs due to the possibility of undesirable outcomes, e.g. setting a target number of safety reports.

5.2.6. ***Safety triggers*** are established levels or criteria values that initiate or trigger an organisation to evaluate or take safety actions to address its safety performance. Such triggers are usually set based on out-of-limits or threshold figures which if exceeded, would be deemed as unacceptable safety performance.

5.2.7. Safety management requires feedback on safety performance to complete the safety management cycle. Through feedback, system performance can be evaluated and any necessary changes effected. In addition, all stakeholders require an indication of the level of safety within an organisation for various reasons, for example:

(a) staff may need confidence in their organisation's ability to provide a safe working environment;

(b) line management requires feedback on safety performance to assist in the allocation of resources between the often-conflicting goals of production and safety;

(c) passengers are concerned with their own personal safety;

(d) senior management seeks to protect the corporate image (and market share); and

(e) shareholders wish to protect their investment.

5.2.8. The size and complexity of the organisation will determine the best methods for establishing and maintaining an effective safety performance monitoring program. Organisations providing adequate safety oversight employ some or all of the following methods:

(a) by establishing an effective hazard and occurrence reporting system

(b) their front-line supervisors maintain vigilance (from a safety perspective) by monitoring day-to-day activities;

(c) they regularly conduct inspections (formal or informal) of day-to-day activities in all safety-critical areas;

(d) they sample employees' views on safety (from both a general and a specific point of view) through safety surveys;

(e) they systematically review and follow up on all reports of identified safety issues;

(f) they systematically capture data which reflect actual day to-day performance (using programs such as Flight Data Analysis (FDA), LOSA and Normal Operations Safety Survey (NOSS));

(g) they conduct macro-analyses of safety performance (safety studies);

(h) they follow a regular operational audit program (including both internally and externally conducted safety audits); and

(i) they communicate safety results to all affected personnel.

5.3. Internal Safety Investigation

5.3.1. For every accident or serious incident, there will likely be hundreds of minor events or near-misses, many of which have the potential to become an accident. It is important that all reported events/hazards be reviewed and a decision taken on which ones should be investigated, and how thoroughly.

5.3.2. The Organisational Safety Policy/SMS Protocols would need to state that the purpose of internal investigations is to find systemic causes and implement corrective actions, NOT to apportion blame to individuals. Where a 'Just Culture' policy is in place, the Policy and Protocols for internal investigations should clearly reference such policy.

Investigation Management

5.3.3. Where the ATSB investigates an organisation event, the SM, or delegate, would act as the organisation's point of contact/coordinator for the investigation. This way the SM will be kept informed as the investigation progresses.

5.3.4. Resources are normally limited, thus the effort expended should be proportional to the perceived benefit in terms of potential for identifying systemic hazards and risks to the organisation.

5.3.5. The accountability for the management of internal safety investigations should be documented in the organisation's SMS specifically to determine: • the scope of the investigation;

(a) the composition of the investigation team including specialist assistance if required;

(b) that the investigation outcomes are recorded for follow-up trend analysis; and

(c) that there is a timeframe for completion.

5.3.6. The accountable person in charge of the investigation should have the authority to:

(a) interview any manager or staff member; and

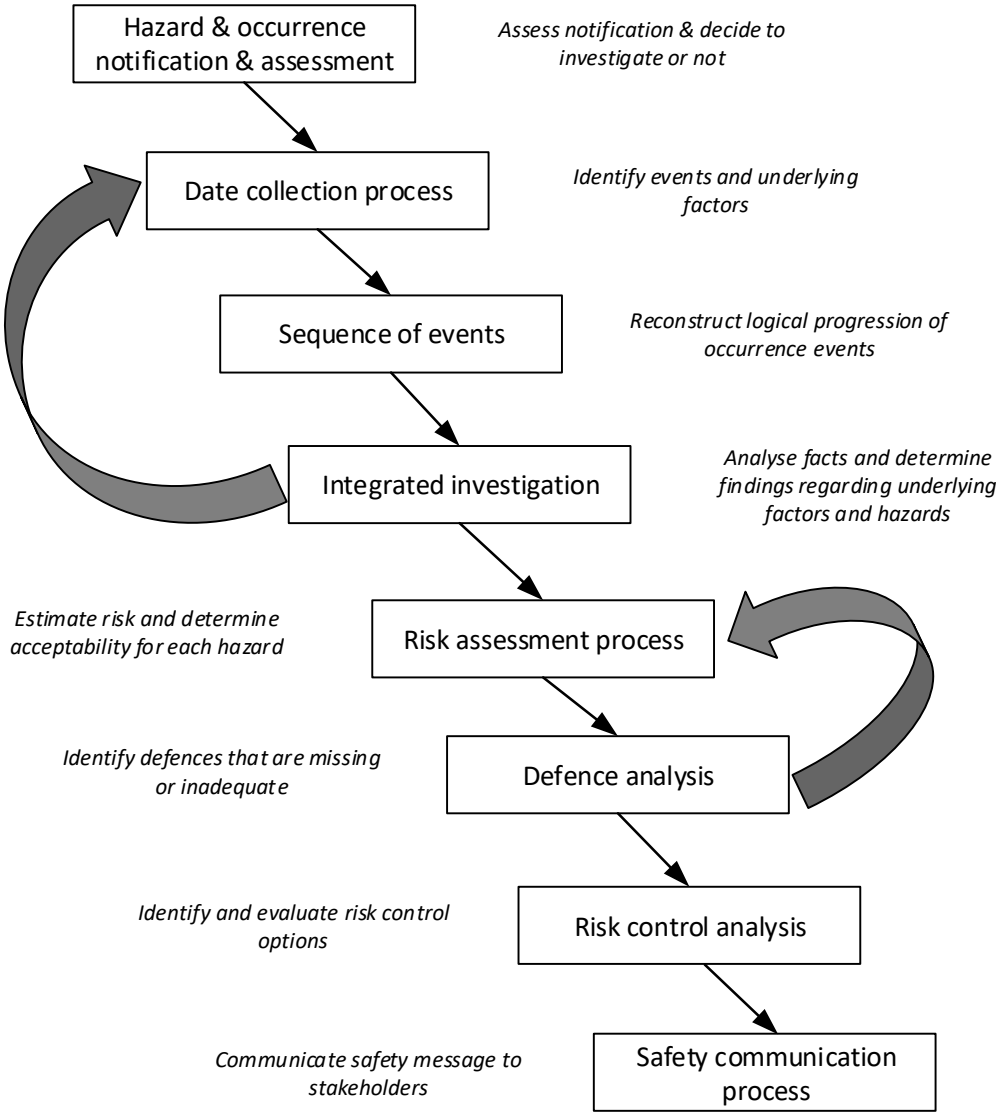
(b) access any company information source.

Scope of Safety Investigations

5.3.7. The extent of the investigation will depend on the actual and potential consequences of the event or hazard. This can be determined through an initial risk assessment. Reports that demonstrate a high potential should be investigated in greater depth than those with low potential.

5.3.8. The investigative process should be comprehensive and should attempt to address the factors that contributed to the event, rather than simply focusing on the event itself – the active failure. Active failures are the actions that took place immediately prior to the event and have a direct impact on the safety of the system because of the immediacy of their adverse effects. They are not, however, the root causes of the event; applying corrective actions to these issues may not address the real cause of the problem. A more detailed analysis is required to establish the organisational factors that contributed to the event.

Internal Safety Investigation Process



Integrated Safety Management Methodology

5.4. Change Management

5.4.1. Changes within an organisation can result in the creation of hazards which can impact on safety. In the main, changes are made to meet business demands, and organisations need the flexibility to meet those requirements. However, whilst the changes need to be made effectively and efficiently, the main focus needs to be on implementing the changes safely.

5.4.2. Changes such as organisational restructuring or the introduction of new procedures or new equipment may affect existing safety risk controls, or introduce new hazards into the operating environment. To manage these changes and minimise any adverse impact they may have on aviation safety, an organisation is to establish a change management process. This process should include or incorporate processes for:

(a) identification of the types of event or triggers that necessitates a formal change process;

(b) assessment of who and what will be affected by the change;

(c) hazards identification and risk assessment (HIRA) arising from the changes; and

(d) development and proper implementation of an action plan to address the changes.

5.4.3. The organisation should identify the changes likely to occur in the business which would have a noticeable impact on:

(a) resources – material and human;

(b) management direction – processes, procedures, training; and

(c) management control.

5.4.4. Change may create the potential for adverse safety outcomes. Typical areas that would require the application of change management procedures include:

(a) new schedule(s);

(b) new port(s);

(c) new type(s) of operation;

(d) addition of a new aircraft type;

(e) addition of extra aircraft of the same or similar type;

(f) introduction of new equipment and/or operational procedures;

(g) change in key personnel; and

(h) restructure of operational department(s).

5.4.5. The operator's SMS documentation should identify those changes that necessitate formal risk management processes, including HF issues. Also refer to the Integration of Human Factors into SMS in Appendix B.

5.5. Continuous improvement of SMS

5.5.1. A organisation should also implement processes to continuously monitor and review the effectiveness of its SMS and where appropriate, identify areas for improvements. This may be done through activities such as internal audits, assessments, management reviews and evaluation of SPIs and SPTs.

5.5.2. Continuous improvement of the safety system requires management of two major components:

(a) maintenance – the objective of which is to maintain current technological, managerial, and operating standards, and

(b) improvement – which is aimed at improving current standards.

5.5.3. Under the maintenance function, the SM should first establish a SMS that includes policies, rules, directives and standard operating procedures (SOPs) and then work

towards ensuring that everybody follows SOPs. To achieve this, a combination of discipline and human resource development measures need to be employed.

5.5.4. Under the improvement function, management will be required to work continuously towards revising the current processes, in response to changing needs, operational environment or standards.

Management Review

5.5.5. Formal management reviews of the SMS should occur on a regular basis. Ideally, there would be a quarterly high-level review process via the Safety Committee/SRB to ensure:

(a) that the SMS continues to meet its core safety objectives;

(b) safety performance is monitored against objectives; and

(c) identified hazards are addressed in a timely and appropriate manner.

5.5.6. Following the formal management review, there should be a periodic SAG review process at line management level to include, for example:

(a) monitoring and reporting on safety management activities by SAG/Safety Committee;

(b) measuring and reporting on safety management performance;

(c) reporting on change management issues;

(d) reporting on resource issues; and

(e) reporting on safety training performance.

Note: For less complex organisations, this could be combined into a single process.

5.5.7. A safety review validates the SMS, confirming not only that people were doing what they were supposed to be doing, but also that their collective efforts have achieved the organisation's safety objectives. Through regular review and evaluation, management can pursue continuous improvements in safety management and ensure that the SMS remains effective and relevant to the organisation's operation.

5.5.8. Based on the SMS review, recommendations could include:

(a) changed SMS objectives;

(b) changed safety goals/targets;

(c) improved SMS processes/procedures; and/or

(d) an implementation plan for improvement changes.

6. SAFETY PROMOTION

6.1. Introduction

6.1.1. Safety promotion encourages a positive safety culture through training, education, effective communication and information sharing.

6.1.2. The key function of safety management training is to create awareness of the objectives of the SMS of the organisation and the importance of developing a positive safety culture.

6.1.3. The SMS training should focus on both the identification and reduction of hazards in the system, and the importance of the human component in achieving this.

6.2. Training and education

6.2.1. An organisation should develop and implement a safety training programme for personnel at different levels and relevant functions in the organisation, including operational personnel, managers/supervisors, senior management and the Accountable Executive. The scope of safety training should include elements of the organisation's SMS and be appropriate to an individual's involvement in the organisation's operations and SMS to ensure that he/she is trained and competent to perform the relevant SMS functions or duties. The safety training programme may be part of a larger training programme for the organisation's personnel.

Training Requirements

6.2.2. As part of the implementation of training in SMS, a Training Needs Analysis (TNA) should be undertaken for all operational safety critical personnel in the organisation.

6.2.3. Depending on the nature of the task, the complexity of safety management training required will vary from:

(a) safety management awareness training for all staff;

(b) training aimed at management's safety responsibilities;

(c) specific training for operational staff (such as flight crew, operations staff, tarmac staff, Licensed Aircraft Maintenance Engineers (LAMEs)/ Aircraft Maintenance Engineers (AMEs), etc.; and

(d) detailed training for safety specialists (such as the Safety Manager, Safety Representatives, and Flight Data Analysts).

Training Documentation

6.2.4. Documentation should be developed to support the SMS training plan, which includes:

(a) a listing of the personnel (staff and third-party personnel) who require SMS training;

(b) a means of determining when each staff member is due to undergo a specific safety training course;

(c) a method of determining the training provided to each member of staff;

(d) safety induction course/s for staff who have not previously been exposed to an SMS;

(e) recurrent safety course/s for all operational safety critical personnel; and

(f) a means of determining the effectiveness of the safety training provided. e.g. feedback questionnaire.

6.2.5. An SMS training register which incorporates individual training records should be established and maintained. This may be incorporated in a centralised training record system.

Initial Safety Training – All Staff

6.2.6. All staff should receive an appropriate induction course covering, for example:

(a) HF elements supporting SMS (see CAAP SMS-3(0) titled Human Factors Training and NTS Assessment for RPT Operations);

(b) basic principles of safety management;

(c) corporate safety philosophy, safety policies and safety standards (including corporate approach to disciplinary action versus safety issues, integrated nature of safety management, risk management decision-making, safety culture, expected behaviours etc.);

(d) importance of complying with the safety policy and with the procedures that form part of the SMS;

(e) organisation, roles and responsibilities of staff in relation to safety;

(f) corporate safety record, including areas of systemic weakness;

(g) corporate safety goals and objectives;

(h) corporate safety management programs (e.g. IRS, Internal Audit Program, LOSA, etc);

(i) requirement for ongoing internal assessment of organisational safety performance (e.g. employee surveys, safety audits and assessments);

(j) reporting reportable matters, hazardous events and potential hazards;

(k) lines of communication for safety matters;

(l) feedback and communication methods for the dissemination of safety information;

(m) safety awards programs (if applicable); and

(n) safety promotion and information dissemination.

Safety Training for Management

6.2.7. It is essential that the management team understand the principles on which the SMS is based. Training should ensure that managers and supervisors are familiar with:

(a) the principles of the SMS;

(b) risk management process;

(c) their responsibilities and accountabilities for safety; and

(d) their legal liabilities.

Specialist Safety Training

6.2.8. A number of safety-related tasks require specially trained personnel. These tasks include:

(a) investigating safety events;

(b) monitoring safety performance;

(c) conducting risk assessments;

(d) managing safety databases; and

(e) performing safety audits.

6.2.9. It is important that staff performing these tasks receive adequate training in the special methods and techniques involved. Depending on the depth of training required and the level of existing expertise in safety management within the organisation, it may be necessary to obtain assistance from external specialists in order to provide this training. Training for the Safety Manager

6.2.10. The person selected as the SM needs to be familiar with most aspects of the organisation, its activities, its management and staff.

6.2.11. Areas where the SM may require formal training include:

(a) familiarisation with different fleets, types of operations, routes, etc.;

(b) understanding the role of human performance in accident causation and prevention;

(c) operation of the SMS;

(d) investigation of reportable matters and hazardous events;

(e) crisis management and emergency response planning;

(f) safety promotion;

(g) communication skills;

(h) computer skills such as word-processing, spreadsheets and database management; and

(i) specialised training or familiarisation (such as TEM/CRM, LOSA and FDA).

Safety Training for Operational Safety Critical Personnel

6.2.12. In addition to the corporate induction training outlined above, staff engaged directly in operations (flight crew, operations staff, LAMEs/AMEs, etc.) require more specific safety training in relation to:

(a) procedures for reporting reportable matters;

(b) procedures for hazard reporting;

(c) specific safety initiatives, such as: - TEM/CRM - Approach and Landing Accident Reduction; and - LOSA.

(d) seasonal safety hazards and procedures (weather-related operations, etc.); and

(e) emergency procedures.

Delivery Methods

6.2.13. The SM, in consultation with the training manager should determine the best method of delivery that fits the training requirements considering the size and complexity of the organisation.

6.2.14. Supporting education material could be delivered via:

(a) an intranet system;

(b) an internal document circulation system;

(c) a safety library (centrally located);

(d) summaries (probably by the SM) notifying staff of the receipt of such information; and/or

(e) a range of available safety posters strategically situated in workplace areas.

6.3. Safety Promotion and Communication

6.3.1. An organisation should develop and maintain means of safety communication to disseminate safety-related information within and, where necessary, outside its organisation. Such information could include its safety objectives, SMS processes, safety-critical issues and safety lessons. The effectiveness of such means of communication should also be reviewed periodically to ensure that the intended audience received and understood the information.

6.3.2. An ongoing program of safety promotion and communication should ensure that the organisation's staff benefit from safety lessons learned and continue to understand the organisation's SMS. Safety promotion is linked closely with safety training and the dissemination of safety information. It refers to those activities which the organisation carries out in order to ensure that their staff understands:

(a) why SMS procedures are in place;

(b) what safety management means; and

(c) why particular safety actions are taken, etc.

Safety Promotion and Safety Culture

6.3.3. Safety promotion provides a mechanism through which lessons learned from safety event investigations and other safety related activities are made available to all affected staff. It also provides a means of encouraging the development of a positive safety culture and ensuring that, once established, the safety culture is maintained.

6.3.4. An organisation's SMS could be affected by both internal (e.g. internal corporate departments such as marketing, finance etc.) and external interfaces (e.g. with other organisations). A organisation should identify and manage these interfaces as part of its safety risk management processes, and develop collaborative risk control strategy to address any identified issues.

6.3.5. An organisation's SMS should also interface, where relevant, with the CAA State Safety Programme (SSP) which is safety management at the State-level. Such interfaces could include providing or sharing safety data and information for the monitoring of safety performance and identification of aviation hazards and risks; and conducting joint projects or initiatives to mitigate these hazards and risks.

Management Role

6.3.6. While it is important that personnel are kept well informed, they should see evidence of the commitment of management to safety. The attitudes and actions of management will therefore be a significant factor in the promotion of safe work practices and the development of a positive safety culture.

6.3.7. An SMS may be integrated with other management systems such as quality management system, and human factor (HF) and error management systems for better

coordination and optimising of resources. Where appropriate, common platforms may be established to integrate the processes across different management systems, and minimise duplication or complication of work and resources. Examples of such include having a single hazard or risk register, and establishing a common safety/quality committee.

Safety Promotion Focus

6.3.8. Safety promotion activities are the primary means by which safety issues are communicated within the organisation. These issues may be addressed through staff training programs or less formal mechanisms.

6.3.9. In order to propose solutions to actual or potential operational safety issues, staff should be aware of the existing hazards identified and the corrective actions that have already been implemented. The safety promotion activities and training programs should therefore:

(a) address the rationale behind the introduction of new procedures; and

(b) ensure the main focus is on 'what is going on within the organisation'. Motivation

6.3.10. If a safety message is to be learned and retained, the recipient first has to be positively motivated. Unless this is achieved, much well-intended effort will be wasted. Propaganda which merely tells people to avoid making errors, to take more care, etc. is largely ineffective as it does not provide anything substantial to which individuals can relate. This approach has sometimes been described as the 'bumper sticker' approach to safety.

Safety Topics

6.3.11. Safety topics should be selected for promotional campaigns based on their potential to control and reduce losses. Selection should therefore be based on:

(a) the experience of past events or near misses;

(b) hazards/potential hazards identified by hazard analysis; and

(c) observations from routine internal safety audits.

6.3.12. The SM/Department Managers/Safety Representatives should be involved in encouraging staff to submit suggestions for promotional campaigns.

Methods of Dissemination

6.3.13. The target audience, (employees) tend to be a 'critical audience', therefore the dissemination of information needs to be done well otherwise it will not be effective. All methods of dissemination – the spoken and written word, posters, videos, slide presentations, etc., require talent, skill and experience to be effective.

6.3.14. Once a decision has been made to disseminate safety information, a number of important factors should be considered, including:

The audience: The message needs to be expressed in terms and vernacular that reflect the knowledge and culture of the audience.

The response: What is expected to be accomplished?

Media: Consider which media is the most effective. For example, print, web, multimedia, etc.

The style of presentation: This may involve the use of humour, graphics, photography and other attention-getting techniques.

6.3.15. The organisational safety promotion program should be based on several different communication methods for reasons of flexibility and cost. Typical methods available are:

Spoken word: Perhaps the most effective method, especially if supplemented with a visual presentation. However, it is also the most expensive method, consuming time and effort to assemble the audience, aids and equipment.

Written word: The most popular method because of speed and economy, the printed safety promotion material also competes for attention with considerable amounts of other printed material.

Videos: Videos while offering advantages of dynamic imagery and sound to reinforce particular safety messages efficiently, also have two main limitations: expense of production and the need for special equipment for viewing.

Electronic media: Use of the Internet offers significant potential for improvement in the promotion of safety, as even small companies can establish and maintain a website to disseminate safety information. This may also include an electronic newsletter (eNewsletter) or podcasting to distribute key safety messages in a timely manner. This medium may be particularly effective in communicating with younger generations.

7. SUMMARY

7.1. Safety

7.1.1. Safety should be actively managed from the very top of an organisation. Safety management should be seen as an integral strategic aspect of normal business management, recognising the high priority attached by the organisation to safety.

7.2. Commitment

7.2.1. An organisation's commitment to safety management is typically evidenced by the following:

(a) a demonstrable Board/CEO level of commitment to an effective formal Safety Management System should exist;

(b) the safety contributions of staff should be encouraged;

(c) companies establishing an SMS need to take a pragmatic approach, building where possible on existing procedures and practices;

(d) a fully-fledged SMS is a formalised, organisation-wide system. Established at the corporate level, the SMS then devolves out into the individual departments of the Organisation. Flight Operations, Engineering and Maintenance, Ground Operations and all other departments whose activities contribute to the operator's safety performance will have their own processes and procedures under the umbrella of the corporate SMS;

(e) where safety sensitive functions of the operator are outsourced (e.g. maintenance, ground handling), contractual agreements should identify the need for an equivalent, auditable SMS in the supplier.

8. APPENDIX A TO CAP SMS-01

8.1. The Benefits of a Safety Management System

8.1.1. To improve on existing levels of aviation safety in the light of the continuing growth of the industry, additional measures are needed. One such measure is to encourage operators to develop and implement their own SMS that fits the size and complexity of their operation.

8.1.2. An SMS is as important to business survival of the organisation as financial management. The implementation of an SMS should lead to achievement of one of civil aviation's key goals; enhanced safety performance through the identification of hazards and reducing these hazards until they are ALARP. An effective SMS may produce the following benefits:

(a) Reduction in incidents and accidents (occurrences);

(b) Reduced direct and indirect costs;

(c) Safety recognition by the travelling public;

(d) Reduced insurance premiums; and

(e) Proof of diligence in the event of legal or regulatory safety investigations.

SMS make economic sense

8.1.3. Few organisations can survive the economic consequences of a major accident. Hence, there is a strong economic and safety case for developing and implementing an SMS. There are typically three types of costs associated with an accident or incident: direct, indirect and industry/social costs.

Direct Costs

8.1.4. There are obvious on-the-spot costs that are easily measured. They mostly relate to physical damage, and include things like rectifying, replacing or compensating for injuries, aircraft equipment and property damage.

Indirect Costs

8.1.5. Indirect costs are usually higher than direct costs, but are sometimes not as obvious and are often delayed. Even a minor incident will incur a range of indirect costs.

Indirect costs include:

8.1.6. ***Loss of business and damage to the reputation of the organisation:*** Many large organisations will not charter an aircraft from an operator with a questionable safety record or one without a documented SMS in place.

8.1.7. ***Legal and damage claims:*** While organisations can take out insurance for public liability, it is hard to cover the costs of lost time handling legal actions and damage claims.

8.1.8. An organisation should act to protect its interests, and to do so will cost both time and money.

8.1.9. ***Surplus spares, tools and training:*** If organisations have a spares inventory and people trained for a one-of-a-kind aircraft that is involved in an accident, the spares and training become surplus overnight. In many cases, the sale value of the spares is below the purchase cost.

8.1.10. ***Increased insurance premiums:*** An accident may push organisations into a higher risk category for insurance purposes, and therefore could result in increased premiums. The implementation of an SMS could help an operator negotiate a lower premium.

8.1.11. ***Loss of staff productivity:*** If people injured in an accident at work are unable to perform their normal duties, under Oman law they should still be paid. They will also need to be replaced in the short term – again a substantial cost in terms of wages (possibility of additional training requirements) as well as management time.

8.1.12. ***Aircraft recovery and clean-up:*** This is often an uninsured cost and is usually met by the operator.

8.1.13. ***Cost of internal investigations:*** This is a cost borne by the operator and is uninsurable.

8.1.14. ***Loss of use of equipment:*** Loss of an aircraft that is not replaced immediately means that the operator will lose business or jeopardise existing contracts.

8.1.15. ***Cost of short-term replacement equipment:*** Short-term hire is usually far above the cost of operating organisation-owned equipment.

8.1.16. Consider the potential savings by reducing these typically uninsured costs. The simplest way is not to have an occurrence in the first place.

Understanding a Safety Management System

8.1.17. A SMS can be compared with a financial management system as a method of systematically managing a vital business function.

8.1.18. The features of a financial management system are well recognised:

(a) financial targets are set;

(b) budgets are prepared; and

(c) levels of authority are established, etc.

8.1.19. The formalities associated with a financial management system include:

(a) 'checks and balances'; and

(b) the whole system includes a monitoring element so that corrections can be made if performance falls short of set targets.

8.1.20. Financial management is central to an organisation's continued success and viability. The outputs from a financial management system are usually felt across the organisation. Financial risks are still taken but financial control procedures should ensure that there are no 'business surprises'. If there are, it can be disastrous for a small organisation. For the larger organisation, unwelcome media attention usually follows an unexpected loss.

8.1.21. An aircraft accident is also 'an unexpected loss' and not one that any organisation in the aviation industry wishes to suffer. It should be apparent that the management of safety should attract at least the same focus as that of finance. The adoption of an effective SMS will provide this focus.

9. APPENDIX B – INTEGRATING HUMAN FACTORS (HF) INTO AN SMS

9.1. Introduction

9.1.1. The Civil Aviation Authority (CAA) recognises that the operations to which this CAP will apply are numerous and varied, and will endeavour to adopt a flexible approach consistent with the maintenance of good standards.

9.1.2. This Appendix provides advice and guidance for integrating Human Factors (HF) into an organisation's SMS. It is crucial that HF is integrated at every opportunity, and not considered separately.

9.1.3. The integration of HF into the SMS provides a managerial and organisational framework to ensure the systematic identification and analysis of relevant HF issues, and the application of appropriate tools, methods and measures to address such issues.

9.1.4. The practical and methodical application of HF within an SMS is essential to ensure compliance and to optimise human performance within their systems.

9.2. Principles for integrating HF into an SMS

9.2.1. HF principles have been summarised from international standards, best practice and in consultation with system safety and human factors experts. These principles will help address the people and systems challenges in SMS and achieve appropriate and identifiable benefits. The following list summarises the HF principles which are encompassed in the body of this document:

(a) Adopt a holistic and integrated approach;

(b) Put the people at the centre of the system;

(c) Account for human variability;

(d) Ensure transparency of organisational processes and actions;

(e) Take account of social and organisational influences;

(f) Involve staff and respect and value their input;

(g) Encourage timely, relevant and clear two-way communication; and

(h) Ensure fairness of treatment (e.g. the 'just culture' concept).

9.3. Benefits for integrating HF into the SMS

9.3.1. It is recognised that the integration of HF in the SMS will result in safety and business benefits. The integration of HF:

(a) Improves overall safety performance in the organisation and reduces the number of incidents;

(b) Ensures that human performance is optimally managed to improve safety capacity and efficiency;

(c) Helps to meet legal and regulatory obligations; demonstrates all reasonable steps have been taken to manage safety and control risk from the perspective of human performance;

(d) Reduces direct costs by considering HF issues in the SMS and as part of any significant change management activity;

(e) Reduces indirect costs (such as staff turnover and stress related leave);

(f) Reduces duplication of activities and effort (and streamlines changes) resulting in cost reductions;

(g) Improves staff motivation across the organisation; and

(h) Improves staff acceptance of change.

9.4. Safety benefits for integrating HF for the organisation

9.4.1. Operationally the integration of HF into the SMS facilitates continuous improvements to safety, including:

(a) Promoting a duty of care throughout the organisation;

(b) Increasing understanding and ownership of the safety processes;

(c) Encouraging continued safety improvement and the development of a 'learning organisation';

(d) Promoting the use of good communications and feedback throughout the organisation;

(e) Helping to disseminate appropriate lessons learned;

(f) Establishing, maintaining, and improving the safety culture of the organisation;

(g) Improving the integration of HF training processes within the training goals of the organisation;

(h) Clarifying HF training and assessment criteria expected of the organisation's members with respect to safety, and providing a documented process to ensure that standards are maintained;

(i) Providing HF input to improve effective data collection and analysis methods to support the safety process;

(j) Supporting the efficient allocation of resources to the safety process; and

(k) Promoting and developing a proactive and predictive management of risk.

9.5. Integrating HF into the SMS

9.5.1. Integrating HF is essential in the elements of the SMS dealing with:

(a) risk management;

(b) management of change;

(c) design and procurement of systems, equipment, machinery and their subsequent usability;

(d) job and task design;

(e) selection and training of safety critical personnel;

(f) safety reporting and flight data analysis; and

(g) incident investigation.

9.5.2. HF risk management allows an organisation to determine where it is vulnerable to human performance limitations. The potential for human error and its sources should be identified and managed through the risk management process.

9.5.3. SMS documentation should clearly demonstrate how human factors have been considered in the management of risk.

9.5.4. Various aspects of human performance should be considered when identifying, assessing and controlling hazards. This includes areas such as prevention, initiation, detection, control, escalation, mitigation, and emergency response.

9.5.5. Of particular relevance are:

(a) Processes to ensure that the potential for human error is explicitly addressed; and

(b) The inclusion of human error management, including error recovery actions, within the risk assessment process.

9.5.6. The risk management process does not change; however, it should include all relevant HF issues.

9.5.7. In addition, the following HF aspects should be considered:

(a) All the people who interact with the system;

(b) Reasonably foreseeable non-compliance with standard operating procedures;

(c) Paying particular attention to abnormal or infrequent modes of operation;

(d) Solutions that support the detection, correction and management of errors; and

(e) Fatigue.

9.5.8. Typically, control measures for potential and actual human error might focus on HF aspects such as equipment design and usability, task and job design, workplace design, procedures, training, communication, team work, supervision, and monitoring. The most effective controls are either to remove or modify the hazard.

9.5.9. HF should also be considered during the implementation of safety management solutions, and any recommendations should only be considered after considering the context of local factors in the working environment, as well as organisational, or systemic factors.

9.5.10. To ensure the effectiveness of the control measures, a process for monitoring and review should be implemented.

9.6. Management of change

9.6.1. The purpose of integrating HF into the management of change is to minimise potential risks by specifically considering the impact of the change on the people within a system.

9.6.2. Change has the potential to introduce new, or exacerbate pre-existing, HF issues. For example, changes in machinery, equipment, technology, procedures, work organisation or work processes are likely to affect performance.

9.6.3. The magnitude of change, its safety criticality and its potential impact on human performance should be assessed in any change management process.

9.6.4. Special consideration should be given to the 'transition period'. Any HF issues identified should be clearly documented. In addition, the activities utilised to manage these issues should be integrated into the change management plan.

9.6.5. Some points for consideration:

(a) The change management effort should be commensurate with the operational risk to the organisation;

(b) Identify all those affected by the change who have the potential to impact safety;

(c) Identify how roles and tasks will be affected by the change;

(d) Identify the risk to human performance associated with the change – including resistance to change;

(e) Implement risk management strategies to eliminate or mitigate risks associated with the change;

(f) Assess and monitor any residual risk associated with human performance; and

(g) Evaluate and review safety performance against stated objectives.

9.7. **Design and procurement**

9.7.1. Design and modification of Human Machine Interfaces (HMI) such as display and control systems, alarm systems, signals and warnings, as well as automated systems may involve significant HF risks.

9.7.2. Integrating HF and usability principles in the early stages of design, modification and procurement is the most effective way of designing out, or managing, HF risk.

9.7.3. The design of equipment and machinery can have a major impact on human performance, and steps should be taken to ensure that HMI are designed with the user in mind. A human-centred design approach should be taken, and principles of good HMI design followed.

9.7.4. The design of safety-related systems should consider human capabilities and limitations, both physical and cognitive, and be suitable for the tasks assigned to operators and maintenance staff. A typical approach could include:

(a) Considering HF and usability practices and principles in designing modifying and/or procuring systems. For example, international standards for user centred design;

(b) Designing, where possible, systems and equipment to be tolerant of errors made by operators;

(c) Identifying, where possible, all the ways that people may potentially interact with the system;

(d) Assessing any risks associated with those interactions;

(e) Ensuring risk management strategies are in place to manage the identified risks;

(f) Assessing and monitoring any residual risk associated with human interaction; and

(g) Evaluating and reviewing safety performance against stated objectives.

9.7.5. Prior to implementing newly designed, modified or procured systems, awareness and/or training of those persons who interact with the system should be undertaken. All interfaces should facilitate good HF practice, and should accommodate the likely level of awareness and/or training of operators (including members of the public where applicable).

9.8. Job and task design

9.8.1. Job and task design can contribute to system safety. Improving the design of jobs and tasks, and the workspaces in which they are performed, can significantly improve human performance and reduce the potential for human error.

9.8.2. Task design is essentially about matching the person and the task – making sure that tasks and activities are appropriate and suited to the human operator's or team's capabilities, limitations and personal needs. For example, tasks that involve excessive time pressure, complex sequences of operations, reliance on memory, are physically or mentally fatiguing etc. are likely to have a negative impact on performance.

9.8.3. A typical approach may be to:

(a) identify safety critical tasks, and those who perform them;

(b) design the task objectives, sequences and actions to be performed;

(c) structure the task so it supports the safe performance by the individual or team;

(d) consider the working environment so it supports the safe performance of the task;

(e) assess the potential risks associated with non-compliance, human capabilities and limitations;

(f) implement risk management strategies to manage identified risks; and

(g) evaluate safety performance against the stated objectives.

9.8.4. Examples of design elements that can be included are:

(a) procedures and rules;

(b) equipment, tools and materials;

(c) HMI;

(d) information requirements;

(e) manning and workload;

(f) workspace;

(g) capabilities and skills required;

(h) team structures;

(i) communication links;

(j) rostering;

(k) rewards and incentives; and

(l) supervision.

9.9. Selection and training of safety critical personnel

9.9.1. It is essential to take proactive steps to integrate HF into selection, training, and job performance to maximise the 'task-person fit' and to reduce the potential for human error.

9.9.2. It is important to identify and assure the adequacy of training and competency of staff performing critical functions directly affecting safety. A clear demonstration of the adequacy, effectiveness and appropriateness of training and competency should be

provided within the SMS; particularly as it relates to HF principles in the organisation's SMS.

9.9.3. Once the competencies for a role have been defined, methods need to be developed for selecting and training people based on these competencies. In some instances, people will already be selected, in which case these people should be evaluated against the competencies and training requirements identified in order to 'bridge' any discernible gaps.

9.9.4. To identify training requirements, a Training Needs Analysis (TNA) can be performed. For information on the conduct of a TNA plus information on the development and implementation of training, the evaluation and review of training effectiveness and safety performance against stated objectives (refer to Section 4 of Appendix C, Human Factors Training and Assessment).

9.10. Safety reporting systems and data analysis

9.10.1. The main objective of any safety data collection and analysis system is to make events, hazards, safety trends and their contributing factors visible, understandable, and supported by useable data so that effective corrective action can be taken.

9.10.2. From the HF perspective, the behaviour of individuals or groups involved in incidents or 'near misses' may not differ greatly from that observed when accidents occur. Generally, the cognitive failures, problems in decision making, communication breakdowns, distractions, and all the other factors which contribute to the sum total of behaviour in an accident will also be present in incidents.

9.10.3. It is important that the reporting system, as identified in the SMS, incorporates the identification of contributing HF. In addition, staff should be trained and encouraged to identify and report contributing HF when reporting hazards or occurrences.

9.10.4. Systems to encourage open reporting based on trust, acceptance and motivation include:

just culture based, confidential hazard and incident reporting systems;

a clear and accessible process for reporting issues;

formal and informal meetings to discuss safety concerns; and

feedback from management about action taken as a result of hazard and incident reports or safety meetings.

9.10.5. The classification of operator errors and contributing factors in any accident and incident data collection system should be based on a taxonomy that is carefully aligned with the model or framework used for the investigation and hazard reduction components of the SMS.

9.11. Investigation

9.11.1. It is essential that the contribution of HF is properly investigated when incidents and accidents occur. This is done so that the organisation can learn from incidents and near misses in order to protect itself against the consequences of failing to accommodate human limitations in the design and operation of aviation systems.

9.11.2. The HF component of investigation should be based on a model or framework for systemic investigations considering human error, both at the individual and organisational levels. A number of human error models and frameworks (such as

Reason's model) have been developed over the last two decades to aid in understanding how humans err and how accidents/incidents occur in the larger context of the systems in which these accidents/incidents take place.

9.11.3. Investigators should be trained in basic HF concepts, and procedures should be designed to examine the detail of human performance factors that may have contributed to the event. These include the systemic sources of the failure (e.g. component failures, design deficiencies of equipment and/or infrastructure, inadequate procedures, and lack of training).

10. APPENDIX C – SMS CHECKLIST

10.1. An example of a Gap Analysis Checklist

Note: This form can be completed either by the employees or line managers only.

SMS Element	Question	Response		
		NO	YES	N/A
Safety Policy, Objectives and Planning	**Management commitment and responsibility**			
	1. Is there a safety policy signed by the CEO?	☐	☐	☐
	2. Is this safety policy appropriate for the size, nature and complexity of the organisation?	☐	☐	☐
	3. Is the safety policy readily visible and accessible to all staff?	☐	☐	☐
	4. Are there clearly established safety objectives compatible with the safety policy?	☐	☐	☐
	5. Are the safety objectives measurable?	☐	☐	☐
	6. Are the safety objectives periodically reviewed to ensure ongoing validity?	☐	☐	☐
	Safety accountability of managers			
	7. Are the roles and responsibilities of management in the SMS documented?	☐	☐	☐
	8. Are the values of management identified as being safety oriented?	☐	☐	☐
	9. Are management aware of their obligations?	☐	☐	☐
	Appointment of key safety personnel			
	10. Is there a safety manager/officer appointed to champion the SMS	☐	☐	☐
	11. Is there a position description outlining the responsibilities of the safety manager/office	☐	☐	☐
	12. Does the appointed safety manage/officer have the required knowledge for the job?	☐	☐	☐
	13. Are there sufficient resources (financial, human, hardware/software) to support the SMS?	☐	☐	☐
	SMS implementation plan			
	14. Is there an SMS implementation plan to target resource allocation?	☐	☐	☐
	15. Has a gap analysis been undertaken to identify existing and missing SMS elements?	☐	☐	☐
	16. Are priorities for SMS implementation based on identified risks?	☐	☐	☐
	Contractors (third party interfaces)			
	17. Does the organisation assess a contractor's previous safety performance before procuring contracted services?	☐	☐	☐
	18. Does the organisation have contracts or service level agreements with contractors clearly specifying the safety standards they must meet?	☐	☐	☐
	19. Does the organisation audit ongoing contractor safety performance for compliance regularly?	☐	☐	☐

SMS Element	Question	Response		
		NO	YES	N/A
	Emergency response plan			
	20. Is there an appropriate emergency response plan for all the workplace locations?	☐	☐	☐
	21. Has the organisation assessed which emergencies are most likely and developed plans for each different type?	☐	☐	☐
	22. Is there documentation of all major hazards in the work area?	☐	☐	☐
	23. Are there sufficient notices in the workplace advising people what to do in the event of an emergency?	☐	☐	☐
	24. Does the organisation have regular emergency exercises/ drills?	☐	☐	☐
	Documentation			
	25. As part of the SMS documentation, has the organisation developed a safety management manual?	☐	☐	☐
	26. Are there written policies, procedures and instructions covering all the SMS standards?	☐	☐	☐
	27. are these written policies, procedures and documents authorised, current and available to all relevant personnel?	☐	☐	☐
	28. Are there a written policy for retaining and maintaining SMS documentation?	☐	☐	☐
	29. Are all documents maintained in accordance with established document control procedures?	☐	☐	☐
Safety risk management	**Hazard identification**			
	30. Is there an effective ongoing hazard identification program?	☐	☐	☐
	31. Does the hazard identification program include a confidential reporting system?	☐	☐	☐
	32. Are confidential reports properly de-identified?	☐	☐	☐
	33. Are hazards associated with contracted agencies included in the hazard reporting system?	☐	☐	☐
	34. Is there a procedure for acknowledging safety-related reports?	☐	☐	☐
	35. Are the results of hazard reports and safety suggestions made available to the initiator?	☐	☐	☐
	Risk assessment and mitigation			
	36. Is the process for risk assessment and management fully documented?	☐	☐	☐
	37. Is there a process for continuously assessing hazards for their risk potential (likelihood and severity)	☐	☐	☐
	38. Does the organisation have a process for managing risks to a tolerable level i.e. as low as reasonably practicable (ALARP)?	☐	☐	☐
Safety assurance	**Safety performance monitoring and measurement**			
	39. Are there key safety performance indicators to measure aviation safety performance?	☐	☐	☐
	40. Are the safety performance indicators monitored for achievement?	☐	☐	☐

SMS Element	Question	Response		
		NO	YES	N/A
	41. Do the safety performance indicators go beyond reactive/lag indicator measurement?	☐	☐	☐
	Internal safety investigation			
	42. Is there a simple, user-friendly system for reporting safety occurrences?	☐	☐	☐
	43. Is there a standard procedure for incident/accident investigation?	☐	☐	☐
	44. Is the approach to incident/accident investigation systemic in nature i.e. focused on root causes? (the why?)	☐	☐	☐
	45. Are both immediate causes (active failures) and contributing factors (latent conditions) identified?	☐	☐	☐
	46. Are enough resources/time dedicated to conducting investigations?	☐	☐	☐
	47. Are recommendations/corrective actions tracked to ensure completion?	☐	☐	☐
	48. Are recommendations/corrective actions reviewed to determine if they have been effective in reducing risk?	☐	☐	☐
	49. Is a Just Culture policy applied post investigation to consistently manage at-risk behaviour?	☐	☐	☐
	Management of change			
	50. Is there a documented change management procedure?	☐	☐	☐
	51. Are changes carefully planned and staggered?	☐	☐	☐
	52. Does the procedure require identification of (and consultation with) all stakeholders?	☐	☐	☐
	53. Doe the change management procedures contain an appropriate risk management strategy to reduce risks associated with the proposed change?	☐	☐	☐
	54. Is performance monitored after the change?	☐	☐	☐
	Continuous improvement			
	55. Are there regular internal and external audits to check if the SMS is working?	☐	☐	☐
	56. Does the organisation have a written procedure specifying how and when the effectiveness of the SMS is evaluated?	☐	☐	☐
Safety promotion	**Training and education**			
	57. Has the organisation done a training needs analysis and clearly defined competencies?	☐	☐	☐
	58. Is a supply of safety-related information (magazines, books, pamphlets, posters, videos, DVDs, online resources) readily available to all employees who have safety responsibilities?	☐	☐	☐
	59. Are employees encouraged and assisted to attend safety-related training courses and seminars?	☐	☐	☐
	60. Are new employees given sufficient training and checking in their technical duties prior to being	☐	☐	☐

SMS Element	Question	Response		
		NO	YES	N/A
	permitted to operate either supervised or unsupervised?			
	61. Is the refresher training and checking of all employees adequate?	☐	☐	☐
	62. Are employees given sufficient training in new procedures?	☐	☐	☐
	63. Are trainers and checkers adequately trained and checked, both for competence and standardisation?	☐	☐	☐
	64. Are employees trained in the procedures and policies of the SMS?	☐	☐	☐
	65. Is there a training records register	☐	☐	☐
	66. Are training initiatives evaluated to determine if they are effective?	☐	☐	☐
	Safety communication			
	67. Are regular briefings/toolbox talks/newsletters etc. used to communicate with staff about current safety issues?	☐	☐	☐
	68. Are there set standards for safety communication and are they effective?	☐	☐	☐
	69. Are they regularly evaluated for improving the method of communicating specific messages?	☐	☐	☐
	70. Does the organisation share safety-related information freely with all employees?	☐	☐	☐
Results	**Total number of "Yes" responses –** **Total number of "No" responses –**	**Assessment result (% of 'Yes' responses) _____ %**		
Permanent employee Yes /No	**Position held (manager etc.) and brief job description**	**Years of employment with company ____yr____mth**		

Instructions for use of the above form:

1. Preference shall be given to interviewing the employees and names are not required.
2. Interview approximately twenty (20) persons with the break-up being as follows – fourteen (14) employees and six (6) managers.
3. The answers given can be expanded by the person being interviewed, but record pertinent facts given to each question and submit as additional information.
4. Do not prompt answers even though a general trend of answers may have been established by the interviewer.
5. The "Who, what, why, when, how" analogy may be used to achieve a more definitive answer to a question asked.

11. APPENDIX D – SOURCES OF ADDITIONAL INFORMATION

11.1. Safety Management Systems

- ICAO (2006) Safety Management Manual (SMM). International Civil Aviation Organization. Doc 9859 AN/460. Downloadable from http://www.icao.int/anb/safetymanagement/Documents.html
- ICAO SMS Training Material. International Civil Aviation Organisation. Downloadable from: http://www.icao.int/anb/safetymanagement/training.html
- UK CAA CAP 712: Safety management Systems for Commercial Air Transport Operations.
- UK CAA CAP 726: Guidance for Developing and Auditing a Formal Safety Management System.
- Part I Subpart 7 of the Canadian Aviation Regulations (CARs) - Safety Management System Requirements;
- Transport Publication (TP) 8606, 2005-07-01 - Inspection and Audit Manual;
- TP 13739, 2001-04-01 - Introduction to Safety Management Systems;
- TP 14135, 2004-09-01 - Safety Management Systems for Small Aviation Operations – A Practical Guide to Implementation;
- National Standard of Canada, CAN/CSA-ISO 9000-00 - Quality Management Systems Fundamentals and Vocabulary;
- Alan Waring, United Kingdom, 1996 - Safety Management Systems;
- James Reason, United Kingdom, Ashgate, 1997 - Managing the Risks of Organizational Accident;
- James Reason, United Kingdom 1987 - Managing the Risks of Organizational Accidents;
- Shell Aircraft Aviation Safety Management Guidelines, January 2000
- Peter M. Senge, New York, Doubleday, 1990 - The Fifth Discipline;
- R. Curtis Graeber and Mike Moodi, Flight Safety Foundation, IFA/IASS, South Africa, 1998 - Understanding Flight Crew Adherence to Procedures: The Procedural Event Analysis Tool (PEAT);
- James R. Evans and William M. Lindsay, U.S.A., South-Western College Publishing, 1999 - The Management and Control of Quality;