



Safety Regulation Group

SAFETY MANAGEMENT SYSTEMS – GUIDANCE FOR SMALL, NON-COMPLEX ORGANISATIONS

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1 WHY DO I NEED A SAFETY MANAGEMENT SYSTEM?

- 1.1 In recent years our understanding of how accidents and incidents happen has improved. More emphasis is now placed on the causal factors involved and the organisational factors that contribute to errors being made. Organisational factors include how an organisation operates, how it sets out its procedures, how it trains its staff and what level of importance it gives to safety issues identified within the organisation.
- 1.2 A Safety Management System (SMS) allows you to take a proactive approach to safety by identifying some of these causal factors and taking action before an event happens. SMS helps you to have a greater understanding of the hazards and risks affecting the safety of your organisation. These hazards and risks could have a severe impact on your organisation in terms of financial cost and reputation. An SMS is an effective way to take your organisation beyond compliance with the regulations.
- 1.3 The International Civil Aviation Organization (ICAO) requires organisations to have an SMS and the CAA already requires some organisations (such as aerodromes and air navigation service providers) to have an SMS in place as part of their licence requirements. In the near future the European Aviation Safety Agency (EASA) will also mandate organisations that fall within its scope to have an SMS in place.

2 WHAT IS A SAFETY MANAGEMENT SYSTEM?

- 2.1 An SMS is an organised approach to managing safety. It sets out the organisation's structure, identifies the accountabilities and responsibilities of key staff members and documents the policies and procedures to manage safety effectively. An effective SMS allows the hazards and risks that could affect your organisation to be identified, assessed and prioritised so that appropriate mitigation measures can be put in place to reduce the risks to as low as reasonably practicable (ALARP).
- 2.2 A risk may be described as ALARP if you have taken all reasonable action to mitigate the risk and the cost (in terms of time, effort and money) of taking further action would be 'grossly disproportionate' to any further reduction in the level of risk. Reducing a risk to ALARP does not mean that the risk has been eliminated as some level of risk still remains; however, the organisation has accepted the risk.
- 2.3 There is a lot of advice and guidance on SMS already available. Whilst you may find it useful to review this material, small organisations are encouraged to use this document in conjunction with ICAO Document 9859 Safety Management Manual as their principal sources of guidance on SMS.

3 HOW IS A SMALL ORGANISATION DEFINED?

- 3.1 This guidance material is written for small, non-complex organisations. Whether or not this guidance material is suitable for your organisation will depend on various factors including the size, complexity and level of risk associated with your activities. Organisations should liaise with your assigned regulatory point of contact to confirm whether this guidance material is suitable for you.

Factors to consider include:

Number of employees
Number and complexity of aircraft types operated or maintained
Number of bases
Number of aircraft movements
Number of approvals and ratings held
Length of runway
Instrument arrival or departure procedures
Environmental factors

- 3.2 Implementing an SMS may initially appear to be a daunting task, however, it is likely that some of the key elements that make up an SMS are already in place, but perhaps not formalised or clearly documented. The structure and content of an SMS should be essentially the same for any organisation but the level of detail should reflect the size, complexity and level of risk faced by your organisation. It is important to realise that there is no “one size fits all” in terms of SMS development and implementation; what is important is to develop an SMS that works for your organisation and is effective.

4 WHAT ARE THE KEY COMPONENTS AND ELEMENTS OF AN SMS?

- 4.1 This guidance material describes the key elements of an SMS. We have also included key points that will help you implement your SMS.

- 4.2 The four key components are further divided into twelve elements:

- **Safety Policy and Objectives**
 - Management commitment and responsibility
 - Safety accountabilities
 - Appointment of key staff members
 - Emergency response planning
 - SMS documentation
- **Safety Risk Management**
 - Hazard identification
 - Risk assessment and mitigation
- **Safety Assurance**
 - Safety performance monitoring and measurement
 - Management of change
 - Continuous improvement
- **Safety Promotion**
 - Training and education
 - Safety communication

- 4.3 An effective SMS requires all these elements to be in place. To what degree these elements are in place will depend on the size and complexity of your organisation, and also the maturity of your SMS. As this guidance material is generic and intended for all smaller non-complex organisations, how you implement these key components will depend on your particular circumstances.

5 SAFETY POLICY AND OBJECTIVES

5.1 Management commitment and responsibility

For your SMS to be effective it will require the allocation of both time and resources. It requires the senior management to show commitment and take responsibility for your organisation's SMS. Without this the SMS will not function effectively.

The management's commitment to safety should be expressed in a written safety policy. The policy should set a clear, high-level direction for your organisation to follow in order to manage safety effectively and should be endorsed by the Accountable Manager.

The safety policy should be read and understood by all staff members and be reflected in actions as opposed to impressive words just cut and pasted into a document. The Accountable Manager should actively demonstrate his or her commitment to the policy. This will help contribute to the creation of a positive safety culture within your organisation, which is essential to the success of your SMS. With a positive safety culture all staff members should be responsible for safety, and consider the safety implications of everything they do.

Key Point: Your safety policy should be individual, reflecting your organisation. As a minimum it should:

- *Outline your organisation's fundamental approach to safety;*
- *Show a senior management commitment to safety;*
- *Show a commitment to provide adequate resources to manage safety effectively and to reduce risks to 'as low as reasonably practicable';*
- *Encourage all staff members to actively participate in and fulfill all aspects of the SMS;*
- *Encourage a positive safety culture within the organisation.*

An example of a safety policy showing the level of detail required can be found in Appendix A to this guidance material.

5.2 Safety accountabilities

Your organisation's management structure should be clearly defined. For small organisations this structure may be fairly simple and consist of the person in charge (Accountable Manager) and other key staff members who have a role in how the organisation is managed on a day-to-day basis. The accountabilities and responsibilities of the Accountable Manager and key staff members should be clearly understood.

The Accountable Manager should normally be the person ultimately accountable for safety and who is involved in the day-to-day management of the organisation. It is essential that the Accountable Manager has the authority and budgetary control to make safety related decisions and take any appropriate actions to maintain safety.

Key Point: The responsibility for safety issues can be delegated as appropriate, however, the Accountable Manager remains ultimately accountable for safety within the organisation at all times.

Key Point: Small organisations should complete an organisational chart showing the key positions with their responsibilities and the lines of accountability within the organisation.

5.3 Appointment of key staff members

Your organisation should identify an individual who is the focal point for the SMS. In small organisations this task may be carried out by the Accountable Manager or delegated to a member of staff as a part-time role as appropriate.

Key Point: A person in your organisation should have the role of managing the SMS and report directly to the Accountable Manager.

Depending on the size of your organisation, the SMS focal point may need to be supported by a Safety Committee. For a small organisation a Safety Committee could consist of a few key members of staff and appropriate people from other organisations or groups that interface with your organisation.

Key Point: It is important that the relevant people both within your organisation and those that interface with it, meet to discuss safety related issues on a regular basis.

5.4 Emergency response planning

An Emergency Response Plan (ERP) should be established that describes the actions to be taken by staff in an emergency. Many small organisations will already have an ERP as part of their licensing requirements and you should continue to comply with these requirements.

As a minimum the ERP should describe procedures for:

- An orderly transition from normal to emergency operations;
- Designation of emergency authority (who will take charge out of hours or at the weekend?);
- Assignment of emergency responsibilities (what happens when that person is away or on leave?);
- Coordination of efforts to resolve the emergency (who is going to call the emergency services?);
- Safe continuation of operations or return to normal operations as soon as practicable.

The ERP should identify the responsibilities, roles and actions for staff members involved in dealing with emergencies within your organisation and consider any outside agencies or third party contractors affected. For some organisations there may be regulatory requirements already set for the ERP or contingency planning.

Key Point: The ERP should be available and understood by all key staff members and practiced on a regular basis to ensure that everyone is aware of their responsibilities and required actions and are competent to carry out appropriate actions in an emergency.

Key Point: Laminated cards or checklists with appropriate contact numbers could be held by key staff members to assist them in the actions required during an emergency.

Key Point: It is important to coordinate your ERP with other organisations that you interface with, including the emergency services that may attend an emergency and third party organisations that are contracted to your organisation.

5.5 SMS documentation and control

All aspects of your SMS should be clearly documented in order to keep an accurate record of why decisions were made, why actions were taken and why any changes were implemented. Your documentation should be controlled and in a suitable format so that it can be clearly understood by staff members in your organisation, any third party organisations that are contracted to work with you and the CAA. Templates and examples are provided in the appendices to this guidance material that may be useful. Clear documentation will also allow your SMS to be easily audited or assessed.

As a minimum, SMS documentation should include:

- The safety policy and objectives of the SMS;
- The accountabilities and responsibilities of the Accountable Manager and key staff members;
- Any safety-related processes, procedures or checklists;
- The results and subsequent actions from any safety audits or assessments;
- The results of any risk assessments and mitigation measures in place;
- A hazard log (an example of a hazard log/risk assessment can be found in Appendix B to this guidance material).

You may find it useful to create a separate SMS manual for your organisation or it may be easier to document your SMS within existing manuals. An example of a contents page for an SMS manual can be found in Appendix C to this guidance material. Other documents may be held either as hard copies or electronically. However you keep a record of your SMS, the system should be reliable and secure, for example information technology systems should be backed up and protected from damage and enable easy access and retrieval of this information.

6 SAFETY RISK MANAGEMENT

6.1 Introduction to safety risk management

The safety risk management process starts with identifying the hazards affecting the safety of your organisation and then assessing the risks associated with the hazards in terms of likelihood (what is the likelihood of the risk happening?) and severity (if the risk occurs how bad will it be?). Once the level of risk is identified, appropriate remedial action or mitigation measures can be implemented to reduce the level of risk to as low as reasonably practicable. The implemented mitigation measures should then be monitored to ensure that they have had the desired effect.

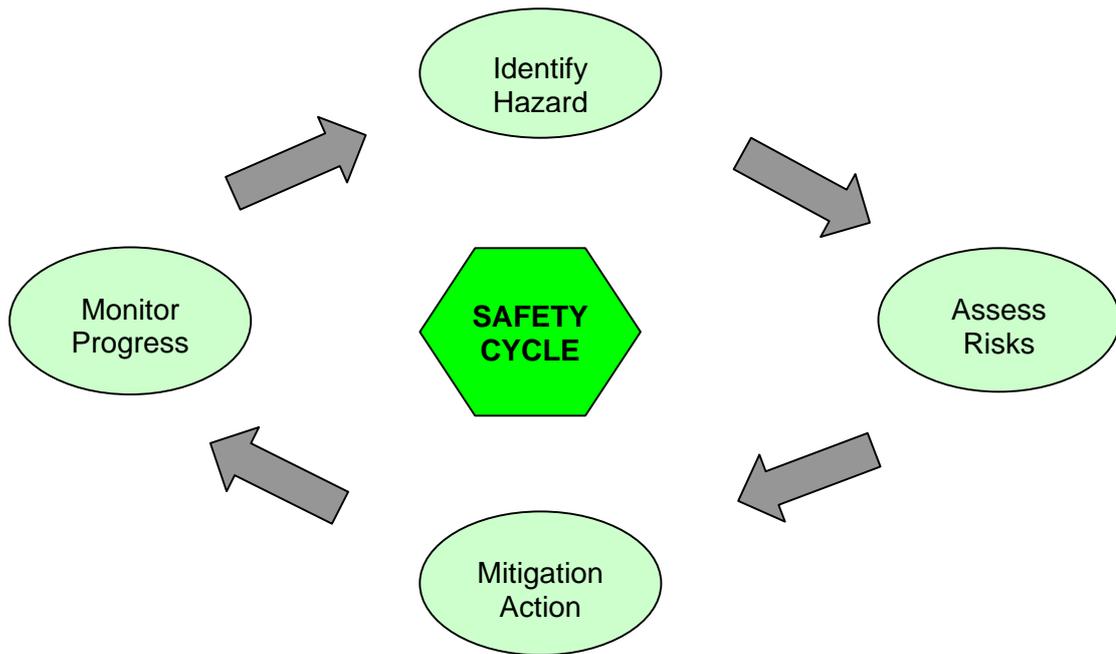


Figure 1 Simple safety risk management process

A **Hazard** is simply defined as a condition, event or circumstance that has the potential to cause harm to people or damage to aircraft, equipment or structures.

A **Risk** is defined as the potential outcome from the hazard and is usually defined in terms of the likelihood of the harm occurring and the severity if it does.

For example:

A thunderstorm is a hazard to aircraft operations. One associated risk with this hazard is that an aircraft is struck by lightning and suffers a failure of the electrical system on the aircraft.

Bird activity in or around an aerodrome is a hazard to aircraft operations. One risk associated with this hazard is that a bird strike causes an aircraft engine to fail and the aircraft crashes.

In general a hazard is around in the *present* whereas the risk associated with it is a potential outcome in the *future*.

6.2 Reporting systems

Hazards can only be controlled if their existence is known. Through a safety reporting system, underlying situations or conditions that have the potential to endanger the safety of aircraft operations can be identified. Safety reporting can be reactive (from an event that has happened) or proactive (from a potentially unsafe situation being identified) or predictive (trying to predict what might happen in the future).

Internal voluntary reporting of less significant incidents, which may not necessarily be required to be reported under the CAA Mandatory Occurrence Reporting (MOR) scheme but are very useful to your organisation, should be actively encouraged. Greater levels of reporting, even what may be classified as minor issues, will allow you to monitor the safety performance of your organisation and to identify developing safety trends.

All staff members within your organisation and staff members of other organisations that interface with you need to actively participate in the safety reporting system. All stakeholders and users need to be clear about how to report, what to report and who to report to. Information from the reports can then be used to identify safety risks so that appropriate action can be taken. An example of a suitable template for an internal Safety Reporting Form can be found in Appendix D to this guidance material.

The reporting system should use the information provided to enhance safety rather than to apportion any blame if genuine errors or mistakes have been made. To encourage reporting without fear of repercussion it is important that staff members feel that there is an open and just culture within your organisation. It is also important that adequate feedback is given to the person reporting an incident.

Key Point: It is important to remember that hazard identification is not a static, one-off process; it needs to be performed whenever you plan an organisational change, your organisation is undergoing rapid expansion or contraction, you introduce new equipment or procedures, changes to key staff members are taking place or whenever you think there is a possibility that a new risk may be created.

Key Point: To encourage staff to report potential hazards your organisation should have a safety reporting system that is just, confidential, simple and convenient to use. In a just safety reporting system, employees should not be punished for unpremeditated or inadvertent errors or lapses. Instead the reasons for the errors or lapses should be investigated so that safety lessons can be learnt.

6.3 Hazard identification

A hazard identification process is the formal means of collecting, recording, analysing, acting on and generating feedback about hazards that affect the safety of the operational activities of your organisation. In a mature SMS hazard identification is an ongoing process.

There are many ways of identifying hazards and depending on the size of your organisation, the following methods may be useful:

- Brainstorming, where your Safety Committee or small groups meet to identify possible hazards;
- Data from previous accidents and incidents;
- Mandatory/voluntary incident reporting schemes (internal and external);
- Internally or externally conducted safety assessments/audits;
- Safety information from external sources; i.e. similar organisations, media, AAIB, CAA etc.
- Generic hazard checklists.

6.4 Risk assessment and mitigation

The purpose of the risk assessment process is to allow your organisation to assess the level of risk associated with the identified hazards in terms of the potential harm. Risks should be assessed in terms of severity and likelihood. Once you have assessed the risk in terms of severity and likelihood, a simple risk assessment matrix can be used to determine the overall level of risk. Depending on the level of risk, appropriate mitigation measures can be taken to either eliminate the risk or reduce the risk to a lower level or as low as reasonably practicable, so that it is acceptable to your organisation. Mitigation measures should be implemented to reduce the likelihood of the risk occurring or reduce the severity of the outcome if it does.

The assessment process also allows the risks to be ranked in order of risk potential so that priorities can then be established and resources can be targeted more effectively at the higher-level risks. Figure 2 shows a simple risk assessment process and an example of how the process could work is shown in Appendix B to this guidance material.

Key Point: It is important to include people with the relevant expertise and experience in the risk assessment process to ensure the robustness of the process. All risk assessments are reliant on the quality of the information used to make the assessment, and the knowledge of the people conducting the assessment.

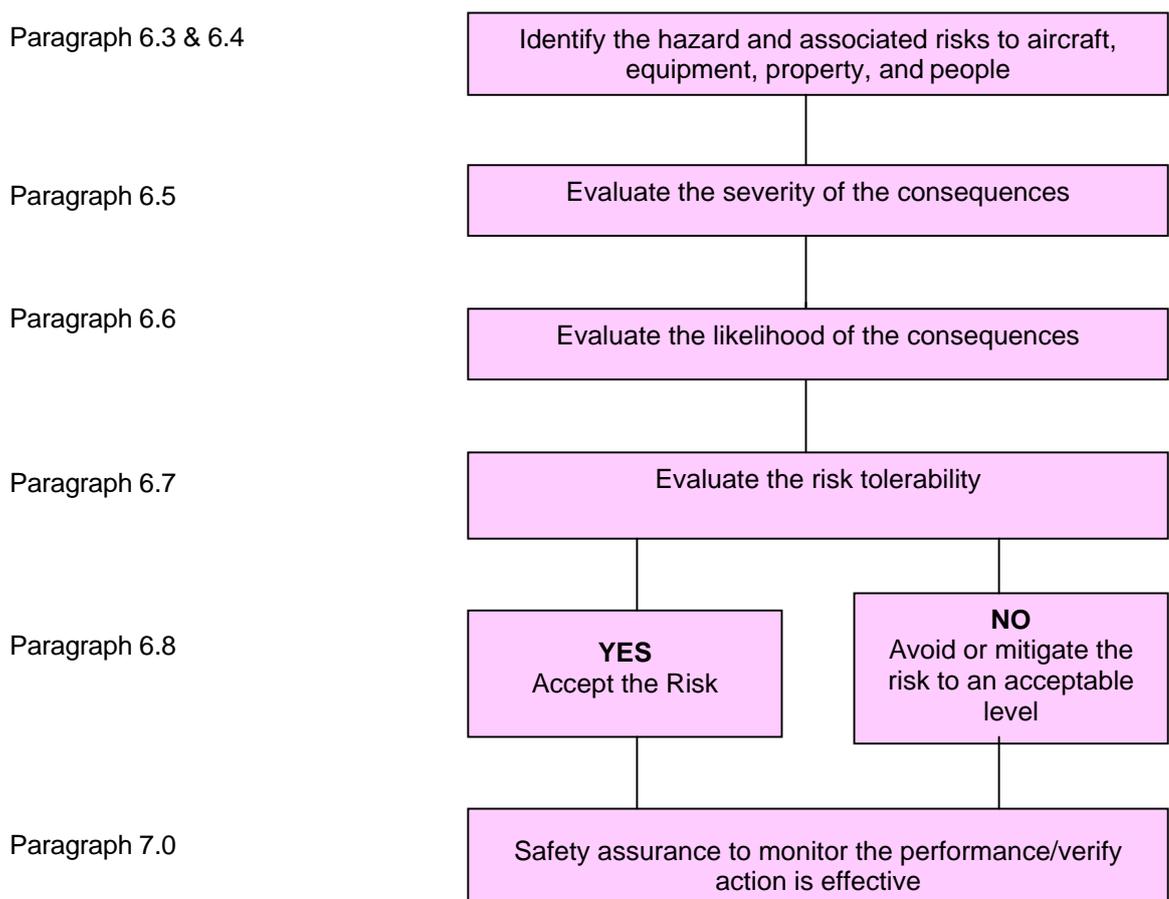


Figure 2 Simple risk management process

The risk assessment process starts with identifying the risk(s) associated with the hazards you have previously identified. There may be more than one risk associated with a particular hazard and a risk assessment may need to be conducted for each risk.

6.5 Risk severity

The risk will need to be assessed in terms of its severity (if it happens how bad will it be?). In order to assess the severity you should take into account any mitigation measures that are currently in place to reduce the severity. You should assess the severity in terms of the worst possible realistic scenario.

To help assess the severity you should ask the following questions:

- Would lives be lost (employees, passengers, by-standers)?
- What is the likely extent of property or financial damage?
- What is the likelihood of environmental impact (fuel spillage, physical disruption to the natural habitat)?
- What are the likely commercial implications or media interest?
- Would there be a loss of reputation?

To help define the severity Appendix B, Figure 2 gives an example of a severity table that could be used, or you may decide to define the severity in another way.

6.6 Risk likelihood

The risk will also need to be assessed in terms of its likelihood (what is the likelihood of the risk occurring?). In order to assess the likelihood you should take into account any mitigation measures that are currently in place to reduce the likelihood. Defining the likelihood is sometimes more difficult as it is not an exact science. It will rely on a logical, common sense analysis of the risk to arrive at a reasonable answer.

To help assess the likelihood you should ask the following questions:

- Is there a history of similar occurrences (either in your organisation or in other organisations known to you) to the one under consideration, or is this an isolated occurrence?
- What other aircraft, equipment or components of the same type might have similar defects?
- How many people are involved and how frequent is the activity?

To help define the likelihood Appendix B, Figure 3 gives an example of a likelihood table that could be used, or you may decide to define the likelihood in another way.

6.7 Risk tolerability

When the severity and likelihood have been defined, a Risk Tolerability Matrix can then be used to assess how tolerable the risk is. An example of a Risk Tolerability Matrix can be found in Appendix B, Figure 4.

Using a risk tolerability matrix the risk can then be classified as either acceptable, to be reviewed or unacceptable allowing a suitable risk mitigation strategy to be developed if required.

Unacceptable: If the risk is unacceptable, the operation or activity should stop immediately or not take place. Major mitigation will be necessary to reduce the severity if the risk actually occurs or reduce the likelihood of the risk occurring. Normally it is the likelihood of the occurrence that can be reduced rather than the severity.

Review: If the risk falls into the review category, the severity or likelihood of occurrence is of concern; measures to mitigate the risk to as low as reasonably practicable (ALARP) should be sought. Where the risk is still in the review category after this action has been taken it may be that the cost of actions required to reduce the risk further are too prohibitive. The risk may be accepted, provided that the risk is understood and has the endorsement of the Accountable Manager.

Acceptable: If the risk is acceptable the consequence is so unlikely or not severe enough to be of concern; the risk is acceptable. However, consideration should still be given to reducing the risk further.

6.8 Risk mitigation

If the level of risk falls into the unacceptable or review categories, mitigation measures will be required to reduce the risk to a level as low as reasonably practicable (ALARP).

Mitigation measures are actions or changes, such as changes to operating procedures, equipment or infrastructure, to reduce either/both the severity and/or the likelihood.

Generally risk mitigation strategies fall into three categories:

Avoidance: The operation or activity is cancelled or avoided because the safety risk exceeds the benefits of continuing the activity, thereby eliminating the risk entirely.

Reduction: The frequency of the operation or activity is reduced or action is taken to reduce the magnitude of the consequences of the risk.

Segregation: Action is taken to isolate the effects of the consequences of the risk or build in redundancy to protect against them.

For example: For aircraft operations into an aerodrome without the necessary ground navigation aids and surrounded by high mountains there is a risk that an aircraft could crash into the high ground. Action to mitigate the risk could include:

Avoidance: Cancel all operations to the aerodrome (eliminates both the severity and likelihood);

Reduction: Limit operations to the aerodrome in daylight only (reduces the likelihood);

Segregation: Operations to the aerodrome are limited to aircraft equipped with additional navigation equipment and procedures (reduces the likelihood).

6.9 Hazard log

Any identified safety hazards, risk assessments and subsequent follow up actions need to be clearly documented. An acceptable way to do this is by creating a hazard log or risk register. The log or register should include each identified hazard, the associated risk(s), results of the risk assessment taking into account any current mitigation measures in place, further risk mitigation measures if required and a re-assessment of the risk once the mitigation measures have been implemented, to assess whether they have achieved the desired outcome. The hazard log is a working document and should be reviewed regularly, especially during any Safety Committee meetings. The hazard log forms part of your organisation's SMS documentation. Examples of a suitable hazard log and risk assessment can be found in Appendix B to this guidance material.

7 SAFETY ASSURANCE

7.1 Introduction to safety assurance

Safety assurance monitors the performance and effectiveness of your SMS. This will ensure that your hazard identification, risk assessment and mitigation process is being followed effectively and that appropriate mitigation measures are being implemented and working as intended.

Key Point: The safety assurance element gives confidence that for all identified hazards the mitigation measures applied are implemented and achieve their intended objectives.

7.2 Safety performance monitoring and measurement

For your organisation to manage safety performance you need to measure it in some way and for that you need safety data. The first step is to identify what safety performance indicators (SPI) will be used. An SPI is a measure of how safe your organisation is. What SPIs you measure will depend on your particular organisation but some examples are given below.

Key point: Organisations should review the UK State SPIs detailed in the CAA safety Plan (CAP786) as these may provide ideas for organisational SPIs.

7.3 Sources of safety data

Sources of safety data that can be used as SPIs include the number of:

- Hazard and incident reports;
- Warranty claims and customer complaints;
- MORs, such as runway incursions or bird strikes;
- Customer/contractor surveys;
- Safety survey or safety audit findings;
- AAIB reports.

Safety performance targets may be difficult to define and it will be more important to investigate individual events and look for trends in the limited data available. A review of events/incidents/accidents elsewhere, such as AAIB reports and reports from other similar organisations may also prove useful.

7.4 The management of change

The operation of your organisation is dynamic and changes will frequently occur. A simple process should be introduced to help identify potential hazards and to assess the safety impact of any significant changes made. Changes include the introduction of new equipment, changes to facilities or scope of work, introduction of new aircraft or routes, new contracted services, new procedures or changes to key staff members. Are your existing procedures and documentation adequate or do they need to be amended? Have staff members received adequate training and are your organisation's user groups aware of any changes?

7.5 Incident management

Incidents will inevitably occur and these can provide a valuable learning opportunity for your organisation. In an effective SMS a process should be in place to learn from any incident and implement any changes that may be required. Therefore, your organisation should establish a process to ensure that each incident/accident is investigated. The level of investigation should reflect the significance of the event. The investigation should include what happened, when, where, how and who was involved. It should also try to understand why. It is important to establish the facts and avoid speculation.

Key Point: You should try to be objective, it's about finding out why it happened to prevent it recurring rather than finding someone to blame.

Key Point: Your Safety Committee should review the findings from all incidents and recommend improvements if required. Safety lessons should be shared both within your organisation and those relevant organisations that you interface with.

7.6 Continuous improvement of the SMS

Your SMS should be an integral part of your organisation. It should be dynamic rather than static and it should aim to continually improve the safety performance of your organisation.

7.7 Safety assurance and compliance monitoring of the SMS

As part of your SMS there will be a need to establish a compliance monitoring function (for certain organisations this would be part of a Quality Management System). The compliance monitoring function is ideally an independent assessment to assure that the SMS is effective and working.

This requires monitoring of the following:

- A review of how your organisation complies with the published requirements for an SMS;
- Verification that the mitigations and controls that have been put into place to control identified hazards are robust and effective;
- An assessment of the effectiveness of the procedures and processes in your SMS Manual as described, and how they are implemented and practiced.

There should be a closed loop process to ensure identified problems are corrected. Audits should also include assessments of other organisations that interface with your organisation and could affect safety.

Key Point: In a small organisation where everyone may be involved in the SMS it will be challenging to establish an independent review or audit. In such cases independent external auditors could be sought or arrangements made with other external organisations.

Key Point: As the compliance monitoring system helps to monitor the safety performance of the organisation it is important that the Accountable Manager is involved and monitors the system and what it reveals.

Key Point: As an approved organisation there may be specific requirements that dictate what is acceptable as a compliance monitoring system and this guidance should be read in context with those specific requirements.

8 SAFETY PROMOTION

8.1 Safety training and education

Everyone within your organisation has a responsibility for aviation safety. It is important that all staff members are competent to carry out their safety roles and responsibilities. This is achieved through training and ongoing assessment of individuals. This training should include the organisation's SMS, safety policy, reporting procedures, safety responsibilities and how individuals can contribute at all levels. Safety training should include periodic refresher training.

Key Point: For all staff members, a record of their training should be held.

Key Point: Effective safety promotion should result in all staff being actively encouraged to identify and report hazards.

Key Point: All staff should be aware of the safety hazards connected with their duties.

Key Point: Lessons arising from investigations should be disseminated effectively.

8.2 Safety communication

It is important that all staff members, either employed or volunteers, are fully aware of the SMS and any safety matters affecting your organisation. Relevant safety information should also be distributed to other users and contractors working for your organisation.

Effective communication ensures that all staff members are fully aware of the SMS including safety-critical information related to analysed hazards and assessed risks. All staff members should understand why particular actions are taken and why safety procedures are introduced or changed.

Regular staff meetings where information, actions and procedures are discussed may be used for the purpose of communication on safety matters.

Key Point: This can easily be achieved through meetings, safety bulletins, information sheets or newsletters clearly displayed in prominent positions or distributed via post, e-mail and on your organisation's website. Efforts should be made to share best practice and relevant safety-related information with other similar organisations.

9 HOW DOES MY ORGANISATION IMPLEMENT AN EFFECTIVE SMS?

9.1 Gap analysis

The previous sections have described the basic component parts that make up an SMS. Most organisations will already have some of these components in place. It is also not expected that your SMS will be fully functioning overnight; it will take time and effort to integrate these SMS components into your organisation for them to be fully effective.

It is recommended that you assess your organisation to identify what components are in place and what components need to be implemented or strengthened. A “Gap Analysis” is a useful method to achieve this. To help you assess each component within your organisation a set of assessment questions is provided in Appendix E to this guidance material.

9.2 Implementation plan

From your gap analysis an implementation plan can then be developed to implement the remaining relevant components over time in a logical and structured way. Although your plan should have an implementation timeline you should be realistic, as you will find certain components more difficult to implement than others.

Remember:

- A mature SMS will take time to fully implement.
- It is important that all staff members should have the opportunity to contribute to the development of the SMS.
- If in doubt contact your CAA Inspector or Surveyor for advice.

Appendix A: Example safety policy

*Safety is a prime consideration at all times within ******

As the Accountable Manager it is my responsibility to ensure the safety of all our operations and services.

I will ensure that adequate resources are provided to manage safety effectively.

We encourage all our staff and stakeholders to report safety events or potential hazards however insignificant they may consider them at the time.

We have an open reporting culture that encourages free and frank reporting through a just culture.

We strive to achieve:

- *An accident free environment*
- *An effective safety management system and continuous improvement*
- *Full compliance with the statutory national and international regulations that apply to us that include ***** (Part 145, EU OPS, ANO etc)*
- *A commitment to reduce risks to as low as reasonably practicable*

These objectives are for the benefit of the company, its employees and its customers. To this end we have a shared responsibility to achieve these aims.

Safety is everyone's responsibility.

Signed by Accountable Manager

Signed

Appendix B: Example hazard log and risk assessment

Date: 19 April 2010

Owner: A Smith

Contact:

Participants: F Bloggs (Accountable Manager), T Jones (Chief Pilot), A Smith (Chief Engineer), B Edwards (Mechanic), B Simms (Private pilot)

Reported by: B Edwards

Contact:

Date Reported: 2 March 2010

MOR filed (yes/no): Yes

Follow up review date: 19 July 2010

Identified Hazard	Associated Risk	Existing Mitigation Measures in Place	Current Level of Risk	Further Mitigation Measures	Revised Level of Risk	Action By
<i>Incorrect maintenance action: Wire locking missing from aileron system connecting rod. (Safety report form number 046).</i>	<i>Connecting rod detaches causing loss of control of aircraft.</i>	<i>Aircraft Service Manual instruction to wire lock the connecting rod bolt. Duplicate engineering inspection required.</i>	<i>Severity 5 Likelihood 3 Unacceptable</i>	<i>Reiterate Adherence to Aircraft Service Manual and Independent Inspections. Introduction of staged worksheets for breakdowns. Implementation of a Maintenance Error Management System (MEMS).</i>	<i>Severity 5 Likelihood 2 Review</i>	<i>A Smith</i>

Figure 1 Example hazard log and risk assessment

Example hazard identification and risk assessment process for a small aircraft maintenance organisation:

Identifying a hazard: Small Aircraft Maintenance Ltd is an organisation performing maintenance on fixed wing aircraft below 2730 kg. During routine maintenance an engineer found wire locking missing on the attachment bolt of a connecting rod for the aileron system. He reported the finding on a safety report form (Appendix D). An incident investigation was carried out which concluded that the error occurred during an aircraft maintenance check some weeks before. The error occurred due to time pressure because the aircraft maintenance check was running late and the aircraft was required for a flight. Since then the aircraft had completed a number of sectors.

Associated risk: The Safety Committee of Small Aircraft Maintenance Ltd comprises the Accountable Manager, Chief Engineer, Chief Pilot, a private pilot and an engineer. The Safety Committee reviewed the safety report form and a risk assessment was carried out (Figure 1). The Safety Committee defined the hazard as incorrect maintenance action and identified a possible risk of the connecting rod becoming detached causing a loss of control of the aircraft.

Existing mitigation: The mitigation measures in place to stop the connecting rod becoming detached included a maintenance manual reference to wire lock the bolt in place and a requirement for a duplicate inspection.

Appendix B: Example hazard log and risk assessment

Determining the current level of risk: The next stage was to determine the level of risk associated with the connecting rod becoming detached. How severe would it be if it happened and what was the likelihood of it happening?

Severity: Using the table in Figure 2 the severity was determined. It was relatively straightforward to determine that failing to wire lock the aileron connecting rod bolt could realistically lead to the connecting rod becoming detached, causing a loss of control and an aircraft accident. Although there were no previous similar incidents at Small Aircraft Maintenance Ltd, the Safety Committee were aware of previous accidents involving incorrect maintenance or critical aircraft systems. Therefore the severity was determined to be catastrophic (Severity Value 5).

SEVERITY OF CONSEQUENCES		
Aviation definition	Meaning	Value
Catastrophic	Results in an accident, death or equipment destroyed	5
Hazardous	Serious injury or major equipment damage	4
Major	Serious incident or injury	3
Minor	Results in a minor incident	2
Negligible	Nuisance of little consequence	1

Figure 2 Risk severity classifications

Determining the likelihood: Using the table in Figure 3 the likelihood of the connecting rod becoming detached was determined and this was more subjective. Determining the likelihood should be based on any current mitigation measures in place and the effectiveness of those measures related to the risk identified. The existing mitigation measures to stop the connecting rod becoming detached included an aircraft service manual instruction to wire lock the connecting rod bolt and a requirement for a duplicate inspection.

On this occasion both mitigation measures failed and although this sort of error is relatively rare there was evidence to support a conclusion that the likelihood of the connecting rod becoming detached in this particular case was *Remote* (Likelihood Value 3).

Appendix B: Example hazard log and risk assessment

LIKELIHOOD OF OCCURRENCE		
Qualitative definition	Meaning	Value
Frequent	Likely to occur many times	5
Occasional	Likely to occur sometimes	4
Remote	Unlikely to occur but possible	3
Improbable	Very unlikely to occur	2
Extremely improbable	Almost inconceivable that the event will occur	1

Figure 3 Risk likelihood classifications

Determining the risk tolerability: Using the risk assessment matrix in Figure 4, if the risk is determined to be *Catastrophic* (5) and *Remote* (3) the risk would be classified in the *Unacceptable* category.

Risk probability	Risk Severity				
	Catastrophic 5	Hazardous 4	Major 3	Minor 2	Negligible 1
Frequent 5	Unacceptable	Unacceptable	Unacceptable	Review	Review
Occasional 4	Unacceptable	Unacceptable	Review	Review	Review
Remote 3	Unacceptable	Review	Review	Review	Acceptable
Improbable 2	Review	Review	Review	Acceptable	Acceptable
Extremely improbable 1	Review	Acceptable	Acceptable	Acceptable	Acceptable

Figure 4 Risk Tolerability Matrix

UNACCEPTABLE: The risk is unacceptable and major mitigation measures are required to reduce the level of risk to as low as reasonably practicable.

REVIEW: The level of risk is of concern and mitigation measures are required to reduce the level of risk to as low as reasonably practicable. Where further risk reduction/mitigation is not practical or viable, the risk may be accepted, provided that the risk is understood and has the endorsement of the Accountable Manager.

ACCEPTABLE: Risk is considered acceptable but should be reviewed if it recurs.

Appendix B: Example hazard log and risk assessment

Further mitigation measures: As the risk was in the *Unacceptable* category, major mitigation measures were required to reduce the level of risk to as low as reasonably practicable. The Safety Committee identified a number of further mitigation measures (see Figure 1, further mitigation measures).

Revised level of risk: The risk was reassessed in terms of severity and likelihood taking into account the further mitigation measures introduced. With the new measures in place although the severity remained the same the conclusion was that the likelihood of the risk occurring was now *Improbable (2)*.

Using the risk assessment matrix in Figure 4, with the risk severity determined to be *Catastrophic (5)* and the likelihood of occurrence determined to be *Improbable (2)*, the risk was now classified in the *Review* category. Although the Safety Committee agreed that the risk had been mitigated to as low as reasonably practicable it was accepted that a level of risk still remained.

Safety assurance: As part of Small Aircraft Maintenance Ltd's safety assurance, the Safety Committee decided that all the critical flight control systems of aircraft they maintained should be inspected to see if there were any similar defects.

Safety training and communication: The Safety Committee also produced a Safety Bulletin to remind engineers of the importance of wire locking critical flight control systems and introduced a training session to highlight the new procedures for staged worksheets and the introduction of the Maintenance Error Management System (MEMS).

Appendix C: Example SMS manual contents page

1. Table of contents.
2. List of effective pages.
3. Distribution list.
4. Safety policy and objectives (*this section should include the safety policy signed by the Accountable Manager*).
5. Safety organisation (*this section should detail the management structure of the organisation*).
- 5.1 Scope of SMS and contracted activities (*this section should detail what the SMS covers and how it interfaces with other safety related parties*).
- 5.2 Safety accountabilities and responsibilities (*this section should detail the key safety staff members and the safety committee and safety accountabilities and responsibilities of all key staff members*).
- 5.3 Documentation of SMS (*this section should describe the way the SMS is documented and recorded*).
6. Hazard identification and risk management process (*this section should include the safety reporting and hazard identification process and how hazards and their risks are assessed and then managed and controlled*).
7. Safety assurance (*this section should include how the SMS and its outputs are audited. It should also include the safety performance monitoring and measurement process*).
8. Change management (*this section should detail how the organisation uses the SMS system to manage change*).
9. Emergency Response Plan (*this section should detail how the organisation would deal with an emergency situation and provide a quick reference guide for key staff members*).

Appendix E: Self assessment questions

	Guidance Ref		Compliance Y/ N / Partial	Comments / reference to compliance
Management commitment and responsibility	5.1	Is there a written safety policy endorsed by the Accountable Manager?		
	5.1	Do the Accountable Manager and Senior Management actively promote and demonstrate their commitment to the safety policy?		
	5.1	Has the safety policy been communicated effectively throughout the organisation?		
	5.1	Does the safety policy cover the points in this guidance material?		
Safety accountabilities	5.2	Are the safety accountabilities and responsibilities of the Accountable Manager and other key staff members clearly defined?		
	5.2	Does the Accountable Manager have full responsibility for the SMS and authority to make decisions regarding the budget?		
	5.2	Has the management structure of the organisation been defined?		
	5.2	Are all staff members aware of their safety roles and responsibilities?		
Appointment of key safety staff members	5.3	Has a focal point/Safety Manager for the SMS been appointed?		
	5.3	Is there a direct reporting line between the SMS focal point/ Safety Manager and the Accountable Manager?		
	5.3	Does the SMS focal point/ Safety Manager have the appropriate SMS knowledge and understanding?		
	5.3	Does the organisation have a Safety Committee?		

Appendix E: Self assessment questions

	5.3	Does the Safety Committee monitor the safety performance of the organisation?		
	5.3	Does the Safety Committee meet regularly and are the meetings minuted?		
Emergency response planning	5.4	Has an emergency response plan been developed and is it kept up to date?		
	5.4	Are the roles, responsibilities and actions of key staff members defined in the ERP?		
	5.4	Does the ERP include all the considerations in this guidance material if appropriate?		
	5.4	Is the ERP regularly reviewed and tested?		
Safety documentation	5.5	Does the safety management manual or safety documentation in existing manuals contain all the elements as detailed in this guidance material?		
	5.5	Is it regularly reviewed?		
	5.5	Is there a system for the recording and storage of SMS documentation and records i.e. hazard logs, risk assessments and safety cases?		
Hazard identification	6.2	Is there a confidential safety reporting system?		
	6.2	Are safety reports reviewed by the Safety Committee?		
	6.2	Is there feedback to the reporter?		
	6.3	Is there a written procedure describing how hazards are identified?		
	6.3	Have the major hazards associated with the organisation been identified?		

Appendix E: Self assessment questions

Risk assessment and mitigation	6.4	Is there a risk assessment process in place?		
	6.4	Is the risk tolerability matrix appropriate and can it be applied consistently?		
	6.4	Is there a process for deciding any necessary risk mitigation?		
	6.4	Are risk mitigations and controls being verified/audited to confirm the effectiveness?		
	6.4	Are risks being managed to ALARP?		
	6.9	Are the hazards and risks recorded on a hazard log?		
Safety performance monitoring	7.2	Have safety performance indicators been defined?		
	7.3	Are the safety performance indicators reviewed regularly to identify any trends?		
Management of change	7.4	Is there a process to proactively identify hazards and to mitigate risks when significant changes in the organisation occur?		
	7.4	Are procedures or checklists reviewed when significant changes in the organisation occur?		
Incident management	7.5	Are safety investigations carried out after incidents or accidents?		
	7.5	Are the hazards identified from safety investigations addressed and communicated to the rest of the organisation?		
	7.5	Are investigations identifying root cause?		

Appendix E: Self assessment questions

Continuous improvement	7.6	Are lessons learnt incorporated into your policy and procedures?		
	7.6	Is continuous improvement achieved through the methods detailed in the guidance material?		
Safety auditing	7.7	Are safety audits carried out?		
	7.7	Is there an independent quality system or third party agency that audits the SMS?		
	7.7	Are safety surveys carried out?		
Safety training and education	8.1	Have all staff been appropriately trained in respect of the SMS?		
	8.1	Operational staff?		
	8.1	Managers and Supervisors?		
	8.1	Senior Management?		
Communication	8.2	Does safety related information get communicated to all staff members as appropriate?		
	8.2	Does relevant safety information reach external users/customers etc?		
SMS implementation	9.1	Has a gap analysis been carried out?		
	9.2	Is there an SMS implementation plan?		
	9.2	Does the implementation plan reflect the gap analysis?		
	9.2	Is the implementation plan on target?		