Safety Management Systems

What's in it for you?

Civil Aviation
Safety Authority
Australia

Safety Management Systems

What's in it for you?

An introductory guide to aviation Safety Management Systems suitable for:

Aerial work operators.

Charter operators.

Air transport operators.

Maintenance organisations.

Aerodromes.

Civil Aviation Safety Authority Australia

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Warning: This publication is provided as educational guidance only, and does not replace regulatory documents.

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 ensures 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

A Safety Management System can help you identify, classify and manage risks to the safety of your operation, and provides a framework on which to build a sound business.

The benefits become apparent once a Safety Management System is integrated into your operation.

A Safety Management System will help you:
- Market the safety standards of your operation.
- Guard against the direct and indirect costs of incidents and accidents.
- Improve communication, morale and productivity.
- Meet your legal responsibilities to manage safety.

It is a myth that Safety Management Systems are only suitable for large organisations like airlines.

Smaller organisations actually have an advantage when it comes to incorporating a Safety Management System. This is true whether you are involved in flying, maintenance or aerodrome operations.

The smaller your operation, the easier it is to communicate and implement the changes required to run a successful system to manage safety.

This booklet forms part of a package of guidance materials designed to help your organisation implement a Safety Management System.

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 booklet forms part of a package of guidance materials designed to help your organisation implement a Safety Management System

About this booklet

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

Its aim is to give you a general understanding of Safety Management Systems and their key benefits.

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

You can call CASA's Aviation Safety Promotion Division on 131 757 (local call) and 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.

Contents

1 What is it?

What is a Safety Management System?

A Safety Management System is an integrated set of work practices, beliefs and procedures for monitoring and improving the safety and health of all aspects of your operation. It recognises the potential for errors and establishes robust defences to ensure that errors do not result in incidents or accidents.

Decades of research has shown that accidents and incidents can be traced to some form of human error. Errors can occur at the management level – in the development of policy and procedures – in the same way that errors can occur on the flight deck, the ramp, the hangar or the workshop.

A successful Safety Management System provides a systematic, explicit and comprehensive process for managing risks. As with all management systems, it involves goal setting, planning, documentation, and the measuring of performance against goals.

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Any successful Safety Management System is woven into the fabric of an organisation. It becomes part of the organisation's culture and the way people go about their work. [Reason 2001]

Regardless of the size of the operation, all successful Safety Management Systems will include (but are not limited to) four key elements:

- Top-level management is committed to safety.
- Systems are in place to ensure hazards are reported in a timely manner.
- Action is taken to manage risks.
- The effects of safety actions are evaluated.

These four key elements are described in detail below.

1. Top-level management is committed to safety.

While safety management requires the involvement of staff at all levels of an organisation, without complete and visible commitment from the highest management levels, operational safety margins are eroded.

Through its attitudes and actions, top-level management influences the attitudes and actions of staff.

In effect, management defines the safety culture of an organisation and sets the safety standards of the operation. If management doesn't care about safety, it's unlikely that safety will be a priority for staff.

If, on the other hand, management does care about safety, and is seen by staff to take safety matters seriously, the Safety Management System is likely to be successful.

Visible senior management commitment can take a variety of forms, such as:

- The appointment of a safety officer.
- Open communication about safety issues.
- Provision of adequate resources to address safety concerns.

2. Systems are in place to ensure that hazards are reported in a timely manner.

It's been estimated that for each major accident, there are as many as 360 incidents that, properly reported and investigated, might have identified an underlying problem in time to prevent the accident. Identifying the hazard is the first step to analysing the risk. [Reason 2001]

Systems to encourage open reporting and communication include:

- Non-punitive, confidential hazard reporting systems.
- Formal and informal meetings to discuss safety concerns.
- Feedback from management about action taken as a result of hazard reports or safety meetings.

3. Action is taken to manage risks.

Once hazards are identified, a system must be in place to determine logical approaches to counteract the risks to safe operation.

An operator may:

- **Eliminate the hazard completely:** This is the most effective defence, but is sometimes not practical.

- **Change operational procedures to work around the risk:** This may require rewriting some of your operating procedures.

- **Communicate to people about risks associated with the hazard:** This relies on an effective communication and reporting system within your organisation.

The objective is to reduce or eliminate the probability that a particular risk will occur, or reduce the severity of its effects if it does.

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4. The effects of safety actions are evaluated.

The safety actions taken to manage risks impact on your operations. Evaluating the impact allows you to see and communicate the benefits, or to take further remedial action.

Standard evaluation methods include:

- **Monitor and review:** You should look at the short- and long-term impact of safety actions on operations, such as on-time tasks, performance of contracts and every day activities.
- **Audits and checklist:** Formal audits can be done internally or by an external provider. Use developed checklists derived from your safety objectives to determine the impact on operations.
- **Feedback:** You should seek informal feedback about work standards and operational safety from staff and customers.

Safety Management Systems can be implemented in any operation, regardless of size. In fact, there are significant advantages for smaller operators.

Can Safety Management Systems be used by small operators?

Safety Management Systems can be implemented in any operation, regardless of size. In fact, there are significant advantages for smaller operators wanting to implement a Safety Management System.

The cost and effort required to set up a Safety Management System is lower in smaller operations. Because they employ fewer people, it's much easier to create open lines of communication, a key component in any Safety Management System.

The greatest single barrier to success for smaller organisations is the belief that it is too difficult. However, in the long term it can be more difficult and dangerous not to set up a Safety Management System. [Hudson 2001]

How do you set up a Safety Management System?

A step-by-step guide to setting up a Safety Management System is provided in the accompanying booklet, "Safety Management Systems: Getting started". Additional copies of this booklet are available from CASA Safety Promotion Division, ph: 131 757.

Is safety management the same as quality management?

Most operators are familiar with quality assurance, or quality management systems. It's reasonable to say that quality and Safety Management Systems have about 70 per cent in common.

They both have to be planned and managed, because neither quality nor safety happens by chance. Both depend upon measurement and monitoring, and both involve every function, process and person. Both strive for continuous improvement.

However, there are important differences. Quality management was introduced in the 1960s, when understanding of human and organisational psychology was less developed than today.

Safety management differs from quality management by focussing more on human and organisational factors because they dominate risks in all kinds of ways. [Reason 2001]

Safety management recognises that human and organisational errors cannot be eliminated. Safety Management Systems set up processes to improve communication about hazards and errors and take action to minimise risks.

Safety management differs from quality management by focussing more on human and organisational factors.

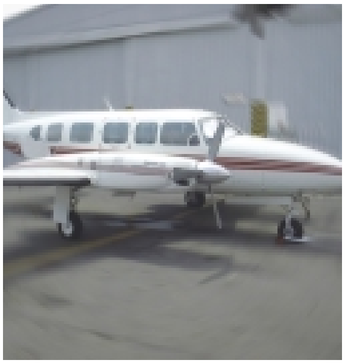
How much does it cost to set up a Safety Management System?

A Safety Management System need not be expensive, though it does require the allocation of some resources and time.

If you are a small operator, it may be possible to allocate the task of setting up and maintaining the Safety Management System to an existing employee. Larger organisations may need to hire a full-time safety manager.

There are likely to be small costs in record keeping and safety related literature. Given that the costs of even a minor aircraft incident are high, the cost of maintaining an effective Safety Management System are small.

Case study



VH-NDU Piper, Young NSW

On 11 June 1993, VH-NDU, a Piper PA31-350 Chieftain operated by Monarch Airlines, was on a landing approach to Young aerodrome in conditions of low cloud and darkness.

It struck trees, crashed, and was destroyed by impact forces and post-crash fire. All seven occupants were killed.

A combination of factors contributed to the accident. The weather conditions were poor, and there was inaccurate visual perception experienced by the handling pilot. The pilot had a high workload, made worse by aircraft equipment deficiencies and inadequate procedures.

Organisational failures on the part of Monarch Airlines included:

- Poor training of flight crew.
- Poor control of the safety of flight operations.
- Inadequate supervision of maintenance.
- Inadequate resources allocated to safety.

These failures were made worse because staff felt unable to discuss safety concerns with management.

These failures were made worse because staff felt unable to discuss safety concerns with management.

Also, communications between the regulator and the operator were ineffective.

Lessons learned:

A safety officer or safety group should consider the following lessons from this accident:

- Open, two-way communication is needed between all personnel.
- Commitment of resources and time is required to achieve high safety standards.
- A positive reporting culture is needed to highlight safety concerns to those able to resolve them.

En Route Lord Howe Island

On 2 October 1994, VH-SVQ, an Aero Commander 690B operated by Seaview Air, crashed into the Pacific Ocean killing all nine people on board. An extensive air and sea search failed to locate the aircraft or its occupants.

Even though the direct cause of the crash could not be determined, many contributing factors relating to the operation of Seaview Air, and its oversight by regulator, were identified.

Problems within Seaview Air included:

- The company was not licensed to operate regular public transport services on the route in question.
- There was little evidence of compliance with the recording and processing of defects.
- Evasion of regulations was common—as admitted by previous chief pilots.

Deficiencies on the part of the Civil Aviation Authority included:

- A lack of effective procedures to review the issue of Air Operators' Certificates and poor operator surveillance.
- Inadequate follow-up of safety hazards identified in Seaview Air's operation.

Many contributing factors relating to the operation of Seaview Air, and its oversight by regulator, were identified.

Lessons learned:

A safety officer or safety group should consider the following lessons from this accident:

- Commitment by all staff to achieve safety goals and objectives.
- Positive communication on safety issues between the operator and the regulator.
- WIllingness by staff to "do the right thing" as part of the way they do business.

2 Why do it?

Apart from the obvious safety benefits, a Safety Management System will help you:

- Market the safety standards of your operation.
- Guard against the direct and indirect costs of incidents and accidents.
- Improve communication, morale and productivity.
- Meet your legal responsibilities to manage safety.

Safety Management Systems make economic sense

Few organisations can survive the economic consequences of a major accident. Hence, there is a strong economic case for pursuing an integrated Safety Management System. There are three types of costs associated with an accident or incident: direct, indirect and industry/social costs.

Direct costs:

These are the 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, and aircraft equipment and property damage.

Few organisations can survive the economic consequences of a major accident.

Indirect costs:

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:

- **Loss of business and damage to 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 Safety Management System in place.

- **Legal and damages claims:** While you can take out insurance for public liability, it is hard to cover the costs of lost time handling legal action and damages claims. You must take action to protect your interests and to do so will cost you time as well as money.

- **Surplus spares, tools and training:** If you 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.

- **Increased insurance premiums:** An accident will push you into a higher risk category for insurance purposes, and therefore could result in increased premiums. The implementation of a Safety Management System could help you negotiate a lower premium.

- **Loss of staff productivity:** If people injured in an accident are unable to work, under Australian law they must still be paid. They will also need to be replaced in the short term – again a substantial cost in terms of wages (and possibly training) as well as management time.

- **Aircraft recovery and clean up:** This is often an uninsured cost and has to be met by the operator.

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

- **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.

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

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

The implementation of a Safety Management System could help you negotiate a lower insurance premium.

Direct and indirect costs compared:

A comparison of direct and indirect costs of a light twin aircraft (indicative only, April 1998).

Event	Direct cost	Indirect cost
Taxiing aircraft wing hits tail of parked Aircraft	$4,500 (Repair)	$19,000 Cross hire; aircraft
Pilot Fired		Unfair dismissal claim
Aircraft attempts take-off with binding brakes	$5,500 (Parts and labour)	$5,200 (Aircraft cross hire)
Propeller strikes ground on go-around following near wheels-up landing	$20,500 Two propeller overhauls Two engine strips	$16,200 Aircraft cross hire Rescue and ferry

Why do it?

The industry/social cost of aviation accidents in Australia was $112 million in 1996

Industry/ social costs:

The Bureau of Transport and Communications Economics found that the industry/social cost of aviation accidents in Australia in 1996 was $112 million. [BTCE 1998]

Over one-third of this cost is made up of the loss to society of the productive capacity of the victims of aviation accidents. A quarter is attributable to damage to aircraft, and a fifth to family and community loss.

Who pays?

For an individual operator, the insurance company may pay, but often the insurance excess is greater than the cost of the damage. The operator often bears almost all of the costs. In 1996, insurance administration made up 3 per cent of the total cost of aviation accidents. [BTCE 1998]

The excess on an insurance policy for a $2 million commuter aircraft is usually 1-2 per cent of the hull value ($20,000-$40,000). Add the indirect costs, and an operator could easily get into financial difficulties. That makes the investment of maintaining an effective Safety Management System very good value.

Improved communication, morale and productivity:

Successful Safety Management Systems are characterised by good communication between management and the rest of the organisation. This enhances safety and can lift morale and, in some cases, productivity.

As communication failures are commonly identified as a source of problems for organisations, having a focus for improving communication can only result in improved performance at all levels. [Hudson 2001]

Marketing advantages:

There are significant marketing advantages in being seen as an organisation with high safety standards. A good safety reputation can contribute to profitability and repeat business.

Increasingly, aviation organisations are required to submit to an external safety audit when bidding for large charter contracts. Because of improved safety practices, operators with Safety Management Systems are more likely to perform well in an audit and be awarded the job.

Legal responsibilities

Recent inquiries into commercial aviation have stressed the need for management to take responsibility for safety, and the need for the aviation industry and the regulator to do more to identify safety deficiencies and reduce the potential for accidents.

Increasingly, Australian law is placing responsibility for safety at senior management level of organisations. This includes maintenance organisations, flying operators and aerodromes.

Section 28BE of the *Civil Aviation Act 1988* puts the main responsibility for flying safety on the shoulders of the Air Operator Certificate holder, and any company directors associated with the AOC.

Clearly management can no longer remain legally "aloof" from the actions of employees.

One proven way of improving safety – and meeting legal requirements – is for operators to take a leadership role in building a Safety Management System designed to manage safety risks.

The Civil Aviation Act (1988): Section 28BE

(1) The holder of an Air Operator's Certificate (AOC) must at all times take all reasonable steps to ensure that every activity covered by the AOC, and everything done in connection with such an activity, is done with a reasonable degree of care and diligence.

(2) If the holder is a body having legal personality, each of its directors must also take the steps specified in subsection (1).

(3) It is evidence of a failure by a body and its directors to comply with this section if an act covered by this section is done without a reasonable degree of care and diligence mainly because of:

- **(a)** Inadequate corporate management, control or supervision of the conduct of any of the body's directors, servants or agents; or
- **(b)** Failure to provide adequate systems for communicating relevant information to relevant people in the body.

Increasingly, Australian law is placing responsibility for safety at senior management level of organisations.

Wheels-up landing wipes out profit

Consider the situation of a six-seat twin-engine aircraft like a Cessna 310. Assume that the aircraft's value is $190,000 and it is insured for charter category.

Again, let us assume that the aircraft is doing 500-600 hours per year. At a charter rate of $350 per hour, the organisation may make about $60 per hour if it is very well organised. For 550 hours per year, the annual profit might be around $33,000.

Even with a minor accident, such as a wheels-up landing, the annual profit could be wiped out completely. Consider some of the uninsured costs resulting from an actual wheels-up accident that resulted in two damaged propellers and minor damage to the underside of the aeroplane.

These costs are set out in the table below.

Even with a minor accident, such as a wheels-up landing, the annual profit could be wiped out completely.

	Item	Cost $
1	Excess	19,000*
2	Difference in insurance payout and cost of repairs	5,000
3	Loss of profit	5,076
4	Loss of no-claim bonus	760
5	Management/supervision time	3,200
6	Charter completion	2,200
7	Extra accommodation	800
8	Loss of aircraft value through accident history	10,000
9	Clean-up costs	1,000
	TOTAL	**$ 47,036**

* The amount for the excess will vary according to your negotiated insurance agreement. This figure has been taken from an actual incident.

Looking at each of these items:

- **Item 1** is the excess that must be paid in the case of any claim. The actual amount will depend on your negotiated insurance agreement.
- **Item 2** is the difference between what the insurance company is prepared to pay and the repair job you are prepared to settle for. Usually insurance companies will take the cheapest quote, whereas you may not wish to settle for what could be an inferior job.
- **Item 3** is the loss of profit based on having the aircraft out of the air for eight weeks for repairs.
- **Item 4** is the loss of no-claim bonus that will occur if there is any claim on the insurance.
- **Item 5** is the time which otherwise would be charged out for company employees.
- **Items 6 and 7** result from inconveniencing passengers. To maintain continuity of business, it is important to complete the charter and ensure that clients are happy in the meantime.
- **Item 8** takes into account that whenever an aircraft has an accident, its value is decreased because of the fact that it has an accident history.
- **Item 9** is the estimated cost of cleaning up the accident site.

Not included in this calculation is the fact that in many instances, an insurance company will only pay the cost of propellers on a pro-rata basis; that is, they will only pay the value of the remaining life in the propeller blades.

For example, if the propeller blades have a 2000 hour life and the accident occurs 1000 hours into that life, the insurance company may only pay for half the cost of the new blades. You pay the full cost of the propellers. The timing of your payment can have a significant effect on medium-term cash flow.

In the situation outlined above, you would have to add a further $10,000 to the immediate costs. The immediate costs in the table are those costs for items 1–9, which total to $47,036. Add to this the pro rata cost of the propellers of around $10,000 (say mid-life), and the total becomes $57,036 - around one-and-a-half year's profit.

The excess that must be paid in the case of any claim will depend on your negotiated insurance agreement.

3 Conclusion

Safety Management Systems are an integrated set of work practices, beliefs and procedures for monitoring and improving the safety and health of all aspects of your operation.

They can be implemented in any organisation regardless of size.

Experience has shown that Safety Management Systems make good economic sense, provide marketing advantages and can lead to improved communication, workplace morale and productivity.

Contact Information

For general information, visit CASA's website: www.casa.gov.au

For Safety Management Systems information visit:
http://www.casa.gov.au/avreg/business/sms/index.htm

or Call CASA's Safety Promotion Division, ph: 131 757 (local call)

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