



Safety Management Systems
Getting started



CIVIL AVIATION
SAFETY AUTHORITY
AUSTRALIA

Safety Management Systems

Getting started



A guide to setting up aviation Safety Management Systems suitable for:

- Aerial work operations.
- Charter operators.
- Air transport operators.
- Maintenance organisations.
- Aerodromes.



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The Civil Aviation Safety Authority (CASA) is responsible for the safety regulation of Australia's civil aviation operators, and for the regulation of Australian-registered aircraft outside Australian territory.

CASA set safety standards and ensure these are met through effective entry, compliance and enforcement strategies. Additionally, CASA provides regulatory services to industry, and plays a part in safety education for the aviation community. CASA also administers exams and issues Australian aviation licences.

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Foreword

In Australia we enjoy an aviation safety record envied by the rest of the world. This is largely due to the hard work and dedication to safety of all members of the aviation community.

However, with the expected growth in air transportation, we could experience an increase in the number of incidents and accidents, despite constant or even slightly declining accident and incident rates.

That's why we all need to examine how to improve aviation safety even further. Aviation Safety Management Systems are widely acknowledged to provide the means by which this can be achieved.

This guide sets out the key steps you need to take to integrate a Safety Management System into your operation. It is based on the best available information, and the lessons learned by Australian operators who have taken a lead role in implementing Safety Management Systems.

The steps outlined are applicable to operators of any size, and in any sector of the aviation industry.

The information presented is not intended as a prescriptive "formula" for the development of a Safety Management System. Operators should use this information to customise a Safety Management System to suit the nature of their operation.

A Safety Management System is an investment with a high return over the long term.

I urge you to consider adopting a Safety Management System to manage safety in your operation.



Mike Smith

General Manager, Aviation Safety Promotion
Civil Aviation Safety Authority (CASA).

This guide sets out the key steps you need to take to integrate a Safety Management System into your operation.

About this booklet

This is the second in a series of booklets on Safety Management Systems.

Its aim is to give you introductory guidance on how to integrate a Safety Management System into your operation.

Additional resources are listed in the "Further information" section of this booklet. These should be used in conjunction with CASA's safety management video and interactive CD-ROM.

Call CASA's Safety Promotion Division on 131 757 (local call) to speak to a safety management specialist if you have any questions about setting up and maintaining a Safety Management System.

Definitions

The following terms are used throughout this booklet. They are derived from Australian Standards definitions used in AS/NZS 4360.

Cost: Activities, both direct and indirect, involving any negative impact, including money, time, labour, disruption, goodwill, political and intangible losses.

Hazard: A source of potential harm or a situation with a potential to cause loss.

Likelihood: Used as a qualitative description of probability or frequency.

Monitor: To check, supervise, observe critically, or record the progress of an activity or system on a regular basis in order to identify change.

Probability: The likelihood of a specific outcome.

Risk: The chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood.

Risk analysis: A systematic use of available information to determine how often specified events may occur and the magnitude of their consequences.

Risk assessment: The overall process of risk analysis and risk evaluation.

Risk evaluation: The process used to determine risk management priorities by comparing the level of risk against predetermined standards, target risk levels or other criteria.

Risk identification: The process of determining what can happen, why and how.

Risk level: The level of risk calculated as a function of likelihood and consequence.

Risk management: The culture, processes and structures that are directed towards the effective management of potential opportunities and adverse effects.

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Introduction

An integrated approach

There has been an increasing trend for the aviation industry to adopt an integrated approach to managing various organisational systems. Specifically, the trend is to integrate quality, safety and risk management systems.

There are benefits and limitations to integrating these management systems. However, recent feedback from the Australian aviation industry has shown that the benefits outweigh the limitations.

The problem with a stand-alone Safety Management System run separately to other management systems is that hazards and errors can be overlooked. As Professor James Reason has shown, hazards and errors can occur at all levels of an organisation, from the cockpit or the shop floor right through to the boardroom. Seemingly minor errors or hazards in one area can combine with others to result in an incident or accident. [Reason 2001]

Because error and hazard can occur at all levels of an operation, your Safety Management System works best if it becomes an integral part of your organisational culture, or "the way you do business". [Hudson 2001]

You should customise your Safety Management System in a way that best integrates it into your operation.

Illustration: Breach of safety defences [Reason]



A hazard has been allowed to pass through successive layers of defence in multiple areas of an operation, resulting in losses.

How to set up a Safety Management System

There are many ways to integrate a Safety Management System into your operation. You may have some elements of a Safety Management System in place already.

You should plan to integrate a Safety Management System into your operation in a way that suits your particular operation.

Regardless of how you incorporate a system for managing safety, you should consider each of the 10 key steps which research has found to be essential to the success of Safety Management Systems.

The 10 basic steps to establishing a Safety Management System are:

- 1. Gain senior management commitment.**
- 2. Set safety management policies and objectives.**
- 3. Appoint a safety officer.**
- 4. Set up a safety committee (usually only for large or complex organisations).**
- 5. Establish a process to manage risks.**
- 6. Set up a reporting system to record hazards, risks and actions taken.**
- 7. Train and educate staff.**
- 8. Audit your operation and investigate incidents and accidents.**
- 9. Set up a system to control documentation and data.**
- 10. Evaluate how the system is working.**

Each step is briefly described in the following chapters.

Putting these elements in place is the first stage in building a Safety Management System. However, they will only be effective if they are integrated seamlessly into your operation and organisational culture.



Regardless of how you incorporate a system for managing safety, you should consider each of these 10 key steps.

Management commitment

1. Gain senior management commitment

While safety management requires the involvement of all staff, without commitment from senior management, your Safety Management System will not be effective.

Regardless of size, complexity and type of operation, senior management must:

- Demonstrate commitment to safety and the Safety Management System.
- Set the safety standards and policies for the operation.
- Encourage participation in safety management.
- Allocate sufficient resources to the Safety Management System.
- Facilitate the flow of safety information.

What resources are required?

Good safety management is a state of mind, not an expensive add-on. It's about the mindset of everyone involved, rather than money.

When planning the implementation of your Safety Management System, you need to look at the resources available and those that you need to provide.

Resources required may include (but are not limited to):

- Time – for meetings, information gathering, planning and communication.
- Safety information.
- Expertise.
- Customised training.
- Contingency plans for hazardous situations and events.

Often time is the largest resource, particularly at the start of the process of implementing a Safety Management System.

Meetings will be required to establish roles and responsibilities. Time must also be taken to communicate the intention of the safety management system to all employees. The time spent communicating policy and goals to staff will pay dividends in gaining commitment.

Management commitment

You can demonstrate management commitment to safety by providing available resources like safety-related literature, courses, seminars and crew resource management training.

One of the most important resources you need to devote to the operation of your Safety Management System is expertise. You will need to involve people from across your operation with the expertise to address safety related issues. Technical training may be required.

All staff should be trained to understand the purpose of your Safety Management System and their role in applying it to the way you do business.

Significant resources – in time and expertise – will be needed to plan contingencies for hazardous situations and events.

Once hazards start to be identified, senior management must be prepared to commit resources to address those hazards. If hazards are not properly addressed, enthusiasm for the Safety Management System will quickly wane.

Checklist

- Senior management is involved in – and committed to – the Safety Management System.
- Senior management has approved the organisation's safety policy and operating safety standards.
- The safety policy and standards are communicated to all staff, with visible endorsement by senior management.
- Appropriate resources are allocated to support the Safety Management System.
- Senior management has established an appropriate reporting chain for safety issues.
- Senior management actively encourages participation in the Safety Management System.



Once hazards start to be identified, senior management must be prepared to commit resources to address those hazards.

2. Set safety management policies & objectives

What are safety policies and objectives?

The purpose of developing safety management policies and objectives is to set out what your organisation is striving to achieve, and how it is going to get there. This is communicated in a written document.

Safety policies set out what you are trying to achieve through your Safety Management System.

Safety policies outline the methods and processes the organisation will use to achieve desired safety outcomes. They serve as clear indications of “the way we do business around here”. They are a tangible indication that senior management is committed to safety, and expects high safety performance from staff and managers.

Objectives set operational safety standards. They need to be specific, measurable, realistic and agreed with those who have to deliver them. Both short- and long-term objectives should be set and prioritised against business needs.

How to write a safety policy

The safety policy can be a stand alone document or it can be incorporated in your operations manual. A copy of the policy should be located where it will be seen by staff.

Senior management should consult widely with staff when preparing the safety policy. Consultation ensures that the document is relevant to your staff and your operation. It will help staff to feel that they have ownership of the safety policy.

Effective policies are a commitment to action. They must:

- Contain the general intentions of management, the approach and objectives of your organisation.
- Cover the arrangements for implementing the policy.
- Become the criteria upon which the organisation bases its actions.
- Align with other operational policies, and are designed to secure commitment and involvement from all staff.

Consultation ensures that the document is relevant to your staff and your operation.

Your policy statement should clearly state:

- Senior management's commitment to the Safety Management System.
- The responsibilities and accountabilities for directors, managers and employees.
- How the organisation will achieve its safety objectives.
- The safety outcomes expected of staff, managers and contractors.

It should be signed by the most senior person in your organisation, usually the owner, Chief Executive Officer or Board of Directors.

The key to effective policy implementation is good business planning.

How to write safety objectives

Safety management objectives are outcome-based to meet the organisation's safety policies. For example, you may have an objective of reducing incidents in your workshop by 15 per cent over the next 12 months. The purpose of communicating safety objectives is to foster a common understanding of what you want to achieve.

In writing your objectives consider the following:

- What are your performance standards or targets?
- Who is responsible?
- What are they responsible for?

Your safety policy should be reviewed periodically to ensure that it remains reflective of your safety objectives and relevant to your operation. You should be able to measure performance against policy, objectives and plans.

Checklist

- A safety policy has been developed by management and staff and signed by the Chief Executive Officer.
- The policies align with other operational policies.
- The safety policy has been communicated to all staff.
- The safety policy is reviewed periodically.



The key to effective policy implementation is good business planning.

3. Appoint a safety officer

The safety officer

The safety officer is the person within the organisation who is responsible for the day-to-day operation of the Safety Management System. Larger organisations may have a director of safety or a safety manager.

Depending on the size of the organisation, the responsibilities of the safety officer may require a full-time appointment, or may be added to existing duties. In large organisations, the safety officer may require the assistance of other people.

The safety officer should have an open line of communication with the Chief Executive Officer. This ensures that safety reports and recommendations are afforded the proper level of attention, and that appropriate solutions are implemented in a timely manner. The safety officer must have the Chief Executive Officer's assurance that any safety issue can be raised without fear of retribution.

The safety officer should be technically competent in one or more of the functional areas of the company's operations. Regardless of technical expertise, the most effective safety officer is the person who is enthusiastic and interested in the task. If the job of safety officer is forced on someone who does not have a keen interest in safety, then it is unlikely that others within the organisation will be encouraged to "buy in" to the Safety Management System.

The safety officer is responsible for:

- The maintenance, review and revision of the safety management program.
- Providing timely advice and assistance on safety matters to managers and staff at all levels.
- Maintaining an appropriate reporting system to identify hazards.
- Monitoring the progress of safety reports and ensuring that hazards are addressed in an a timely manner.
- Providing feedback about ongoing safety issues.
- Reporting incidents and accidents as required by legislation.
- Distributing relevant and up-to-date safety information to staff and management.
- Identifying safety training requirements.

If the job of safety officer is forced on someone who does not have a keen interest in safety then they are unlikely to succeed.

Organisational structure

The appointment of a safety officer or safety manager does not relieve the organisation's key personnel from discharging their legal obligations under *The Civil Aviation Act (1988)*.

The safety officer is not a statutory position, however Civil Aviation Order (CAO) 82.0 gives the chief pilot responsibilities for matters affecting the safety of the flying operations. The safety officer is appointed to administer the safety program. The responsibilities include the identification and reporting of safety hazards, but may not include operational authority.

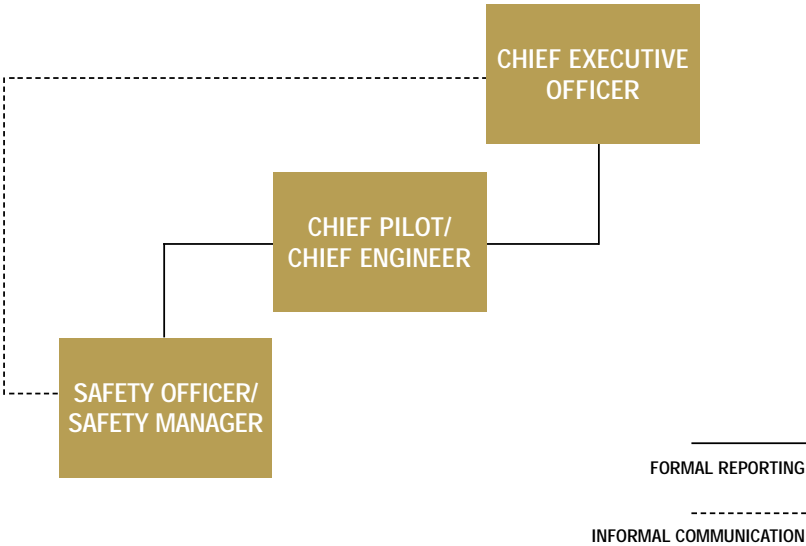
The responsibilities and authority of the safety officer and the chief pilot must be clearly understood in order to prevent any conflict.

One solution might be to have the safety officer report to the chief pilot or chief engineer (Figure 1), with an informal communication line to the Chief Executive Officer. A down side to this structure is the possibility of inappropriate filtering of the information reaching the Chief Executive Officer.



The responsibilities include identification and reporting of safety hazards, but may not include operational authority.

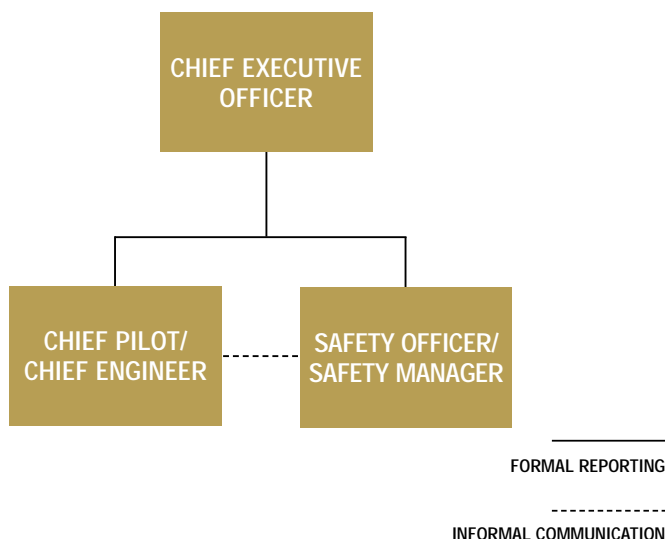
Figure 1: Suggested reporting structure



Safety officer

The preferred option is for the safety officer to report directly to the Chief Executive Officer (Figure 2) with a formal communication line to the chief pilot and/or chief engineer. Ensure copies of all safety related information and reports are made available to key staff as required.

Figure 2: Preferred reporting structure



The responsibilities and authority of the safety officer and the chief pilot must be clearly understood in order to prevent any conflict.

Checklist

- A safety officer has been appointed.
- The safety officer has an open line of communication with the Chief Executive Officer.
- The roles and responsibilities of the safety officer are clearly defined and documented.
- Staff and management understand the roles of the safety officer.

4. Set up a safety committee (if required)

Depending on the size or nature of your operation, the safety officer may be assisted by a safety group or committee.

The safety committee can:

- Act as a source of expertise and advice.
- Review the progress of incidents/accidents, and the actions taken.
- Review the status of hazard/risk reports, and review the actions taken.
- Make safety recommendations to address hazards.
- Review internal audit reports.
- Review and approve audit response and actions taken.
- Encourage lateral thinking and creative solutions.
- Help identify hazards and defences.
- Prepare and submit reports to the Chief Executive Officer for review.

Who should be on the safety committee?

The size of your operation will determine the makeup and number of members in your safety committee.

The committee must include:

- The safety officer.
- A representative from senior management who has the authority to approve safety recommendations.

It should also include at least one representative from each functional area.

For example:

- Flying operations.
- Maintenance.
- Ramp.
- Cabin crew.
- Check-in.



The size of your operation will determine the makeup and number of members in your safety committee.

Who should chair the safety committee?

The safety officer, a senior manager, or any other committee member may chair the meetings. The role of chairperson can be rotated.

Minutes and agenda

Minutes: The minutes of all meetings should be recorded by a committee member, or someone dedicated to this task. The minutes should be provided to each member of the committee as soon as possible after the meeting. Copies of the minutes should be displayed, or made available by other means for the information of employees.

Agenda: A member of the committee, usually the safety officer, should be made responsible for drawing up the agenda. Adequate notice of items to be discussed should be given to the safety officer. The agenda should be distributed one week before the meeting.

A typical agenda might include some or all of the following items:

- Review outstanding issues from previous meetings.
- Review safety action plans.
- Review accident investigation reports.
- Review the effectiveness of previous safety recommendations.
- Notify members of committee activities.
- Assess and resolve identified hazards.
- Review safety audits and action plans.
- Monitor and promote safety involvement.
- Carry out risk assessment on any new equipment, routes or procedures.
- Plan and organise staff training.
- Plan for the impact on safety of operational changes.

How often should the safety committee meet?

The frequency of committee meetings will be determined by the size of your organisation and the volume and severity of identified hazards.

Some safety committees will meet on a weekly basis, while others may only need to meet once every two months. Meetings should take place at least every three months.

The frequency of committee meetings depends on the size of your organisation and seriousness of hazards.

An extraordinary meeting of the safety committee should be called if a serious safety issue requires urgent resolution. Alternatively, the safety officer may advise management of time critical problems and solutions.

Do you need a safety committee?

Depending on the size and complexity of your organisation you may not need a safety committee.

Small general aviation organisations: Smaller organisations with less than 20 staff may prefer to discuss and resolve safety matters in a more informal way. As long as there is good communication, and staff and management are willing to provide advice and assistance to the safety officer, the Safety Management System should function without a formal safety committee.

Another option for smaller organisations is to pool resources with other operators in their region to form a combined safety committee. The sharing of safety information and expertise can benefit all concerned and need not be commercially sensitive.

Regular public transport and larger organisations: In larger organisations (20 or more staff) or organisations with several operational centres, communications are often “filtered”. In these organisations, safety committees are vital to the operation of the Safety Management System.

Checklist

- A safety committee has been established (if required).
- The roles and responsibilities of the safety committee are clearly defined and documented.
- Staff and management understand the roles of the safety committee.
- The safety committee includes representation from across the organisation.
- Minutes of the safety meetings are made available to all employees.



Smaller organisations with less than 20 staff may prefer to discuss and resolve safety matters in a more informal way.

5. Identify hazards and manage risks to your operation

What is a hazard?

A hazard is an event or situation that could result in damage or injury.

The purpose of hazard identification is to allow organisations to assess their risks and determine effective approaches to reduce or eliminate them.

When identifying hazards, management and staff should consider all facets of the operation and identify any areas or situations that may compromise safety.

Hazard identification systems should be non-punitive, confidential, simple and easy to use. You can use paper reporting forms, minutes from meetings, or a computer database to record hazards.

What is risk?

Risk is the chance that a hazard will result in damage or harm. It is measured in terms of consequences and likelihood.

There will always be risks involved in aviation operations. Some risks can be accepted, some can be eliminated, and others can be reduced to the point where they are acceptable.

Risk management is a decision making tool that allows you to continually improve safety performance.

Risk management

The risk management process follows a logical sequence:

1. Establish the context.
2. Identify the hazards.
3. Analyse the risk.
4. Evaluate the risk.
5. Apply the defences.
6. Monitor and review defences.

Some risks can be accepted, some can be eliminated, and others can be reduced to the point where they are acceptable.

1: Establish the context

Establishing the risk management context is about defining the extent and depth of the project or activity you are going to examine.

It requires you to be familiar with all the elements of the project or activity and to decide what criteria you are evaluating the risk against.

For example: operational needs, customer requirements or technical, financial or legal issues.

Establishing the context allows you to limit your process to something that is manageable, such as an activity or task.



2: Identify hazards

There are many ways to identify hazards. You could use:

- Checklists.
- Judgement based on previous experience.
- Records and trend analysis.
- Brainstorming meetings with staff or customers.
- Flow charts.
- Systems analysis, which looks at gaps in how your systems are working together.
- Scenario analysis, which imagines possibilities for hazard and error.

Some of the methods of identifying hazards may need lateral thinking by people who are unencumbered by past ideas and experiences.

Chapter 6 outlines how to set up a basic hazard reporting system.

3: Analyse the risks

Risk analysis is the process of estimating the probability and consequences of each hazard to ensure the risk is understood and prioritised. Critically analyse the hazards and rank them, as far as possible, in order of their risk potential. See Appendix A.

A priority list will ensure that your resources are focussed on the most threatening risks.

Hazards & risk management

Establishing the context allows you to limit your process to something that is manageable.

In analysing risk you must determine:

- The probability of the hazard occurring.
- The consequences of the hazard occurring.

It may help to rank probability and consequences on a graduating scale. to help you prioritise overall risk (see the Australian and New Zealand Standards example on page 25). Any risks with severe consequences and medium-to-high likelihood will obviously assume the highest priority.

4: Evaluate the risk

Once a hazard is identified and approximately ranked, evaluate the risk level. Your safety policy determines the responses to the levels of risk. You may decide to fix "low" risks when possible, but those that rank 'likely' or above need immediate action.

How will you evaluate the risk?

- Group discussions that include representatives with relevant expertise.
- Research by the safety officer.
- Information from other sources (staff, consultants, aircraft or engine manufacturers, safety publications, etc).

5: Apply the defences

Each hazard and its defences need to be critically examined to determine whether the risk is appropriately managed or controlled. Having identified the risks that may need to be resolved, there needs to be a strategy to:

- Eliminate the risk.
- Reduce the level of risk, or the consequences or likelihood of that risk occurring.
- Avoid the risk.

If the risk can be resolved, the activity or task may continue. If not, then steps should be taken to improve the defences or to remove or avoid the hazard. Assess the suitability of your existing defences associated with each of the identified hazards. How effective are they? Do they prevent the occurrence (that is, do they remove the hazard)? Do they minimise the likelihood or the consequence? And to what extent?

Hazards & risk management

To establish the effectiveness of defences, you should ask:

- Are staff aware of the defences?
- Are they trained to use the defences?
- Are there tools or equipment suitable for the anticipated risks?
- Do staff need authorisation to use the defence in an emergency?

In some instances, a range of solutions to a hazard may be available.

For example:

- Re-designing solutions.
- Changing standard operating procedures.
- Ongoing reviews of the activity or task.
- Recurrent training.
- Improved supervision.
- Targeted safety information or advice.
- Contingency planning.
- Limit exposure to the risk.

6: Monitor and review defences.

When any change is made, further risk management must be carried out to ensure the hazard is effectively controlled and the defence has not, in itself, created any new hazards.

Checklist

- Criteria are established for evaluating risk.
- A system is in place to identify hazards.
- Relevant staff are involved in critically analysing and ranking identified risks.
- Defences are set up to reduce, eliminate or avoid risks.
- Staff are aware of the defences, and have received training, where appropriate.
- Checks are in place to find out whether defences are working.



When any change is made, further risk management must be carried out to ensure the hazard is effectively controlled and the defence has not, in itself, created any new hazards.

Table 1: Qualitative measures of consequence and likelihood

Consequence

Level	Descriptor	Description
1	Insignificant	No injuries, low financial loss.
2	Minor	First aid treatment required, on site release immediately contained, medium financial loss.
3	Moderate	Medical treatment required, on site release contained with outside assistance, high financial loss.
4	Major	Extensive injuries, loss of production capability, off site release with no detrimental effects, major financial loss.
5	Catastrophic	Death, toxic release off-site with detrimental effect, huge financial loss.

Note: Measures used should reflect the needs and nature of the organisation and activity.

Likelihood

Level	Descriptor	Description
A	Certain	Is expected to occur in most circumstances.
B	Likely	Will probably occur at some time.
C	Possible	Might occur at some time.
D	Unlikely	Could occur at some time.
E	Rare	May occur only in exceptional circumstances.

Note: These tables **need to be tailored** to meet the needs of an individual organisation.

Table 2: Matrix of consequence and likelihood

Australian Standards and New Zealand Standards (1999).

AS/NZS 4360 Risk Management. Australia: Standards Australia.

Likelihood	Consequences				
	Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
A (certain)	H	H	E	E	E
B (likely)	M	H	H	E	E
C (moderate)	L	M	H	E	E
D (unlikely)	L	L	M	H	E
E (rare)	L	L	M	H	H

Key

E: Extreme risk, immediate action required.

H: High risk; senior management responsibility must be specified.

M: Moderate risk; management responsibility must be specified.

L: Low risk; manage by routine procedures.



Scenario Air

Scenario Air is a country charter operator with a small fleet of light piston twins. Following several difficult years of *ad hoc* VFR and IFR charter operations, including a seasonal daytime scenic operation into nearby “Hopeful Valley”, the company is awarded a contract with a construction company for a weekly crew change flight between Hopeful Valley and the construction company’s base.

The operation involves an early evening flight to Hopeful Valley, arriving shortly after dark in the winter months, with a night return flight to base. The following analysis illustrates the risk management system at work.

1: Establish the context

The weather at Hopeful Valley in the winter months is variable, often characterised by strong gusty winds, broken low cloud and rain showers.

Before the start of the crew contract the previous autumn, the chief pilot of Scenario Air reviewed the company procedures for operations at Hopeful Valley and arranged for each of the company pilots to receive a route training flight.

This flight included a practice Hopeful Valley NDB approach with a circling approach to land. The daytime training flights were done over a two-day period with scenic passengers who had been offered a “Hopeful Valley Special” for the purpose.

The operation began as scheduled at the beginning of winter. A month later, after the fourth flight, the safety officer met with all the pilots to review the new operation.

2: Identify the hazards

At the safety meeting, the pilots discussed the operation and identified the circling approach conducted at night at Hopeful Valley as a safety hazard. While the training procedures had included a circling approach, until the commencement of the crew change contract the pilots had only experienced the procedure at Hopeful Valley in daylight hours.

3: Assess the risks

The lack of ground lighting, the occasional car headlights shining over a nearby hill line, the variable and often unfavourable weather with low, broken clouds and rain, and the lack of experience at this manoeuvre by night, were all identified as significant factors which increased the risk associated with this procedure.

4: Evaluate the risk

It was agreed that, although the likelihood of an accident resulting from this procedure was remote, the result of such an accident would be catastrophic. Therefore the risk of such a manoeuvre was assessed as “high”.

5: Apply the defences

The safety officer reviewed the company's safety defences. These were the training which the pilots had received, by day, in this manoeuvre and the procedures and limitations in the company operations manual in relation to this manoeuvre.

The defences were considered to be inadequate because they failed to address the specific perceptual and orientation problems associated with night circling approaches.

Following the discussion at the meeting, the safety officer made a number of recommendations to the Chief Executive Officer with a copy to the chief pilot.

These were:

- All pilots should receive training in the visual illusions common in night flight.
- All pilots should be given training in circling approaches at night at Hopeful Valley.
- Until training is completed, the crew change flights should be rescheduled to daylight hours.
- Recurrent training should be given in circling manoeuvres at night at intervals not exceeding six months.
- The organisation ask the aerodrome operator at Hopeful Valley to install a VASI system.

6: Monitor and review

A review of the effectiveness of the defences is planned to occur at 6 months and 12 months after the changes commence.

Significant factors which increased the risk associated with this procedure, were identified.

6. Set up a reporting system to record hazards, risks and actions taken.

What is a reporting system?

A reporting system is a formal means of collecting, recording, acting on and providing feedback to staff about hazards and risks to your operation.

Reported risks are those that have been identified and can be managed. Unreported hazards and risks are difficult to identify and therefore to fix. In setting up your reporting system, consider Reason's illustration: Breach of safety defences (see introduction).

Unreported hazards and risks, or employees choosing not to follow policy, or mistakes may not be independently significant. However, the frequency with which they occur could indicate whether there are gaps in your safety defences.

When there are gaps (or holes) in all of your safety system defences, then there is a good chance accidents or incidents will occur.

When there are gaps in all of your safety system defences, then there is a good chance accidents or incidents will occur. This is more likely when management and organisational weaknesses coincide with poor working conditions, poor communication and a poor safety culture.

It has been estimated that for each major accident, there are up to 360 incidents that, if reported and investigated, might have identified underlying problems in time to prevent the accident. [Flight Safety Foundation, 1999]

A systematic process for identifying hazards relies on an effective reporting system.

Define how the reporting system will function, who will be involved in the system and what resources will be required.

For example:

- Anyone from your organisation can submit a report. It will then be considered and the need for a solution will be decided in a timely manner.

What are the features of a good reporting system?

The key features of a good reporting system are:

- Identifying what is relevant.
- Collecting current and applicable information.
- A procedure for receiving and actioning reports.
- A reliable method of accurately recording, storing, retrieving and maintaining safety reports.
- A procedure for distributing relevant or appropriate information to staff (and possibly contractors).
- Able to be audited.



Who should report hazards?

Hazards can be reported by staff, management, customers or passengers and external contractors.

What hazards should be reported?

Any hazard which has the potential to cause damage or injury or which threatens business viability, should be reported.

For example:

- High workload during passenger boarding.
- Poor communication with Air Traffic Services.
- Flight crew stress.
- Failure to follow standard procedures.
- Information overload from NOTAMs.
- In-flight turbulence.
- Unsafe ground traffic movements.
- Failure of passengers to listen to and follow instructions.
- Lack of LAME retraining.
- Poor communication within the maintenance department/contractor.
- Unreasonable time pressure on maintenance staff to complete safety critical tasks.
- Poor work continuity.
- Lack of up-to-date maintenance manuals.
- Poor cross-checking.
- Lack of emergency equipment, procedures and training.
- Poor communication between operational areas.
- Flight crew rushing flight checks/inadequate checklists.



How are the reports made?

Methods of uncovering hazards can range from informal interviews with staff about safety, to computer-based hazard and incident reporting systems.

Staff should feel willing to use the hazard reporting system and trained to access the forms. The forms may be paper or electronic.

They may be kept in a file with a summary sheet, or entered onto a database or other tracking system.

All information should be accepted with the aim of fixing problems – not punishing people.

Hazard reporting methods

Both formal and informal processes can be used to gather information from staff about hazards in your organisation, including:

- Confidential hazard reporting.
- Confidential surveys or questionnaires of staff.
- Informal communication.
- Observations of work practices and work flow.

Confidential hazard report forms

Confidential hazard report forms allow staff to report hazards without fear of retribution.

A sample reporting form is included at Appendix B. The reporting form for the ATSB Confidential Aviation Incident Reporting (CAIR) system may also be adapted for this purpose.

In small operations, it may be difficult to conceal the identity of the person who submits the report. In this case it is vital that staff understand that any safety issue can be discussed without fear of reprisals.

Everyone in your organisation should be familiar with the reporting system that you have in place.

Confidential surveys or questionnaires

Confidential surveys or questionnaires can be used to get feedback from staff about specific areas of your operation.

The confidential survey or questionnaire encourages input or feedback about the the way you do business.

It may be used for many purposes, such as identifying hazards or risks before changes are made, introducing new procedures, or gauging the success of recent changes.

Informal communication

One of the simplest, and most effective, ways of identifying hazards is to talk to staff.

Informal communication can be established by having an “open door” policy which invites staff to express their concerns directly to managers. It can be a chat over a cup of coffee away from work tasks.

These may be initiated when the safety officer or a senior manager walk around the workplace and ask people if they are having any problems.

Your interest in the safety issues of staff demonstrates concern about safety. It sometimes elicits more honest and accurate information than formal channels.

Observations of work practices and work flow

A critical review of specific work practices used in your operation can identify areas of hazard and risk that have been generally overlooked or taken for granted.

Standing back and making an overall observation of how well the work flow occurs in your operation is a process that can be used to identify bottlenecks and potential risks to your business.

You should ensure that the right people in your organisation are involved in providing the solutions to the identified risks.

Often an independent person can give a new perspective on a re-occurring issue.



One of the simplest, and most effective, ways of identifying hazards is to talk to staff.

Other reporting methods

There are other methods you can use to identify safety deficiencies.

For example:

- Small groups meet to identify hazards.
- A formal review of standards, procedures and systems.
- Internal and external safety audits/assessments.
- Suggestion box.

It is important to be self critical, and honestly appraise all areas of your operation. Establishing discussion groups with staff and line managers is a good way to identify hazards. The purpose of group discussions is to identify those hazards that are most likely to cause injury, damage or loss. The number of participants will depend on the size of the organisation, however, three participants should be considered the minimum.

Staff should be made aware that their contribution to the safety system is essential.

Group discussions encourage staff to become actively involved in safety. Staff should be made aware that their contribution to the safety system is essential, and that no staff member will be penalised for raising a safety issue.

Discussion groups have several main advantages. They can:

- Provide a current assessment of the organisation's safety performance.
- Encourage staff to report safety problems or concerns.
- Encourage staff to participate in safety management.
- Reaffirm the organisation's commitment to safety.
- Make staff more aware of the safety implications in their job and the effect their actions have on others.

Feedback

Staff who submit reports should be provided with feedback about:

- The progress of their report.
- Any action taken as a result of their report.

Feedback is essential in letting staff know that the reporting system works and that their contribution to the safety management system is valued.

Checklist

- All reports are recorded and investigated.
- A combination of formal and informal reporting processes is in place.
- Staff are aware they will not be penalised for submitting a report.
- Confidentiality is protected.
- Staff who report hazards are given feedback.
- After investigations, recommendations are made available to all staff.
- A system is in place to allow the safety officer to monitor the status of each identified hazard.





Air Ontario Flight 1363 Fokker F28 Dryden, Canada

On 10 March 1989, a Fokker F28 1000 initiated take-off from Runway 29 at the small provincial airport of Dryden, Ontario, Canada.

After a longer-than-normal take-off roll, the aircraft rotated, lifted off slightly, and began to shudder before it settled back on the runway. It rotated a second time, then finally lifted off at the 5,700ft point of the 6,000ft runway.

The aircraft flew briefly, but failed to gain altitude. A kilometre from the end of the runway the aircraft struck trees and then crashed into the ground, killing 21 passengers and three crew members.

Wet snow and ice on the wings of the aircraft inhibited their lifting capabilities. The aircraft stalled after lifting off, and did not recover.

An inquiry determined that the accident was a result of a combination of failures present within the Canadian aviation system.

Organisational failures on the part of Air Ontario, Air Canada and Transport Canada included:

- Inadequate management of change.
- Poor communication between management and staff.
- Deficient inspection and control.
- Poor monitoring and auditing.
- Inadequate safety management.
- Poor allocation of resources to safety.

Workplace failures included job instability from two regional commuter companies merging, different corporate cultures, high employee turnover and low morale.

Human failures included the decision of the crew not to de-ice or conduct a walk-around, failure of the cabin crew to communicate and ground-handler reticence.

Failures on the part of the operator included:

- Lack of a process to report risks and errors.
- Inadequate standardised manuals and procedures.
- Poor guidelines on de-icing procedures.
- Inadequate crew coordination.

The investigation report acknowledged that the accident was the end result of flaws that had existed undetected in the aviation system for some time.

The lesson in this case for operators everywhere is that when systems and management are inadequate at the same time, an accident is waiting to happen.

Lessons learned

- Effective communication between management and staff may prevent exposure to unanticipated risk.
- Risk management methods can detect problems with task and activities before they are initiated.
- Gaps (or holes) in the system safety defences should be reported and resolved quickly.

7 Training & education



7. Train and educate staff

The commitment to provide both induction and ongoing refresher training and checking to all staff is an essential element of any Safety Management System.

Induction training should be conducted by the safety officer and customised to suit staff members' areas of speciality. It should include information about the Safety Management System, the safety officer, safety group or committee and the responsibilities of all employees to participate in the Safety Management System. Records of participation should be maintained.

Existing employees and new staff must be trained in the operation of the Safety Management System, and encouraged to adopt the safety practices of your organisation. Customising training allows you to impress your operational practices of safe behaviour, risk management decision making and quality control processes on all staff.

When you introduce new technology or equipment, or make changes to your operations, training should be provided. There are also regulatory requirements for specific training and checks, and ongoing technical training for your employees.

Evaluation of the training effectiveness can include review of staff abilities, knowledge of processes and practices used in the workplace and any specific competencies that are required in your operation.

Keeping staff informed and educated about current safety issues through providing relevant, safety related literature, sending them to safety related courses and seminars improves the safety health of your organisation.

Checklist

- Staff understand how the Safety Management System operates.
- Staff are aware of the role they play in the Safety Management System.
- Staff understand that the aim of the Safety Management System is to improve safety – not to attribute blame.
- All personnel attend induction and ongoing safety related training.

8. Audit your operation and investigate incidents and accidents

What is an audit?

An audit is a methodical, planned review of your routine operational functions. Internal safety audits should be carried out as a routine part of your safety programme. Every part of the working system is critically examined to identify strengths, weaknesses or areas of risk. A safety audit compares stated objectives and operating procedures with actual work practices.

All audit procedures should be well documented so that any deficiencies can be easily identified. The audit records and results need to be accurate, complete, reliable and readily accessible for comparison or trend analysis.

Any safety audit should include the activities of external contractors that influence the safety of your operation (eg maintenance contractors, staff accepting cargo on behalf of the operator, and aerodrome operators).

Who carries out an audit/assessment?

Internal safety audits can be carried out by staff from within the area being looked at. Using staff from other areas of your operation is beneficial, it may yield different results as they are less familiar with the intricacies of the daily tasks or working environment.

Larger organisations use a team approach, rather than individuals. Smaller operators benefit by having the safety officer or staff member from another area do the audit.

The most likely people to conduct the audits are:

- Safety officer.
- Representative of the safety group.
- An external safety consultant.
- Quality/inspection department.

All audit procedures should be well documented so that any deficiencies can be easily identified.

Audit & assessment



How should the audit/assessment be carried out?

Depending on the nature and size of your organisation, audits may be carried out at regular intervals (bi-monthly) or prior to and following any changes to the operation. They should occur at least twice a year and should be part of the annual assessment plan for all functional areas.

The audit may involve interviews with key staff, correlation of policies and work practices and observation of the working environment.

When conducting the audit consider:

- The timing of the audit.
- The preparation required to conduct the audit.
- Checklists are used and adhered to.
- There is a comments section for items not included in the checklist.
- Confirmation of the findings.
- Reports are sent to appropriate line managers and the CEO.
- There is appropriate follow up.
- Staff are advised of the results/findings.

Operational areas that may be audited include (but are not limited to):

- Maintenance arrangements.
- Physical work environment.
- Equipment safety.
- Safe systems of work.
- Emergency procedures.

One trap when auditing is to limit the audit to the contents of your checklist. This can be avoided if audit documents are regularly updated and revised.

Staff doing the audit should be competent and familiar with the areas they are auditing.

A report of the audit findings is generally written and should be given to the Chief Executive Officer and key managers for action.

Recommended actions may be phased according to the degree of risk that they pose and the relative cost of eliminating or controlling the hazards.

Small operator

It is necessary to continually update your knowledge of your operations and check to see if your operation is meeting its own safety standards. Are staff reporting hazards? If not, why? A safety assessment should be conducted at least annually.

Larger operator

The safety officer and the quality/inspection department (if applicable) are responsible for planning and conducting regular safety audits/assessments.

Each functional area should be audited at least annually.

What is an investigation and why do it?

An investigation is a detailed study of the circumstances surrounding an event.

When staff submit an incident or accident report, the safety officer may investigate the situation leading up to the event, the causes of the event and the event itself.

The safety officer is also responsible for reporting any short term or long term effects the event may have on the safety of your business operations.

An investigation is usually completed following any incident or accident and may be conducted by a team of experts as well as those involved in your routine operations.

The safety officer may require specific training in how to conduct an investigation and prepare reports for submission for the Chief Executive Officer or external agencies.

Courses for training in aviation investigation are commercially available.

Depending on the nature of the incident or accident and its consequences, the event may involve investigations from external agencies such as the Australian Transport Safety Bureau.

The recommendations from the investigation may allow you to improve the safety system defences of your operation and prevent the accident or incident occurring again.



Audits should occur at least twice a year and should be part of the annual assessment plan.

Audit & assessment



It is necessary to continually update your knowledge of your operations.

Aspects of your operation that may be investigated include (but are not limited to):

- Management and supervision procedures.
- Physical working conditions.
- Accident prevention strategies.
- Safety information dissemination.
- Training for staff and contractors.
- Safety performance.
- Organisation safety standards and practices.
- Safety incident investigation and corrective actions.

Checklist

- A system exists to audit whether the company is meeting regulatory requirements and its own safety standards.
- Staff are encouraged to submit hazard reports and share safety concerns.
- Feedback is provided to those audited.
- Investigations are carried out for hazard reports, accidents and incidents.

9. Set up a system to control documentation and data

Your Safety Management System should be documented. It should be tailored to the needs of your operation and the staff who will use it. The range and extent of the documentation depends on the complexity of the operation, the skills, training, competence and expertise of staff.

Documentation may be located in policy and procedures manuals and include:

- A policy statement by the Chief Executive Officer.
- The reporting chain and responsibilities of the safety officer and safety committee.
- The organisation's hazard identification and risk management system.
- The safety communication pathways.
- The safety training program.
- Emergency and contingency planning.
- Risk management methods.
- Audit schedules and investigation criteria.
- Safety Management System evaluation procedures.
- Any other activities of the Safety Management System.

Documentation needs to be accessible to those who need to use it, and may include online material, posters and videos.

A record should be kept of:

- All activities involving the identification and assessment of hazards and their defences and any incidents that have occurred.
- Any reports issued or received.
- Any safety recommendations.
- Any management action.



Documentation



The range and extent of the documentation depends on the complexity of the operation, the skills, training, competence and expertise of staff.

The document control procedures need to be tailored to the needs of the organisation.

They need to cover:

- The location of current dated versions of documents.
- The review period and who is authorised to change them.
- What to do with obsolete documents.
- The identification and storage of significant documents.

Small operators

Smaller operators may find it more appropriate to document the Safety Management System with an existing manual, such as the operations manual.

Larger operators

Larger operators may want to document their safety program as a dedicated manual or document.

Data control

Collecting information about the health of your business operations through flight and maintenance reports, safety reports, audits, checks and evaluation of your staff and your work practices generates a lot of data. This can be stored on paper or electronically.

Analysis of the data allows you to measure your progress towards your objectives and to make informed decisions about safety issues.

The management and control of this data may influence the quality of the analysis done on it. There are commercially available computer systems for processing and tracking data. The one you select should allow you to protect and back-up your data.

Ensure that you collect relevant data, rather than lots of interesting, but unrelated information.

Checklist

- Your Safety Management System is documented.
- Documents are accessible to those who must use them.
- Relevant safety data is kept.

10. Evaluate how the system is working

The Chief Executive Officer should ensure that the Safety Management System is properly reviewed and evaluated at regular intervals.

Both the Chief Executive Officer and the safety officer must ensure that the operation of the Safety Management System continues to improve.

The Chief Executive Officer needs to ensure that the program is adequately resourced, supported by managers and continues to be effective in meeting the safety objectives.

The evaluation process should cover general activities of the operation and the impact on safety performance.

Staff should be given the opportunity to make recommendations.

Evaluate the safety, quality and risk management systems for:

- Passenger handling within terminals.
- Apron operations.
- Aircraft refuelling.
- Airside engineering.

Safety Management Systems begin with enthusiasm, however, once the initial interest has worn off, the system may begin to wind down.

As components of the system are established, the emphasis shifts to maintaining and developing the system to ensure there are no gaps and to consolidate the safety culture.

If the number of safety reports reduces, it may not mean that you've reduced your hazards. It may be that there is something wrong with your system.

Talk to staff to find out why they aren't submitting reports.

Checklist

- There is a plan to review the Safety Management System.
- Adequate resources have been allocated to the evaluation process.
- Staff are involved in the evaluation of your Safety Management System.

Staff should be given the opportunity to make recommendations.

Conclusion



Integrated Safety Management Systems can benefit your operations.

The application of the system depends on the size and nature of your operation. By customising your Safety Management System to the way you do business you can ensure ownership of the process.

Management commitment, effective two-way communication and a positive safety culture are the foundations for success.

Effective safety management systems contribute to successful business performance by involving people at all levels to:

- Set objectives, policy and procedures for safe operations.
- Set responsibilities, accountabilities and authorities for safety action.
- Report safety concerns.
- Identify and minimise hazards and risk within the work place.
- Maintain document control.
- Participate in and improve the standards of safety performance.
- Monitor and evaluate the safety health of your operation.

Integrating safety, quality and risk management systems provides a cost effective approach to protecting the resources of your operation.

Further information

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