



Advisory Circular

BCAA-AC-GEN007

BURUNDI CIVIL AVIATION AUTHORITY

SAFETY MANAGEMENT SYSTEM

1.0 PURPOSE

This Advisory Circular (AC) is issued to advise operators and organisation about aviation safety management and to provide technical guidance on how to develop; implement; and enforce an effective Safety Management System (SMS).

2.0 REFERENCES

The State Safety Program (SSP).

Civil Aviation Regulations

3.0 INFORMATION AND GUIDANCE

3.1 Operational Definition of Terms

Acceptable Level of Safety (ALoS): Is the minimum degree of safety that must be demonstrated and assured to be in practice by an organization safety management system.

Active failures: Are actions or inactions, including errors and violations, which have an immediate adverse effect, or which triggers the incident or accident. They are normally symptoms of safety problems, not causes

Consequence: Is the potential outcome (or outcomes) of a hazard. The damaging potential of a hazard materializes through one or many consequences.

Error: Is trying to do the right thing, but for one reason or another one fails to achieve what is expected.

Generic Hazards: Is a hazard that is common to all, in a particular operational environment (e.g. bird hazards; seasonal bad weather in the operational area; high ground close to the end of the runway.)

Hazard: Is a condition or an object with the potential to cause injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.

Just Culture: Is an organizational policy of trust in which people are encouraged to provide safety-related information, even if it is self-incriminating without fear of reprimand. ICAO, (2009).

Level of safety – degree of safety of a system, representing the quality of the system, safety-wise, expressed through safety indicators.

Latent conditions: Are conditions in the system, such as those created by poor equipment or task design; conflicting goals; defective organizations; or management decisions (e.g. poor internal communications ‘deferral of maintenance item). These conditions are generally created by people far removed in time and space from the event. They are inadequacies and safety concerns present in a system well before a damaging outcome is experienced.

Safety: The state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management. It is the absence of risk.

Safety Accountabilities within an SMS are statements of what an individual is required to deliver, either directly or through supervision and management of others, including those to whom the individual has delegated responsibility, with regard to the operation of the SMS.

Safety culture: Is a set of enduring values and attitudes regarding safety issues shared by all members of an organisation; it incorporates the Just Culture.

Safety indicators – parameters that characterize and/or typify the level of safety of the system

Safety Measurement: Is the quantification of high-level state functions, such as the status of development/implementation of primary aviation safety legislation the status of development/implementation of specific operating regulations and the level of regulatory compliance within the state or the absence of such thereof.

Safety Management System (SMS): Is a systematic approach to managing safety including the necessary organizational structures; accountability; policies; and procedures.

Safety Oversight: Is the function by which States ensure effective implementation of the ICAO safety related SARPs and associated procedures.

Safety Performance: Is functional and operational performance procedures developed based on operational area safety hazards identification and safety risk consequences assessment.

Safety Performance Level: Is a measure of the degree of satisfactory demonstration of civil aviation flight safety operational environment, risk management and risk control.

Safety Responsibilities: Are SMS functions and duties which describe the safety purpose of what an individual is required to do, with regard to the operation of the SMS.

Safety Risk Index: Is a representative code of the ratio between the risk probability of occurrence and the severity if risk occurred, (*ref. Fig. 04, p8*).

Safety Risk Tolerance: Is the classification of the risk effect rating derived from risk index, (*ref. Fig. 05, p9*).

State Safety Program (SSP): Is an integrated set of Regulations and activities aimed at improving safety.

Violation: Is a deliberate act. It is knowingly engaging in behavior that involves a deviation from established procedures, protocols, norms or practices.

Notes:

Safety Management System (SMS) and Quality Management System (QMS); The two differ in that:

- SMS focuses on safety; human factors; organizational processes and workplace conditions (i.e. Safety Satisfaction).
- QMS focuses on organisation product(s) and or services delivery, (i.e. customer satisfaction).

3.2 Safety Management Strategies

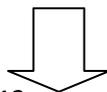
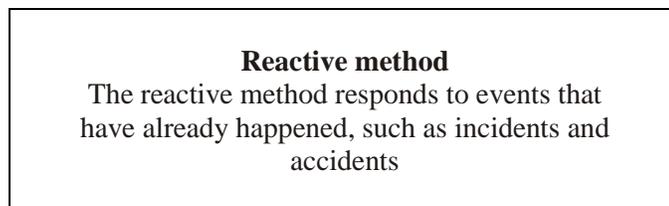
Safety is increasingly viewed as the consequence of the management of certain organizational processes, with the final objective of keeping the safety risks of the consequences of hazards in operational contexts under organizational control. It is important appreciate that aviation safety issues are neither inherent to, nor a natural condition of, aviation operations, but a by-product of the need for, and engagement in, activities related to production or delivery of aviation services.

Interventions to these issues can be based on reactive; proactive or predictive safety management strategy. Methods and techniques associated with these strategies are applied to capture safety data upon which mitigation measures are develop.

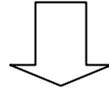
Observations and experience has indicated that aviation systems do not perform as per design specifications always, which leads to operational and performance practical drift. Therefore instead of relying on regulatory compliance exclusively, performance based approaches that constantly monitor operations, and process oriented techniques that constantly track and analyse inconsequential deviations during routine operations have become desirable.

Reactive safety management waits for a serious triggering event, with oftentimes considerable damaging consequences, has happen in order to launch the safety data capture process. Reactive safety management is based upon the notion of waiting until “something breaks to fix it”. **Proactive** safety management is based upon the notion that system failures can be minimized by identifying safety risks within the system before it fails, and taking the necessary actions to mitigate such safety risks. **Predictive** safety management does not require a triggering event to take place in order to launch the safety data capture process. Routine operational data are continually captured, in real time. It is based on the notion that safety management is best accomplished by trying to find trouble, not just waiting for it to show up. Therefore, predictive safety data capture systems aggressively seek safety information that may be indicative of emerging safety risks from the operational areas.

Fig. 1 Safety management strategies



Proactive method
The proactive method looks actively for the identification of safety risks through the analysis of the organization's activities



Predictive method
The predictive method captures system performance as it happens in real-time normal operations to identify potential future problems

Effective safety management is based on eight basic and generic building blocks:

1. Senior management's commitment to allocate financial resources to safety management functions.
2. Effective safety reporting through voluntary and self-reporting by operational personnel. It is essential therefore for organizations to develop working environments where non punitive safety reporting can take place.
3. Continuous monitoring through systems that collect safety data on hazards during normal operations and to analyse the data to extract safety information.
4. Investigation of safety occurrences with the objective of identifying systemic safety deficiencies rather than assigning blame.
5. Sharing safety lessons learned and best practices through the active exchange of safety information. It is said that "learn from the mistakes of others, you are not going to live long enough to make them all yourself".
6. Integration of safety training for operational personnel. Safety is everybody's responsibility and operational personnel are safety experts in their own right.
7. Effective implementation of standard operating procedures (SOPs), including the use of checklists and briefings. SOPs, checklists and briefings, whether on a flight deck, in an air traffic control room, in a maintenance shop or an aerodrome apron, are amongst the most effective safety devices operational personnel have to discharge their daily responsibilities.
8. Continuous improvement of the overall level of safety. Managing safety is not a one-day affair. It is an ongoing activity that can be successful only through continuous improvement.

Implementing these eight building blocks should be an organizational safety culture that fosters safe practices, encourages effective safety communication, and actively manages safety.

In summary, safety management: Includes the entire operation; focuses on processes; making a clear differentiation between processes and outcomes; is data-driven; involves constant monitoring; is strictly documented; aims at gradual improvement as opposed to dramatic change; and it is based on strategic planning as opposed to piecemeal initiatives.

3.3 Hazards and Consequences

Hazards: Hazard identification and safety risk management are the core processes involved in the management of safety. They are the dogmatic components that underlie the overarching concept of system safety. A hazard is a condition or an object with the potential to cause injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function. They are integral to the contexts where delivery of services by takes place. In and by themselves, hazards are not “bad things”. Hazards are not necessarily damaging or negative components of a system. It is only when hazards interface with the operations of the system aimed at service delivery that their damaging potential may become a safety concern.

Hazards belong in the present, they are, in most cases, part of the operational context, and therefore they are present in the workplace before operational personnel “show up to work”. As physical components of the operational context or workplace, most hazards are, and should be, detectable through audits

Consequences: Consequence is the potential outcome (or outcomes) of a hazard. The damaging potential of a hazard materializes through one or many consequences. Consequences belong in the future. They do not materialize until hazards interact with certain operations of the system aimed at service delivery. It is as a consequence of this interaction that hazards may unleash their damaging potential

3.4 SMS Regulatory Requirements

The Authority requires Aircraft operators; Approved maintenance organizations and Aviation Training Organizations to implements an acceptable SMS to identify safety hazards and to ensure the implementation of remedial action; and to maintain agreed safety performance. It is required to continuously monitor and to regularly assess safety performance with the aim of continuous improvement of the overall SMS performance. The SMS shall clearly define lines of safety accountability throughout a service provider organization, including a direct accountability for safety on the part of senior management.

The SMS regulatory requirements are specified in the State Safety Program (SSP) which defines the acceptable level of safety (ALoS) in civil aviation. The Authority is responsible, under the SSP, for the acceptance and oversight of organizations’ SMS. Prescriptive and Performance Regulations provide administrative and safety risk controls requirements by establishing “what” is to be achieved and “how” it can be achieved.

3.5 Acceptable Level of Safety (ALoS)

Acceptable level of safety (ALoS) – Is the minimum degree of safety that must be assured by a safety management system in actual practice. The ALoS to be achieved is established by the State and defined in the State Safety Program (SSP). When establishing ALoS, consideration is given to the level of safety risk that applies; the safety risk tolerance; the improvements and expectations in the civil aviation system activity, and it should reflect a combination of safety measurement safety performance measurement

The tools that are applied to reduce the safety risk index and therefore improve the safety risk tolerability i.e. realise ALoS are:

- i. **Regulations:** Prescribe restrictive administration, operations and safety risk control.
- ii. **Training:** Improves safety awareness, knowledge, competence and skill.
- iii. **Technology:** Improves accuracy, reliability, dependability & minimises effects of human error.

3.6 Predictive Safety Risk Management and ALoS

3.6.1 Acceptable Level of Safety is an objective result of predictive safety risk management. In principle, it involves:

- Listing the operation or activity and its components or activity break down.
- Stating the existing generic hazard.
- Stating the specific components of the hazard(s).
- Stating the hazard related consequences of and assess the safety risk(s).
- Assess the existing defences to control the safety risk(s), the resulting safety risk index and tolerability.
- Apply further action (defences) to reduce the safety risk index, in case ALoS is not realised.

The Table below, is a template that may be used when assessing and analysing the specific components of the hazard to establish the safety risk index for identification of the associated level of safety.

Operation or Activity	Generic hazard	Specific components of the hazard	Hazard-related consequences	Existing defenses to control safety risks, and safety risk index	Further action to reduce safety risks, and resulting safety risk Index

3.6.2 Hazard Analysis

Hazard Probability of Occurrence: Using the data available; and objective assessment of the hazard specific components and the operating conditions and environment establish probability of the hazard occurrence. This can be either Frequently; Occasionally; Remotely; Improbable; Extremely Improbable. The table below gives the accorded value of each respective probability of occurrence that is used to obtain the hazard risk index.

Fig. 2 Hazard Probability of Occurrence

Probability of occurrence		
Qualitative definition	Meaning	Value
Frequent	Likely to occur many times (<i>has occurred frequently</i>)	5
Occasional	Likely to occur some times (<i>has occurred infrequently</i>)	4
Remote	Unlikely, but possible to occur (<i>has occurred rarely</i>)	3
Improbable	Very unlikely to occur (<i>not known to have occurred</i>)	2
Extremely improbable	Almost inconceivable that the event will occur	1

Hazard Severity of Occurrence: Objectively and basing on available evidence of the severity of past occurrences, determine the severity of the identified hazards of the operation activity. This can be either Catastrophic; Hazardous; Major; Minor; or Negligible.

Using the hazard severity of occurrence rating and the table below, the severity of occurrence value letter can be obtained.

Fig. 3 Hazard Severity of Occurrence

Severity of occurrences		
Aviation definition	Meaning	Value
Catastrophic	<ul style="list-style-type: none"> ➤ Equipment destroyed. ➤ Multiple deaths. 	A
Hazardous	<ul style="list-style-type: none"> ➤ A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely. ➤ Serious injury. ➤ Major equipment damage. 	B
Major	<ul style="list-style-type: none"> ➤ A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of increase in workload, or as a result of conditions impairing their efficiency. ➤ Serious incident. ➤ Injury to persons. 	C
Minor	<ul style="list-style-type: none"> ➤ Nuisance. ➤ Operating limitations. ➤ Use of emergency procedures. ➤ Minor incident. 	D
Negligible	<ul style="list-style-type: none"> ➤ Little consequences 	E

Fig. 4 Risk Index Code (Risk Probability/ Risk Severity)

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

Fig. 5 Risk Tolerability

Risk management	Assessment risk index	Suggested criteria
 <p>Intolerable region</p>	<p>5A, 5B, 5C, 4A, 4B, 3A</p>	<p>Unacceptable under the existing circumstances</p>
 <p>Tolerable region</p>	<p>5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C</p>	<p>Acceptable based on risk mitigation. It might require management decision</p>
 <p>Acceptable region</p>	<p>3E, 2D, 2E, 1A, 1B, 1C, 1D, 1E</p>	<p>Acceptable</p>

3.7 Contents of a Safety Management System Manual (SMSM)

The State Safety Program (SSP) SMS scope requires all service providers in Uganda to establish; and document an SMS that commensurate with the size, nature and complexity of the operations authorized to be conducted under their respective certified operations approval. These include: Air Operators; Approved Training Organizations; Approved Maintenance Organizations; Organizations Responsible for Type Design and/or Manufacture of aircraft, Air Traffic Service Providers and Certified Aerodromes.

It is required of the organisation to develop a Safety Management System Manual (SMAM) endorsed by the organisation senior management communicating and defining the organisation’s approach to the management of safety in a manner that meets the safety objectives.

The Safety Management System Manual shall be developed in a format illustrated below:

SECTION 1 PREFACE

- 1-1 Introduction**
- 1-2 Distribution List**
- 1-3 Record of Amendments**
- 1-4 Checklist of effective Pages**
- 1-5 Definitions**
- 1-6 Abbreviations**

SECTION 2 GENERAL

- 2.1 Purpose and Scope of Safety Management System Manual**
- 2.2 Legal Requirements**

SECTION 3 SAFETY POLICY AND OBJECTIVES

3.1 Scope of the Safety Management System – this shall depend on the organisation respective certified operations approval.

3.2 The Safety Policy and Objectives – a definition and demonstration of the organisations commitment to Safety Management.

SECTION 4 SAFETY ACCOUNTABILITIES

Safety issues responsibility thought the entire organisation hierarchy, defining the levels of authority to make decisions regarding safety risks tolerability; safty accountabilities; and responsibilities regarding the operation of the SMS.

SECTION 5 KEY SAFETY PERSONNEL

Safety Services officer to manage the corporate safety functions like advising senior management on safety matters; Assisting Line Managers; and overseeing hazard identification systems. Departmental heads responsible for unit departmental functional safety operations

SECTION 6 DOCUMENTATION CONTROL PROCEDURES

Responsibility and accountability of the SMSM development, amendment and revision.

SECTION 7 COORDINATION OF THE EMERGENCY RESPONSE PLAN (ERP)

Outlining in writing what actions should be taken following an accident; and who is responsible for each action. ERP ensures that there is an orderly and efficient transition from normal to emergency operations, delegation of emergency authority and assignment of emergency responsibilities as well as the coordination of efforts to cope with the emergency, with the overall objective of safe continuation of operations or the return to normal operations as soon as possible.

SECTION 8 HAZARD IDENTIFICATION AND SAFETY RISK MANAGEMENT SCHEMES

Schemes that enhances fore identification generic hazards in the operational areas; effective and quality reporting system of safety incidents and accuracies in the work areas; non disciplinary action as a result of reports, (*Just Culture*); collection and storage of data; analyzing of data; distribution of information deduced from the collected safety data; risk analysis to establish the probability and severity of occurrence; assessment to establish risk tolerability; and risk control or mitigation measures to the consequences to ensure the Acceptable Level of Safety (ALoS) is not compromised.

SECTION 9 SAFETY ASSURANCES

Procedures for safety performance monitoring (e.g. safety reporting systems; studies; audits; surveys; and investigations) and safety measurement increased or reduced safety incidents and currencies'. Safety assurance in addition includes establishing and maintaining a process to identifying and eliminating the causes of sub-standard performance of the SMS; and continuous improvement of the SMS through pro-active evaluation of facilities, equipment, documentation, procedures through audits and surveys; and individuals performance to verify the fulfillment of their safety responsibilities and accountabilities.

SECTION 10 SAFETY AUDITING

Established means to ensure that the SMS is effective in terms of human resources level of knowledge and competency; facilitation in terms of equipment, facilities, tools and literature; and compliance with approved procedures and instruction. (Checklists; Questionnaires; informal confidential interviews are recommended safety audit techniques. These may be supplemented by Internal Safety Investigation).

SECTION 11 MANAGEMENT OF CHANGE

Explanation of strategies that prevent hazards that may arise due to change to safety risks. Hazards may inadvertently be introduced into an operation whenever change occurs or is introduced. Safety management practices require that hazards that are a by-product of change are identified and managed. It is required to establish systematic; predictive and proactive strategies to manage such safety risks that arise out of change. Change may be due to expansion; contraction; changes to existing systems, equipment, programmes, products and services; and introduction of new equipment or procedures, it may also be due to changes in regulatory or security requirements. Whatever the change, its consequences must be effectively managed to ensure that the Acceptable Level of Safety (ALoS) is maintained.

SECTION 12 SAFETY PROMOTIONS

Safety promotion sets the tone that predisposes both individual and organizational behavior and fills in the blank spaces in the organization's policies, procedures and processes, providing a sense of purpose to safety efforts; training is one indication of management's commitment to an effective SMS. It is required that organization develop and document a program to train employees, regardless of their level in the organization and provisions that allow down and upward communication among operational personnel and organization's management on safety matters.

SECTION 13 TRAINING AND EDUCATION

Organisation safety management training provides current information and safety issues relevant to the specific operations and operational units of the organization. Organization training ensures that the personnel are competent to perform their safety management duties. Safety training and education should include:

- a) Indoctrination/initial training about safety cautiousness and awareness.
- b) Organisational SMS safety policy; objectives accountabilities roles and responsibilities
- c) The general concept of Safety Management System (SMS).
- b) Hazards, risks reporting; hazard consequences identification and mitigation.
- c) Probability and severity of occurrence; assessment to establish risk tolerability.
- d) Human factors and Organizational factors.
- e) Change related hazards.

A training file should be developed for each employee, including management, training records which verify that the personnel has received the planned training. The training statement should specify the safety training responsibilities, including contents, frequency, validation and safety training records management.

SECTION 14 SAFETY COMMUNICATION

It is required to define the means the organization uses to communicate SMS objectives and procedures to all operational personnel, to the extent that the SMS concepts are practiced in all aspects of the organization's operations supporting the delivery of services. There must be established channels (e.g. briefings, notices or bulletins) through which the safety manager communicate the

performance of the organization's SMS programme. Lessons learned from investigations and case histories or experiences, both internally and from other organizations should be widely distributed. Communication should flow between the safety manager and operational personnel throughout the organization. Safety performance will be more efficient if operational personnel are actively encouraged to identify and report hazards.

Safety communication should be designed to:

- a) ensure that all staff are fully aware of the SMS;
- b) convey safety-critical information;
- c) explain why particular actions are taken;
- d) explain why safety procedures are introduced or changed; and
- e) convey "nice-to-know" information.

Examples of organizational communication include:

- a) safety management systems manual (SMSM);
- b) safety processes and procedures;
- c) safety newsletters, notices and bulletins; and
- d) websites or email.

SECTION 15 CONTRACTED SAFETY MANAGEMENT ACTIVITIES

If the organisation safety management function is contracted (wholly or part of) the arrangement details should be explained and the responsibilities and accountabilities clearly allocated.

Director General of Burundi Civil Aviation Authority