Australian Government
Civil Aviation Safety Authority

Safety Management Systems for aviation: a practical guide

SMS 4

Safety assurance

3rd Edition

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

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What is safety assurance?

Safety assurance activities are at the core of your safety management system (SMS), with assurance functions monitoring compliance and performance as well as managing changes. Assurance consists of processes and activities undertaken to determine if your SMS is operating according to expectations and requirements.

Safety assurance includes systematic and ongoing monitoring and recording of your safety performance, as well as evaluating your safety management processes and practices. It also involves continuously monitoring your operating environment to detect changes which may introduce emerging risks or degrade any existing safety risk controls.

SMS component	Elements
Safety assurance	Safety performance monitoring and measurement
	Management of change
	Continuous improvement of the SMS

Safety assurance is the way you demonstrate your SMS works.

Safety performance monitoring and measurement

You have decided on your safety objectives; you have implemented them; and now you are monitoring and measuring how you are progressing to meeting these targets. You need feedback on your safety performance so that you can evaluate it and make changes where necessary.

Your stakeholders may also need assurance of the level of safety within your organisation. For example:

- staff need to be confident that your organisation can provide a safe working environment
- line management needs feedback on safety performance to help allocate resources, given the often-conflicting goals of production, profit and safety
- passengers have concerns about their personal safety
- senior management seeks to protect corporate image
- shareholders wish to protect their investment (for larger organisations).

Safety performance monitoring occurs through collecting safety data and information across various sources. The types of monitoring you do depends on the size and complexity of your organisation. However, having safety data to support informed decision-making is an essential aspect of your SMS.

The most important outcome of establishing a safety performance management structure is the presentation of information to the organisation's decision makers so they can make decisions based on current, reliable safety data and information. The aim should always

be to make decisions in accordance with the safety policy and towards your safety objectives.

You can monitor your safety performance using a variety of data sources including:

- **hazard and safety reports:** using your safety reporting data to identify common issues or trends that may warrant further analysis or investigation. This includes those hazard or safety reports that when assessed individually may appear to be a low-level safety risk but when trended could identify a latent or emerging safety risk for your organisation. This is supported by having established an effective hazard and safety reporting process as part of safety risk management (see book 3 for further information).
- **safety surveys**: provide an inexpensive and valuable source of safety information and are used to canvass your employees' views on safety, examining their thoughts on procedures and processes related to specific areas of the operation or safety policies. Surveys can involve the use of checklists, questionnaires, monitoring and observing day-to-day activities, regular inspections of safety-critical areas, or confidential interviews or focus groups of staff. Safety surveys generally provide qualitative information, which may require validation via other safety data to determine if corrective action is required.
- **safety audits:** these focus on assessing the integrity of your SMS and can evaluate the effectiveness of implemented safety risk controls, while also monitoring compliance with safety regulations.
- **safety investigations:** findings and recommendations from investigations can provide useful information which can be analysed against your other safety data. Information from investigations can also help evaluate the effectiveness of safety risk controls, by identifying controls that have worked but also any that failed.
- **operational performance data:** systematically capturing daily performance data can provide useful data of events and operational performance. This data can be obtained from programs such as flight data analysis, line operations safety audits, maintenance operations safety audits, normal operations safety survey and maintenance error decision aid.

Performance monitoring and measurement requires you to have:

- **safety objectives:** these have been established within your safety policy and objective element of the SMS. They outline your desired safety outcomes related to safety concerns specific to your operational context. Refer to Book 2: Safety policy and objectives for further information on setting safety objectives.
- **safety performance indicators (SPIs):** these are tactical parameters relating to your safety objectives and are a reference point for your safety data collection
- **safety performance targets (SPTs):** another tactical parameter used to assist with achieving your safety objectives.

SPIs and associated SPTs must be routinely reviewed to determine if they are providing the information needed to track progress being made toward the safety objectives.

Safety performance management is an ongoing activity. Safety risks and availability of data change over time. Initial SPIs may be developed using limited sources of safety information. Later more safety data will be available and the organisation's safety analysis capabilities will likely mature. As this happens you should consider refining the scope of your SPIs and SPTs to better align with your desired safety objectives.

Safety performance indicators (SPIs)

The development of SPIs should be linked to your safety objectives and be based on the analysis of data that is available or obtainable. The monitoring and measurement process involves the use of selected SPIs and corresponding SPTs.

You should monitor the performance of established SPIs and SPTs to identify any abnormal changes in safety performance. Safety performance monitoring and measurement provides a means to verify the effectiveness of safety risk controls. Assessing the effectiveness of safety risk controls is important as their application does not always achieve the intended results. This will help identify whether the right safety risk controls have been selected and if necessary, may result in the application of a different safety risk control strategy.

In addition, they provide a measure of the integrity and effectiveness of SMS processes and activities.

SPIs should encompass a wide spectrum of indicators to provide a fuller and more realistic picture of your safety performance. This should include:

- low probability / high severity consequence events, such as accidents and serious incidents
- high probability / low severity consequence events, such as non-consequential operational events, non-conformance reports or operational deviations
- process or system performances, such as training completion status, safety meeting frequencies and attendance, and safety report processing.

When establishing your SPIs you should consider:

- **measuring the right stuff:** determine the best SPIs which will identify if your organisation is tracking to achieve your safety objectives. Consider what are your biggest safety issues and risks, identify SPIs that show how effective your controls are in these areas.
- **availability of data:** is there data already available that you want to measure? If not, you may need to establish additional data collection sources.
  For small organisations with limited amounts of data, pooling data sets may help identify trends, this could be supported through industry associations who can collate safety data from multiple organisations. Or even using your own safety data and comparing this to broader industry data, such as from external investigation reports (ATSB) and other industry publications relating to safety.
- **reliability of the data:** data may be unreliable either because of its subjectivity or because its incomplete. In these instances, using various data sources can assist as it allows you to develop a clearer picture to identify if subjective data is also appearing across multiple sources, improving its reliability.
- **common industry SPIs:** it can be useful to identify if there are any common SPIs used within your area of the industry. This can assist when first developing your SPIs but can also allow for comparisons to be made between organisations, helping to identify, and set best safety practices. Industry associations may be able to assist with these, or even reaching out to talk to other operators in your area for assistance.

image: Civil Aviation Safety Authority

Leading and lagging indicators

There are two common categories used to classify SPIs: leading and lagging indicators. Lagging SPIs measure events that have already occurred. They are also referred to as outcome-based and are normally, but not always, the negative outcomes you're aiming to avoid. Because lagging SPIs measure actual safety outcomes, they can measure the effectiveness of existing safety mitigations.

For example, a lagging SPI monitoring effectiveness of a safety mitigation would be the number of ramp collisions per number of movements between vehicles, following a redesign of ramp markings. This provides a measure of the effectiveness of the new markings, assuming nothing else has changed. A reduction in collisions validates an improvement in the overall safety performance of the ramp system, which may be attributable to the change in question.

Using the same example, an increasing trend in ramp collisions per number of movements may have been what led to the identification of sub-standard ramp markings. This would have been identified through using safety data trending analysis, which showed an increased number of safety reports regarding ramp collisions.

Leading SPIs measure processes and inputs being implemented to improve or maintain safety. These are also known as activity or process SPIs, as they monitor and measure conditions that have the potential to lead to or contribute to a specific outcome.

Examples of leading SPIs driving the development of capabilities for proactive safety performance include such things as percentage of staff who have successfully completed safety training on time or frequency of bird scaring activities.

Case study

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OUTBACK
maintenance services

Outback Maintenance Services set SMART safety objectives: specific, measurable, achievable, relevant objectives with a specified timeframe in which they are to be achieved. By setting such objectives, Peter Lawson can monitor and measure how their SMS is going.

Six months into the process, he and Mick Jones, the safety officer, give everyone a report on progress with the database (which they have set up in an Excel spreadsheet on the hangar PC), the number of reports they have received, and in particular those received since the Beechcraft engine cowl fasteners incident, the new rostering system.

They have also developed SPIs in relation to the database which include both leading and lagging indicators. Their leading indicator is the tracking of all staff training on how to use the database. Their lagging indicator is the trending number of hazard reports submitted each month. Information on both these SPIs is reported at their safety meetings and there is a scorecard printed and displayed on the whiteboard in the staff kitchen.

Safety performance targets (SPTs)

Once your SPIs have been established you should consider if it's appropriate to identify and develop SPTs and subsequent alert levels. SPTs should be realistic, context specific and achievable when considering your resources available and your operational context.

It is not always necessary or appropriate to set SPTs as there may be some SPIs that are better for monitoring trends rather than being used to determine a target. Safety reporting is an example of when having a target could either discourage people from reporting, if your target is to not exceed a specific number of reports, or to report trivial matters to meet a target, if the target is to reach a certain number.

There may also be SPIs better suited to be defined as a trend (i.e. a reduction or increase, depending on the nature of the SPI) to target continuous safety performance improvement, such as to reduce the number of events, rather than used to define an absolute target.

When first implementing your SMS, it is more appropriate to develop safety objectives and SPIs, and for SPTs to come later. This allows you to start gathering, analysing, and presenting on your SPIs. Trends will start to emerge, which provide an overview of your safety performance and if it is steering towards or away from your safety objectives. At this point you can then identify reasonable and achievable SPTs for relevant SPI.

Once you have an idea what your current level of performance is, by establishing your baseline safety performance, you start setting SPTs to give a clear sense of what you should be aiming to achieve. The organisation may also use benchmarking to support setting performance targets.

Understanding what achieving SPTs means is also important. Achieving SPTs may not always be indicative of safety performance improvements. You need to be able to distinguish between just meeting a SPT and actual, demonstratable safety performance improvement. You need to consider the context within which the target was achieved, and not look at the SPT in isolation.

SPTs are useful in driving safety improvements but, implemented poorly, they have been known to lead to undesirable behaviours. That is individuals and departments becoming too focused on achieving the target and perhaps losing sight of what the target was intended to achieve, rather than an improvement in organisational safety performance. In such cases it may be more appropriate to monitor SPI for trends

Safety performance monitoring and measurement checklist

- ☐ Established systems are in place to ensure feedback on safety performance is received and the data is analysed.
- ☐ Feedback data is used to evaluate safety performance and identify necessary changes.
- ☐ An indication of the level of safety within the organisation is available to all stakeholders.
- ☐ A safety performance monitoring program appropriate to the organisation is established and maintained

Safety audits

Internal safety audits are used to assess the effectiveness of the SMS and identify areas for potential improvement. They can also assess if safety risk controls have been effectively implemented and are being monitored. The focus of your internal audit is on the policy, processes and procedures that provide your safety risk controls.

Safety audits are used to ensure that your organisation, including your SMS, is sound in terms of:

- adequate staff levels
- compliance with approved procedures and instructions
- levels of competency and training to carry out specific roles
- maintaining required levels of performance
- achievement of the safety policy and objectives
- effectiveness of interventions and risk mitigations.

Internal audits are most effective when those conducting them are independent from the functions being audited. Ensuring independence and objectivity is a challenge for safety audits and can be difficult to achieve in smaller organisations. However, independence and objectivity can be achieved by having protections in place, such as dedicated policies, procedures, roles, and communication protocols.

The results from audit processes become one of the various inputs to your safety risk management and safety assurance functions. Internal audits inform management of the level of compliance within the organisation, the degree to which safety risk controls are effective and where corrective or preventive action is required.

Safety investigations

Safety investigations are conducted as part of your SMS to support hazard identification and risk assessment processes (see Book 3: Safety risk management), however they also provide a mechanism for monitoring safety performance. Investigations provide valuable sources of hazard identification and to identify weaknesses in risk controls for corrective actions to be taken.

For every accident or serious incident in your organisation, there are likely to be hundreds of minor events or near-misses, many of which have the potential to become accidents. You should review all reported events and hazards to decide if there is a need to investigate, and how thoroughly.

A reactive approach would be to investigate only serious incidents or accidents. However, there are other proactive reasons for conducting investigations, these include for hazard-based trending, risk identification and for instances where more in-depth complex analysis of systems failures may be warranted.

The benefits of conducting safety investigations include:

- gaining a better understanding of the events leading up to the occurrence
- identifying contributing human, technical and organisational factors
- making recommendations to reduce or eliminate unacceptable risks
- identifying lessons learned that should be shared within the organisation, and where appropriate the broader aviation community.

You must have a clear policy, stating that the purpose of internal investigations is to find systemic causes and implement corrective actions, not to blame individuals. Your internal investigation procedures should state this which underlies the principles of a positive safety culture.

Use a risk-based approach to identify which occurrences you need to investigate and to what extent.

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Resources for carrying out safety investigations are normally limited, so the effort you make should be in proportion to the perceived benefit. In other words, how will the investigation assist in identifying systemic hazards and risks to your organisation?

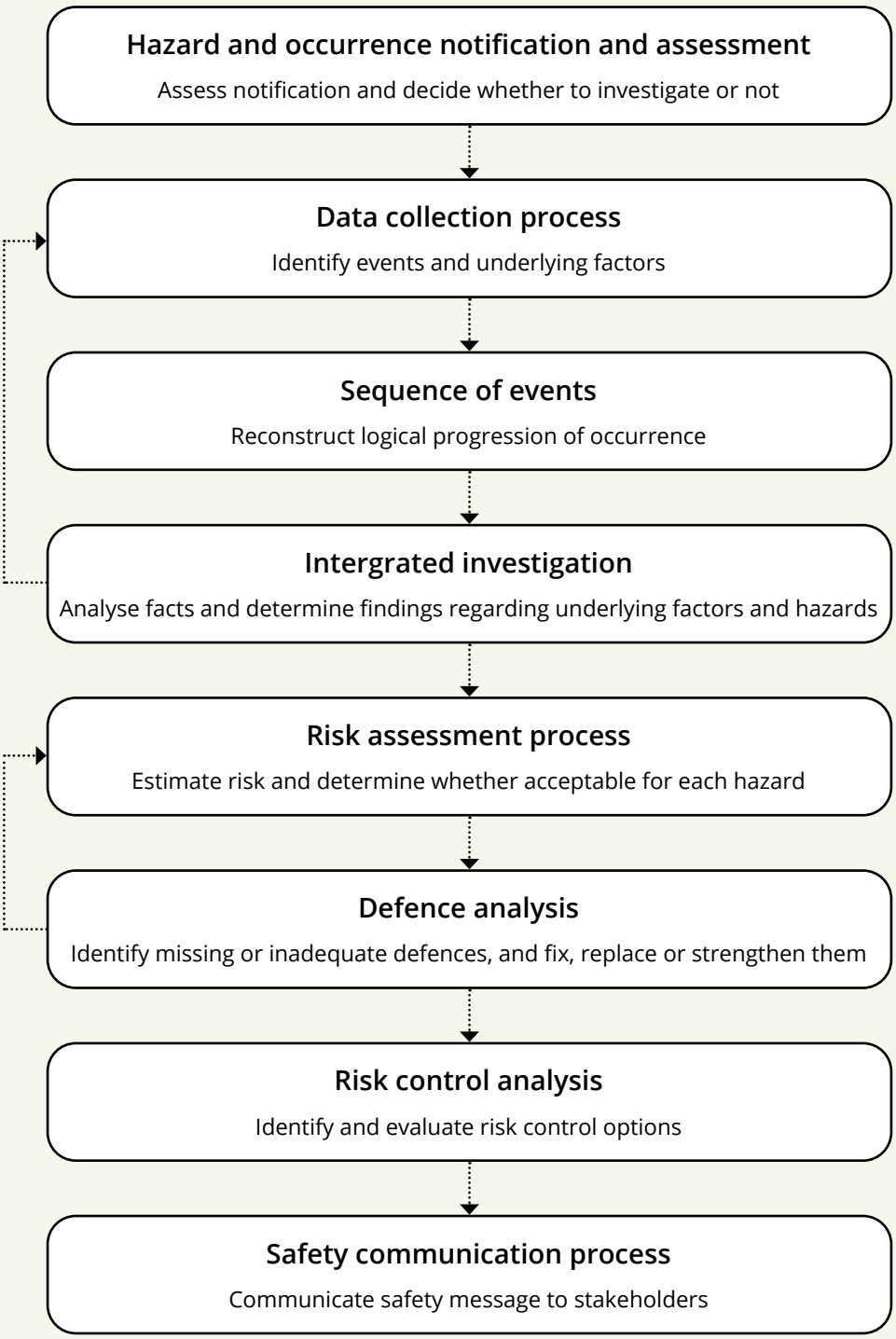
Accountability for the management of internal safety investigations and the investigation process should be documented in your SMS. Your documentation should include guidance for:

- determining when and under what conditions an investigation will be considered
- the scope of the investigation
- identifying who will investigate, including specialist assistance (if required)
- recording the investigation findings for follow-up trend analysis, and who is responsible for this
- timeframes for completion.

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

The investigative process should be comprehensive and must identify the contributing factors that lead to an accident or incident as well as the contributing factors that may increase risk. Incorrectly performed investigations may potentially fail to provide the necessary information to address the real cause(s) of the event/problem.

Internal safety investigation process flow



Investigations are more beneficial when they include a focus on contributing factors: the 'why', rather than a description of the accident or incident only (the 'what'). Accident investigation requires trained investigators who use evidence as the basis for identifying contributing factors including, but not limited to, organisational issues and human performance limitations.

Organisations need to ensure investigators are properly trained and have appropriate support. Investigative output, including reporting, should be disseminated/actioned throughout the organisation, along with details of lessons learned. Is your internal safety investigation process doing its job? Is it validating the hazards you have identified and reviewing your underlying risks? Both the information identified through the investigation process as well as the effectiveness of the investigation process form an element of your safety assurance.

The way an investigation is conducted, and most importantly, how the report is written, will influence the likely safety impact, the organisation's safety culture, and the effectiveness of future safety initiatives. Again, the purpose of investigations is not to apportion blame to any individual or group, but rather to improve safety.

Internal safety investigation checklist

- ☐ The investigative process is comprehensive and attempts to address the factors that contributed to the event, rather than simply focusing on the event itself. (The 'why', not just the 'what'.) The process includes a detailed analysis undertaken to establish organisational factors contributing to events.
- ☐ All reported events and hazards are reviewed, and a classification system guides the decision-making process on which ones should be investigated, and how thoroughly.
- ☐ The organisational safety policy states that the purpose of internal investigations is to find systemic causes and implement corrective actions, not to apportion blame to individuals.
- ☐ Where a positive safety culture/safety reporting culture policy is in place, the policy and protocols for internal investigations clearly reference it.
- ☐ The safety manager, or delegate, acts as the organisation's point of contact/coordinator for Australian Transport Safety Bureau (ATSB) investigations (where applicable) as a way of keeping informed as they progress.
- ☐ The extent of the investigation depends on the actual and potential consequences of the event or hazard (as determined by an initial risk assessment).
- ☐ The effort expended on investigations is proportional to the perceived benefit in terms of potential for identifying systemic hazards and risks to the organisation.
- ☐ Accountability for the management of internal safety investigations is documented in the organisation's SMS manual.

Management of change

The aviation industry is constantly undergoing dynamic changes which can expose your organisation to new risks. To mitigate the risks associated with uncontrolled changes it is necessary to manage changes in a structured manner within your SMS. You need to assess both changes within your operating environment and your organisation, to identify hazards and risks which can affect the safety of operations.

You may make changes within your organisation to meet business demands and to be more flexible. However, while the changes need to be made effectively and efficiently, your focus should be on implementing them safely. A change introduced to improve safety may introduce safety risks elsewhere, as change invariably creates the potential for unintended consequences.

Management of change in an SMS applies to hazard identification and risk assessment related to the safety of operations. Other potential risk factors, such as the inability to sustain business growth, should be considered, as while they are additional to the scope of SMS change management, they may affect operational safety.

Different types of change introduce varying degrees of potential risk. The degree of scrutiny required, and the resulting level of detail at each step, should be proportionate to the degree of risk potentially introduced by the change. You need to be able to recognise an upcoming change to your operation, either through internal changes or external operating environment changes, and consider how critical the risk associated with that change may be to your operating systems.

Large-scale changes, such as major infrastructure projects or organisational restructures, should be managed as stand-alone projects, with safety validation documentation forming part of the project safety plan. A project safety plan will be an evolutionary document. For example, it may initially set out assumptions and replace these with more factual information as it becomes available. Similarly, the project safety plan may initially set out the risk assessment methodology and findings, later incorporating these as safety requirements.

Regulatory management of change

Management of change within your SMS is a different process to management of change in the regulatory context. Regulatory change management is aimed at organisations that are required to have a change process outside of the scope of an SMS. The regulatory context includes consideration of significant changes which require CASA mandatory notifications and approvals.

Under your SMS, management of change is a process that occurs regardless of any regulatory requirements for notification and approvals. The purpose of SMS change management is to provide proactive risk management and assurance functions to ensure you are meeting your safety objectives. Whereas regulatory change management is directly linked to your CASA regulatory authorisations, these may leverage off or have implications for your SMS, but your SMS change management should always be occurring regardless.

It is an organisation's responsibility to ensure they are meeting both their SMS management of change processes as well as any regulatory management of change requirements.

image: Adobe Stock | EtiAmmos

Management of change guidance and procedures

By taking a systematic approach to implementing change, organisations can gain a much clearer picture of the objectives of change and how to achieve them safely.

Any change within an organisation can create hazards which affect the safety of operations. Having change management processes ensures that the impact of a specific change on any previously identified hazards and risk mitigation strategies are identified before any change is implemented. The objective is to ensure safety risks resulting from a change are managed, or controlled, to an acceptable level. Additionally, any flow-on effects should be looked for after the change has been implemented.

Whether change is brought about through changes in your operating environment, new projects, or through modifications to operating procedures, it will involve risks. There is a very strong link between change management and risk management, the two processes support each other and should be used together.

Your management of change process should provide a structured framework for managing both internal and external changes. This should assist in minimising the inherent risks arising from change and enhancing effectiveness whilst ensuring safety is maintained or enhanced.

You should also consider the impact of any change on personnel, as this could affect the way a change is accepted by those affected. Early communication and engagement will normally improve the way the change is perceived and implemented. Ensuring continual communication post implementation not only increases change adoption but can provide significant feedback information to ensure risk controls for the change have worked as intended.

When planning for change its important to consider the following:

- implementing changes in an incremental manner to minimise potential adverse effects
- ensuring use of resources for change implementation will not adversely impact on operational safety
- ensuring communication and consultation takes place with all key stakeholders.

Types of change

Change can come from both external and internal sources and result from many different triggers. These may include:

- organisational change such as a new company structure or new key personnel, including appointment of new senior managers or a new management team
- changes in customer requirements, expectations, or new contracts
- changes in the work environment such as new runway or taxiways at one of your operating airports/aerodromes
- changes in domestic or global trading conditions
- operational change such as a new fleet, a new operational contract, introduction of a new major system, the introduction of a new route
- physical change such as the addition of a new base, moving to a new head office
- changes to operational or administrative processes or procedures
- editorial changes or amendments to the organisation's documentation
- identified inadequate skills and knowledge base, leading to new training programs
- new technology
- regulatory or procedural changes
- change in contractors and third-party providers or bringing on new contractors.

When identifying changes another way to consider this is like a business improvements manager would. Looking at your organisations current state verses possible future state. Identifying possible future business opportunities or shifts, which you then complete a proactive change risk assessment for. This would include some change categories such as:

- future legislation or regulatory changes
- future technology or systems changes, including access or usage changes
- people and culture, including mindsets, value systems and focus requiring changing and uplift

Management of change process

The change management process includes the following steps:

Step 1: Understand and define the change

This includes a description of the change and why it's being implemented. At this step you should be identifying if the change is occurring due to internal or external factors and what the overall objective for the change is.

For example, a change in regulations would be an external change and the objective would be for the organisation to ensure compliance with the new regulations. The introduction of a new ground power unit (GPU) however, would be an internal change that has come about due to identifying the current GPU is nearing the end of its service life. The objective would be to replace the old GPU with a more cost-effective model.

Provide a compelling argument for making the change and a clear statement of the benefits that will result. If undertaken properly, this step will enable you to respond to people's questions, concerns, and perceptions, thereby ensuring theirwilling participation, their sense of ownership and thus the project's eventual success.

Step 2: Understand and define who and what will be affected

When considering who will be affected, this may be individuals within the organisation across various departments, including contractors and even external parties to the organisation. Equipment, systems, and processes may also be impacted. A review of the system description and organisational interfaces may be needed to fully identify all areas and individuals that may be affected.

This is also an opportunity to determine who should be involved in the change process. Changes may affect risk controls already in place to manage other risks, and therefore change could increase risks in areas that are not immediately obvious.

Step 3: Identify hazards and complete risk assessments

You need to identify any potential safety hazards related to the change and carry out a safety risk assessment. The impact on existing hazards and safety risk controls that may be affected by the change should also be reviewed. This step should use your already existing safety risk management processes (see Book 3: Safety risk management).

Whenever there is change, there are likely to be both opportunities and risks. You should adopt a risk-based approach to planning change. Identify and quantify both opportunities and risks, analysing, evaluating, and reducing risk will minimise the negative impact of change on aviation operations, while maximising potential benefits.

Don't make this process overly complicated. The most important part of the process is having all the people who are likely to be affected by the change, or who can add value to identifying potential risk, in the room to openly discuss the issues.

Step 4: Develop an action plan

Developing an action plan will define what is to be done, by whom and when, to ensure the change is implemented in such a way as to maintain or improve safety. There should be a clear plan describing how the change will be implemented and who is responsible for which actions, and the sequence and scheduling of each task. This includes not only the tasks required to implement the change itself but also any safety risk controls you identified in step 3 that would be needed to manage safety risks associated with the change.

The action plan should address the need to manage the change and be developed specifically for your organisation, considering its unique culture and circumstances. The level of detail in the plan will vary with the organisation, how complex the change is, and the number of variables involved.

The critical feature of step 4 is the link back to the hazard identification and risk assessment in step 3. This is achieved by extracting the risk treatment strategies, or risk controls, identified in the risk assessments, and listing these items as tasks in the action plan. Each task will have a nominated timeline, responsibilities, and resources.

The pace of change and the required momentum also need to be considered in this step. For larger and more complex projects, the change implementation program might need to be maintained over several years.

An action plan must also outline internal implementation, communication strategies and needs to engage all staff. This will give stakeholders confidence that the risks of the change have been considered, and that the risk treatments are being appropriately resourced and managed.

An action plan also provides a documented record of activities, tasks, resources, and performance that can be used as a reference for future change management. Cultural and organisational factors need to be considered to ensure that the change is implemented smoothly and effectively. The key to effective implementation is engagement and communication. Many people in the organisation will want the benefits of the change but will need to be given a high level of confidence or reassurance that the benefits will outweigh the costs.

Step 5: Sign off and implement change

This step is done to confirm the change is safe to implement. The individual with overall responsibility and authority for implementing the change should sign off on the change plan. However, your accountable manager and safety manager should also sign off on the appropriateness of the risk assessment and action plan steps of the change as well.

During this step you need to be:

- undertaking the tasks and activities in the action plan
- reporting progress to the change owner
- continually communicating with staff and other stakeholders
- reviewing action progress and performance, ensuring risk treatments listed in the risk assessment and action plan have been implemented and are complete.

During this step you should be checking regularly to ensure ongoing deliverables of the action plan are clear, understood, and are being implemented within the timeframes identified.

Step 6: Assurance planning and ongoing monitoring

At this step you need to identify what follow-up actions are needed. Consider how the change will be communicated both during implementation and at completion. Identify whether additional activities, such as a systems audit or post implementation review, are needed during and after change implementation.

This step should drive your planning assumptions to be tested to determine if they have held true. Also ensuring that the change is implemented as intended and any other changing circumstances do not alter priorities. Your action plan must be constantly monitored, reviewed, and adjusted where necessary.

A key factor in this step is maintaining communication and consultation with all stakeholders. You need to have a means for receiving feedback from all stakeholders and be monitoring their feedback to determine actions to continuously improve the change implemented and measure the success of actions taken.

The following should be monitored for changes or deviations, with revised actions taken accordingly:

- knowledge: new factors or information are included
- stakeholders: new stakeholders are included over time and are consulted
- communication: high quality and appropriate methods are used
- risks: risk treatments are implemented, and new risks are identified, addressed, and managed appropriately
- common understanding: understanding is maintained by all participants
- quality of decisions: decisions are reviewed at all stages
- external factors: changes in legislation, regulation, and market factors are monitored and taken into account
- effectiveness: implementation plan is monitored for effectiveness.

Management of change checklist

- ☐ Management of change processes take safety issues into account.
- ☐ Changes likely to occur in the business which would have a noticeable impact on the following are identified:
  - Resources - material and human
  - Management direction - processes, procedures, training
  - Management control.
- ☐ The SMS documentation identifies the changes (including human factors issues) that require formal risk management processes.
- ☐ Management of change utilises existing SMS safety risk management processes to identify hazards and risks that could impact safety.

Maintaining and continuously improving your SMS is an ongoing journey as the organisation itself and your operating environment will be constantly changing.

image: Civil Aviation Safety Authority

Continuous improvement of the SMS

Continuous improvement of your SMS is supported by all your safety assurance activities that include the performance monitoring and verification actions undertaken to assure the effectiveness of your SMS.

You only know something is effective if you measure it. That is why it is important that your safety objectives are SMART – specific, measurable, achievable, relevant and within a timeframe (see Book 2: Safety policy and objectives).

That way, you can measure and review what you have been doing and improve on areas where your SMS is not as effective. Your review should look at all parts of your SMS to make sure they are still relevant and applicable. Your SPIs and SPTs should be periodically reviewed to ensure their continued meaningfulness as indicators of safety performance.

However, SMS effectiveness should not be based solely on SPIs and SPTs, you should aim to implement a variety of methods to determine effectiveness, to measure outputs as well as outcomes of your processes, and asses the information gathered through these activities. This includes methods such as:

- audits: both internal and external audits and their respective findings
- assessments: including assessments of safety culture and SMS effectiveness
- occurrence monitoring: including monitoring the recurrence of safety events, both incidents and accidents, as well as errors and any rule breaking situations
- safety surveys: like assessments, these include cultural surveys which can provide useful feedback on staff engagement with the SMS, while providing some indicators of the organisation's safety culture
- management reviews: examining whether the safety objectives are being achieved and are an opportunity to look at all available safety performance information to identify overall trends
- SPI and SPT evaluation: possibly as part of the management review, this should consider trends and if possible, compare with other operators or industry data for benchmarking
- addressing lessons learned: from safety reporting and safety investigations, these lessons should lead to safety improvements being made and communicated throughout the organisation.

Safety performance management is not intended to be a set and forget process. It is dynamic and should be reviewed and updated routinely based on inputs from safety analyses and in response to major changes in the operation, top risks, or environment.

Monitoring of the safety performance and internal audit processes contributes to your ability to continuously improve safety performance. Ongoing monitoring of the SMS, its related safety risk controls and support systems, assures the organisation that the safety management processes are achieving their desired safety performance objectives.

Management review

It is important senior management review the effectiveness of the SMS. Your management review should look at all parts of your SMS to make sure they are still relevant and applicable. You need to outline how you are going to review each element of your SMS – safety policy and objectives, safety risk management, safety assurance, and safety promotion – in your SMS manual.

Small organisations should review their SMS at least once a year to ensure that:

- the SMS continues to meet its core safety objectives
- safety performance is monitored against objectives
- identified hazards and safety risks are addressed in a timely and appropriate manner.

A practical way for small operators to maintain a focus on improvement is to network with other operators and share information and good ideas to try.

For larger organisations, more formal periodic reviews are conducted by a safety committee. For example:

- reporting on the effectiveness of management of change activities and issues
- reporting on safety training performance
- evaluation of facilities, equipment, documentation and procedures through safety audits and surveys continued tracking of safety culture change or maturity level.

It is essential management get a holistic picture of the organisation's safety performance and are fully aware of all possible safety information. You need to take a risk-based approach when reviewing and assessing SMS processes and procedures. Consider how effective they are at managing your safety performance, and not just looking at your level of compliance with your documented procedures.

Continuous improvement of the SMS checklist

- ☐ An SMS is established that includes policies, rules, directives, and procedures.
- ☐ Management works continuously towards revising the current processes in response to changing needs, operational environment, or standards.
- ☐ Lessons learnt from safety reporting and safety investigations lead to safety improvements being made and are communicated throughout the organisation.
- ☐ Formal management reviews of the SMS occur on a regular basis.
- ☐ Proactive evaluation of day-to-day operations, facilities, equipment, documentation and procedures through safety audits and surveys.
- ☐ Safety reviews validate the SMS, confirming not only that people were doing what they were supposed to be doing, but also that their collective efforts have achieved the organisation's safety objectives and targets.
- ☐ Through regular review and evaluation, management pursue continuous improvements in safety management and ensure that the SMS remains effective and relevant.

Outcomes-based and PSOE considerations

To move from compliance-based safety assurance to become outcomes-based, organisations cannot simply document the elements of this component. Instead, you need to consider how your documented elements will be displayed, monitored, and evidenced as being a live safety management process.

For example, having SPIs in place that are easy to measure is compliance-based. While ensuring SPIs are focusing on what's important to measure and are linked to identified safety risks, are being continuously monitored and analysed for trends and are regularly updated to remain relevant and promote ongoing safety performance is outcomes based.

The overall outcomes-based approach strives for constant evaluation of the SMS to determine its effectiveness and ways to continuously improve safety performance whilst seeking to embrace best practices and proactive safety management at all levels.

As your SMS moves from implementation, to operational and through to maturing, the Present, Suitable, Operating and Effective (PSOE) evaluation of your safety assurance should also naturally shift, as shown in the examples below.

Safety assurance				
Evaluation				
Implementing	**Present**	**Suitable**	**Operating**	**Effective**
Safety assurance activities including SPIs are being drafted but are not yet fully developed.	Initial SPIs are linked to safety objectives. There is a change management process in place, linked to safety risk management processes.	SPIs are focused on what's important are linked to identified risks and are being monitored. Auditing is assessing the SMS effectiveness and outputs.	The organisation assures itself it has an effective SMS and is managing risks through audit, assessment, and monitoring of safety performance	The organisation is continuously assessing its approach to safety management and continuously improving safety performance, seeking out and embracing best practices.

See Booklet 8: SMS resource kit for the SMS evaluation tool to assist with evaluating this element of your SMS using PSOE.

Toolkit

image: Civil Aviation Safety Authority

Booklet 4 – Safety assurance tools

This toolkit contains the following:

- ☐ Toolkit purpose and use
- ☐ Generic issues to consider for safety performance monitoring
- ☐ Example: Safety performance indicators and targets
- ☐ Example: Audit scope planner
- ☐ Sample: Self-assessment checklist
- ☐ Practical safety culture improvement strategy
- ☐ Safety culture index survey
- ☐ Information relevant to a safety investigation
- ☐ Corrective/preventative action plan
- ☐ Case study: Sample event notification & investigation report
- ☐ Case study: Sample aviation safety incident investigation report
- ☐ Checklist for assessing institutional resilience against accidents (CAIR)
- ☐ Example: Management of change template
- ☐ Safety cases

Toolkit purpose and use

Contained within the following toolkit are examples of ways an organisation can develop certain elements within the safety assurance component of an SMS. These are examples only to assist in building overall SMS knowledge, being compiled from various sources, and are in no way a CASA recommendation regarding templates or standards to meet regulatory compliance.

Generic issues to consider for safety performance monitoring

The following is a list of generic aspects or areas to be considered to 'assure safety' through safety performance monitoring and measurement:

- **responsibility:** who is accountable for operational management (planning, organising, directing, controlling) and their ultimate accomplishment?
- **authority:** who can direct, control, or change the procedures and who cannot? Who can make key decisions, such as safety risk acceptance?
- **procedures:** specified ways to carry out operational activities that translate the 'what' (objectives) into 'how' (practical activities).
- **controls:** elements of the system, including hardware, software, special procedures or procedural steps, and supervisory practices designed to keep operational activities on track.
- **interfaces:** examining such things as lines of authority between departments, lines of communication between employees, consistency of procedures, and clear delineation of responsibility between organisations, work areas and employees.
- **process measures:** having a means of providing feedback to responsible parties, that required actions, are taking place with the expected and required results.

image: Adobe Stock | CarloBarquero

Example: Safety performance indicators and targets

Performance Indicator	Target
Number of major risk incidents (as defined in SMS manual)	1 or less
Number of unstable approaches per 1000 landings	2 or less
Percentage of extensions to flight duty periods per month	2%
Number of internal audits (per calendar year)	4
Number of audit findings per audit	2 or less
Number of repeat audit findings	Nil
Number of safety committee meetings (per calendar year)	6
Safety committee attendance of key personnel	Minimum 80%
Number of emergency response planning drills (per calendar year)	1
Number of hazard / safety reports	20 or more
Percentage of staff completed safety training before due dates	95%
Number of safety newsletters issued (per calendar year)	4
Number of formal risk assessments	5 or more
Percentage of changes (organisational/procedural/technical etc.) that have been subject to risk assessment	95%
Number of safety surveys (per calendar year)	1
Number of airworthiness incidents (as defined in SMS manual)	1
Number of flights flown with operational MEL restrictions	3 or less

Note: The above SPIs and SPTs are examples for illustration only and do not represent appropriate indictors or targets. Organisations should set objectives that are relevant to their particular type of operation.

Example: Audit scope planner

SMS Item	Year 1	Year 2	Year 3	Year 4	Year 5
1. Safety policy and culture					
2. Governance, management, accountabilities, responsibilities, and authorities					
3. Regulatory compliance					
4. Safety records, document control and information management					
5. Review of the safety management system					
6. Internal SMS audit arrangements					
7. Corrective actions					
8. Safety performance targets and performance measures					
9. Management of change					
10. Internal communication					
11. Risk management					
12. Safety-critical worker competence					
13. Information, instruction, and training					
14. Procurement and contract management					
15. Engineering and operational safety systems					
16. Process control					
17. Asset management					
18. Safety interface coordination					
19. Occurrence and emergency management					
20. Investigations					
21. Third party audits					

Note: Operators need to develop their own audit scope planner requirements based on their own operating conditions, risks, incident history and determined safety objectives.

Sample: Self-assessment checklist

You can use the following self-assessment checklist to identify training requirements, administrative, operational, and other processes that might indicate safety hazards. You can then focus attention on those issues posing a possible safety risk.

Management and organisation

Management structure

1. Does the organisation have a formal safety policy and written safety objectives?
2. Are the corporate safety policies and objectives adequately disseminated throughout the organisation? Is there visible senior management support for these safety policies?
3. Does the organisation have a safety department or a designated safety manager (SM)?
4. Is this department or SM effective?
5. Does the SM report directly to the accountable manager?
6. Does the organisation support the periodic publication of a safety report or newsletter?
7. Does the organisation distribute safety reports or newsletters from other sources?
8. Is there a formal system for regular communication of safety information between management and employees?
9. Are there periodic safety meetings?
10. Does the organisation participate in industry safety activities and initiatives?
11. Does the organisation formally investigate incidents and accidents? Are the results of these investigations disseminated to managers and operational personnel?
12. Does the organisation have a confidential, non-punitive, hazard and incident reporting program?
13. Does the organisation maintain an incident database?
14. Is the incident database routinely analysed to determine trends?
15. Does the organisation operate a flight data analysis program?
16. Does the organisation operate a line operations safety audit program?
17. Does the organisation conduct safety studies?
18. Does the organisation use outside sources to do safety reviews or audits?
19. Does the organisation seek input from aircraft manufacturers' product support groups?

image: Adobe Stock | DOC RABE Media

Management and corporate stability

1. Have there been significant or frequent changes in ownership or senior management within the past three years?
2. Have there been significant or frequent changes in the leadership of operational divisions within the past three years?
3. Have any managers of operational divisions resigned because of disputes about safety matters, operating procedures, or practices?
4. Are safety-related technological advances implemented before they are directed by regulatory requirement, i.e., is the organisation proactive in using technology to meet safety objectives?

Financial stability of the organisation

1. Has the organisation recently experienced financial instability, a merger, an acquisition, or other major reorganisation?
2. Was consideration given to safety matters during and following the period of instability, merger, acquisition, or reorganisation?

Management selection and training

1. Are there well-defined management selection criteria?
2. Is operational background and experience a requirement in the selection of management personnel?
3. Are first-line operational managers selected from operationally qualified candidates?
4. Do new management personnel receive formal safety induction and training?
5. Is there a well-defined career path for operational managers?
6. Is there a formal process for the annual evaluation of managers, that includes safety performance?

Workforce

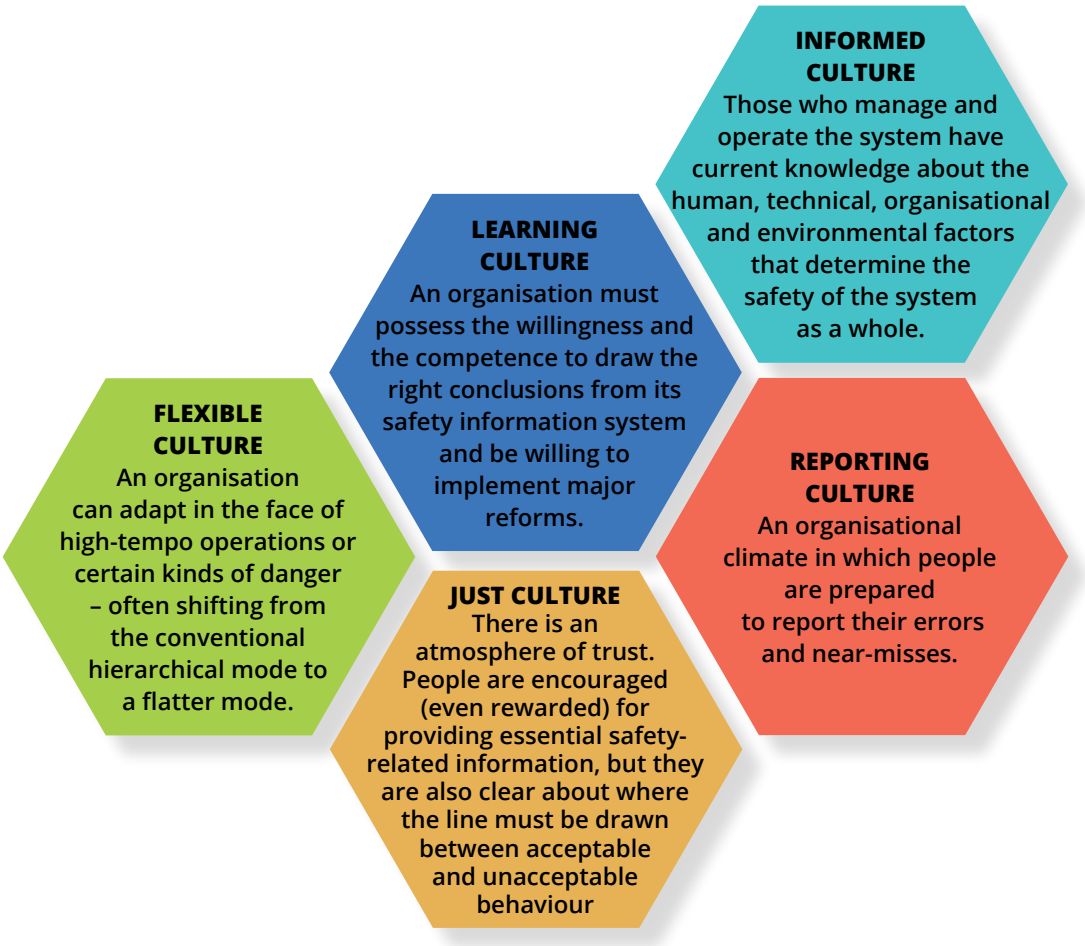
1. Have there been recent layoffs by the organisation?
2. Are a large number of personnel employed on a part-time or contractual basis?
3. Does the company have formal rules or policies to manage contractors?
4. Is there open communication between management, the workforce, and unions/associations about safety issues?
5. Is there a high rate of personnel turnover in operations or maintenance?
6. Is the overall experience level of operations and maintenance personnel low or declining?
7. Is the distribution of age or experience levels within the organisation considered in long-term organisational planning?
8. Are the professional skills of candidates for operations and maintenance positions formally evaluated during the selection process?
9. Are multicultural issues considered during employee selection and training?
10. Is special attention given to safety issues during periods of labour-management disagreements or disputes?
11. Have there been recent changes in salaries, working conditions or superannuation?
12. Does the organisation have a corporate employee health and wellbeing maintenance program?
13. Does the organisation have an employee assistance program that includes treatment for drug and alcohol abuse and mental wellbeing?

Relationship with the regulatory authority

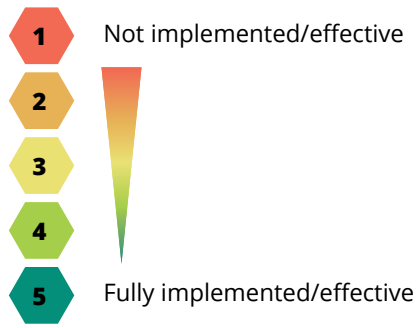
1. Are safety standards set primarily by the organisation, or by the appropriate regulatory authority?
2. Does the organisation set higher standards than those required by the regulatory authority?
3. Does the organisation have a constructive, cooperative relationship with the regulatory authority?
4. Has the organisation been subject to recent safety-enforcement action by the regulatory authority?
5. Does the organisation consider the differing experience levels and licensing standards of other states when reviewing applications for employment?
6. Does the regulatory authority routinely evaluate the organisation's compliance with required safety standards?

Practical safety culture improvement strategy

The five key ingredients of an effective safety culture



Each of these safety culture ingredients can be measured using tangible and visible safety data, most of which is already being collected, but not always systematically tracked.



Managing the risks of organisational accidents. Aldershot, UK, Reason, J. (1997), Ashgate.

image: Civil Aviation Safety Authority

Method

Convene a representative safety taskforce to brainstorm the type of data that could easily be collected and represents each of the five safety culture ingredients.

Each indicator can then be given a rating from 1–5, for its implementation and effectiveness.

Each indicator should measure a demonstrable behaviour rather than superficial attitudes.

For example, indicators of a flexible culture could be:

- succession planning
- critical role planning

or of an informed culture:

- risks identified and changes managed.

Safety culture index survey

All employees, irrespective of the area in which they work, contribute to safety, and each is personally responsible for ensuring a positive safety culture. The purpose of this questionnaire is to obtain individual opinions about safety. Individuals are required to answer all the questions as honestly as possible, providing their own answers, not those of others.

Several separate results are obtained from a safety culture survey using this form:

- a 'benchmark' safety culture score that can be compared with similar companies world-wide
- a means of comparing the views of management with those of staff regarding the company's safety culture.
- A means of evaluating the results of any changes made to the company's safety management system when a follow-up survey is carried out
- identification of areas of concern, indicated by '1' and '2' responses, which can assist in the allocation of safety resources.
- a means of comparing the safety culture of different departments and operational bases.

The higher the value, the better the safety culture rating. Use the following as a guide only, but an average company safety culture score of 93 is considered a minimum. Anything less would suggest that improvements are needed.

- poor safety culture 25–58
- bureaucratic safety culture 59–92
- positive safety culture 93–125.

Organisations with a **poor safety culture** treat safety information in the following way:

- information is hidden
- messengers are marginalised, punished, or dismissed
- responsibility is avoided
- dissemination is discouraged
- failure is covered up
- new ideas are crushed.

Organisations with a **bureaucratic safety culture** treat safety information in the following way:

- information may be ignored
- messengers are tolerated
- responsibility is compartmentalised
- dissemination is allowed, but discouraged
- failure leads to local repairs
- new ideas present problems.

Organisations with a **positive safety culture** treat safety information in the following way:

- information is actively sought
- messengers are trained
- responsibility is shared
- dissemination is rewarded
- failure leads to enquiries and reforms
- new ideas are welcomed.

Circle the appropriate number (1 to 5) in the box against each of the 25 questions. If you **strongly disagree** with the statement, **circle 1.**

If you **strongly agree, circle 5.**

If your opinion is somewhere in between these extremes, **circle 2, 3** or **4** (for **disagree, unsure** or **agree**).

Please respond to every question. Adding all the responses gives a safety culture score for the company, which is checked against known benchmarks.

Number	Statement	Company rating				
		Disagree				Agree
1	Employees are given enough training to carry out their tasks safely.	1	2	3	4	5
2	Managers get personally involved in safety enhancement activities.	1	2	3	4	5
3	There are procedures to follow in the event of an emergency in my work area.	1	2	3	4	5
4	Managers often discuss safety issues with employees.	1	2	3	4	5
5	Employees do all they can to prevent accidents.	1	2	3	4	5
6	Everyone is given sufficient opportunity to make suggestions regarding safety issues.	1	2	3	4	5
7	Employees often encourage each other to work safely.	1	2	3	4	5
8	Managers are aware of the main safety problems in the workplace.	1	2	3	4	5
9	All new employees are provided with sufficient safety training before commencing work.	1	2	3	4	5
10	Managers often praise employees they see working safely.	1	2	3	4	5
11	Everyone is kept informed of any changes which may affect safety.	1	2	3	4	5
12	Employees follow safety rules almost all of the time.	1	2	3	4	5
13	Safety within this company is better than in other airlines	1	2	3	4	5
14	Managers do all they can to prevent accidents.	1	2	3	4	5
15	Accident investigations attempt to find the real cause of accidents, rather than just blame the people involved	1	2	3	4	5
16	Managers recognise when employees are working unsafely	1	2	3	4	5
17	Any defects or hazards that are reported are rectified promptly	1	2	3	4	5
18	Mechanisms are in place in my work area for me to report safety deficiencies.	1	2	3	4	5
19	Managers stop unsafe operations or activities.	1	2	3	4	5
20	After an accident has occurred, appropriate actions are usually taken to reduce the chance of recurrence	1	2	3	4	5
21	Everyone is given sufficient feedback regarding this company's safety performance.	1	2	3	4	5
22	Managers regard safety to be a very important part of all work activities.	1	2	3	4	5
23	Safety audits are carried out frequently.	1	2	3	4	5
24	Safety within this company is generally well controlled.	1	2	3	4	5
25	Employees usually report any dangerous work practices they see.	1	2	3	4	5
	Safety culture total:					

Source: Edkins, G.D. (1998). The INDICATE safety program: A method to proactively improve airline safety performance. Safety Science, 30: 275-295.

Information relevant to a safety investigation

The primary objective of safety investigations is to understand what happened, and how to prevent similar situations from occurring in the future, by eliminating or mitigating safety deficiencies. This is achieved through careful and methodical examination of the event and by applying the lessons learned to reduce the probability and/or consequence of future recurrences.

A competent, professional safety investigation:

- **yields** information needed to:
  - identify trends and problem areas
  - permit comparisons
  - satisfy legal requirements
- **identifies** the basic causes contributing directly and indirectly to each incident
- **identifies** deficiencies within the system and organisation that allowed the incident to occur
- **suggests** specific corrective actions to improve the SMS
- **physically examines** the equipment used during the accident or incident. This may include examining the front-line equipment used, its components, and the workstations and equipment used by supporting personnel.
- **documents** the broad spectrum of the operation, for example:
  - maintenance records and logs
  - personal records and logbooks
  - certificates and licences
  - in-house personnel and training records and work schedules
  - operator manuals and standard operating procedures
  - training manuals and syllabuses
  - manufacturers' data and manuals
  - regulatory authority records
  - weather forecasts, records, and briefing material
  - flight planning documents.

A competent, professional safety investigation uses:

- **recordings** of flight recorders, air traffic control ATC radar and voice tapes etc. These may provide useful information for determining the sequence of events.
  - As well as traditional flight data recordings, maintenance recorders in new generation aircraft are a potential additional source of information.
  - Smartphones and tablets (with GPS) may also be valuable sources of relevant information.
- **interviews** with individuals directly or indirectly involved in the accident or incident. These can be a principal source of information for any investigation. In the absence of measurable data, interviews may be the only source of information. However, because memory is fallible, and personal recollections can be biased, validate records of conversations whenever possible.
- **direct observation** of actions performed by operating or maintenance personnel in their work environment. This can reveal information about potentially unsafe conditions. However, the people being observed must be aware of the purpose of the observations.

- **simulations** permit reconstruction of an occurrence and can facilitate a better understanding of the sequence of events that led to the occurrence, and the manner in which personnel responded to it. Computer simulations can be used to reconstruct events using data from on-board recorders, ATC tapes, radar recordings and other physical evidence.
- **specialist advice** is necessary. Investigators cannot be experts in every field relating to the operational environment and must realise their limitations. When necessary, they must be willing to consult with other professionals during an investigation.

Assigning an investigator

Safety investigators are ideally independent from the area associated with the occurrence or identified hazard. Better results will be obtained if the investigator is knowledgeable, is trained, and skilled or experienced in safety investigations.

The investigators would ideally be chosen for the role because of their knowledge, skills, and character traits, which should include integrity, objectivity, logical thinking, pragmatism, and lateral thinking.

Corrective/preventative action plans

Recommendations for corrective actions

Investigations should identify recommendations for corrective actions to prevent incidents and accidents recurring. You achieve this by addressing all contributing factors identified during an investigation.

Not all contributing factors can be completely eliminated, and some may be eliminated only at a prohibitive cost. The investigation team should work with line management to develop corrective actions.

The corrective actions recommended by the investigation team should be:

SMARTER

S Specific

M Measurable

A Achievable

R Relevant

T Timely

plus

E Effective

R Reviewed

Each recommendation states the action to be taken to correct a contributing factor. The team reviews each contributing factor and:

- formulates recommendations which, if implemented, will reduce the likelihood of that factor contributing to future similar incidents
- recommends improvements to the system defences to limit the consequences of the contributing factor, so that residual risk is recognised by management as acceptable
- makes interim recommendations for immediate corrective actions after an incident or near-miss to mitigate current risks, before taking long-term corrective actions.
- Management must fully evaluate any corrective action to ensure changes do not weaken other defences or expose other risks.

Corrective action plan example

Item Ref	Recommendation	Responsible Area	Responsible Person	Completion Date	Sign off
1.1	**Communication** • Shift handovers are formalised between outgoing supervisors and incoming supervisors. As far as possible during these handovers there should be no interruptions, and all information on operations, field activities/plant status etc. should be conveyed. • Until the handover is complete, incoming supervisors should not make decisions, or give authorisation on operational matters.				
1.2	**Incompatible goals** • Clear communication to all personnel that normal protocols or practices should not be altered for non-operational purposes, and that safety must always be the key driver above any other needs of the organisation (including operations/production, time constraints etc.).				
1.3	**SWIs (safe work instructions)/procedures** • Key roles and responsibilities are specified to ensure accountabilities/or responsibilities are clearly defined.				

Case study

Event notification and investigation report

BUSH aviation and training

When an incident occurs, use this flow chart as a guide to completing the required actions in a timely manner.

Event notification

Report number: (Must be completed for ALL events)

A. Event Type			
1. Type: ☐ Incident/accident	☐ Personal injury	☐ Equipment damage	☐ Environmental damage
☐ Near-miss	☐ Complaint	☐ Ongoing condition	☐ Hazard
2. Category (event title):			
3. Date: / /		4. Time: am / pm	
5. Reported date: / /		6. Reported time: am/pm	
7. Reported to:		8. Witness name/s:	

9. Location

10. Description

11. Diagram

Sketch event scene, or a picture of the sequence of events, including location of involved people and equipment at the time of the event. Take photographs (attach in order) .

12. Organisation:

Event notification (continued)

B. Environmental impact

13. Environmental impact:

C. Equipment

14. Equipment name / type:

D. Person/s Details

15. Name:

16. Employer:

17. Role:

18. Duty status at time of event:

☐ On duty at workplace:

Commenced: am / pm

☐ Travelling while on duty

☐ Travelling to / from work

19. Employment status

☐ Employee

☐ Contractor

☐ Other, specify

20. Did person cease work before end of shift?: ☐ Yes ☐ No

21. If yes, what time? am / pm

22. Injury severity: ☐ Fatality ☐ Lost time ☐ Disabling injury ☐ Medical treatment ☐ First aid ☐ Occupational disease/illness

23. Activity being performed: (modify for your operation)

Aerial agricultural operation	Dropping	Single load operations
Aerial photography	Feral animal control	Surveillance
Aerial surveying	Search and rescue	Winching/hoisting

E: Immediate corrective actions:

24. Immediate corrective actions:

25. Signature of person completing event report:

Name: Signature:

Date: Time:

26. Event notification sign-off by the shift supervisor:

Name: Signature:

Date: Time:

Use the guidance notes on the following pages to assist in fact-gathering to ensure you identify all contributing factors relating to the event.

Analysis of contributory factors

Report number:
(To be completed for any actual or potential event at Level 2 and above)

Individual/team actions: Identify the individual/team actions that contributed to or caused the event. These are the errors or violations that led directly to the event. Typically, they are associated with those who have direct contact with equipment, such as operators or maintenance staff. They are always committed 'actively' (someone did or didn't do something) and have a direct relation to the event.

Check question: Does the item tell you about an error or violation of a standard or procedure made in the presence of a hazard? (Tick only if applicable)

Individual and team factors impact					
IT1	Supervision?	☐ Absent ☐ Inadequate ☐ Unsuitable	IT8	Safety compliance?	☐ Absent ☐ Inadequate ☐ Unsuitable
IT2	Authority?	☐ Absent ☐ Inadequate ☐ Unsuitable	IT9	Instructions given?	☐ Absent ☐ Inadequate ☐ Unsuitable
IT3	Operating speed?	☐ Exceeded ☐ Unsuitable	IT10	Training for task?	☐ Absent ☐ Inadequate ☐ Unsuitable
IT4	Equipment use?	☐ Absent ☐ Exceeded limits ☐ Misuse ☐ Unsuitable selection	IT11	Experience for task?	☐ Absent ☐ Inadequate ☐ Unsuitable
IT5	PPE?	☐ Absent ☐ Exceeded limits ☐ Misuse ☐ Unsuitable selection	IT12	Misconduct?	☐ Mitigated ☐ Unmitigated
IT6	Work procedure followed?	☐ Partially ☐ Not followed ☐ Unsuitable	IT13	Interruptions breakdown in team coordination?	
IT7	Equip/ material handling?	☐ Inadequate ☐ Unsuitable	IT14	Other	
CODE	Based on the above event facts, IDENTIFY the individual/team actions that contributed to the event – give reasons.				

Analysis of contributory factors continued

Task/environmental conditions: Identify the task/environmental conditions contributing to the event. These are the circumstances under which the errors and violations took place and can be embedded in task demands, the work environment, individual capabilities and human factors.

Check question: Does this item describe something about the task demands, work environment, individual capabilities or human factors that promoted errors/violations, or undermined the effectiveness of the system's defences? (Tick only if applicable)

Workplace factors impact			Human factors impact		
WF1	Lighting	☐ Some ☐ Significant	HF1	Complacency/ motivation	☐ Some ☐ Significant
WF2	Weather Time of day	☐ Some ☐ Significant	HF2	Alcohol/other drugs	☐ Some ☐ Significant
WF3	Dust/contaminants	☐ Some ☐ Significant	HF3	Familiarity with task	☐ Some ☐ Significant
WF4	Noise	☐ Some ☐ Significant	HF4	Fatigue	☐ Some ☐ Significant
WF5	Wildlife	☐ Some ☐ Significant	HF5	Time pressure	☐ Some ☐ Significant
WF6	Surface gradient/ conditions	☐ Some ☐ Significant	HF6	Peer pressure	☐ Some ☐ Significant
WF7	Workspace access/ restriction	☐ Some ☐ Significant	HF7	Physical capabilities	☐ Some ☐ Significant
WF8	Housekeeping	☐ Some ☐ Significant	HF8	Mental capabilities	☐ Some ☐ Significant
WF9	Tools/equipment condition/availability	☐ Some ☐ Significant	HF9	Physical stress	☐ Some ☐ Significant
WF10	Task planning/ preparation	☐ Some ☐ Significant	HF10	Mental stress	☐ Some ☐ Significant
WF11	Routine/non-routine task	☐ Some ☐ Significant	HF11	Confidence level	☐ Some ☐ Significant
WF12	Abnormal operational situation/ condition	☐ Some ☐ Significant	HF12	Secondary goals/ external factors	☐ Some ☐ Significant
WF13	Risk perception/ management	☐ Some ☐ Significant	HF13	Personality	☐ Some ☐ Significant
WF14	Personnel safety	☐ Some ☐ Significant	HF14	Manuals and procedures	☐ Some ☐ Significant
WF15	Other workplace factor/s _____	☐ Some ☐ Significant	HF15	Other human factors _____	☐ Some ☐ Significant
CODE	Based on the above event facts, IDENTIFY the task/environmental conditions that contributed to the event – give reasons.				

image: Adobe Stock | Listock

Organisational factors Identify the organisational factors that contributed to the event. These are the underlying organisational factors that produce the task/environmental conditions affecting workplace performance. These may include fallible management decisions, processes and practices.

Check question: Does this item identify a standard organisational factor present before the event and that resulted in the task/environmental conditions, or allowed those conditions to go unaddressed? (Tick only if applicable)

Organisational factors impact					
HW	Hardware	☐ Contributing	MM	Maintenance management	☐ Contributing
TR	Training	☐ Contributing	DE	Design	☐ Contributing
OR	Organisation	☐ Contributing	RM	Risk management	☐ Contributing
OR2	Provision of tools/equipment				☐ Contributing
OR3	Planning and scheduling				☐ Contributing
CO	Communication	☐ Contributing	MC	Management of change	☐ Contributing
IG	Incompatible goals	☐ Contributing	CM	Contractor management	☐ Contributing
PR	Procedures	☐ Contributing			
CODE	Based on the above, IDENTIFY the organisational factors that contributed to the event – give reasons.				

Corrective actions and sign-off

Report number:

Guidelines for raising corrective actions:

For each identified absent or failed defence and organisational factor:

- list the corrective actions the investigation has shown to be necessary.
- identify who will be responsible for taking the action or, where a contractor is involved, who will be responsible for ensuring the action is completed. Continue on a new sheet of paper if necessary, adding the report number at the top of additional sheets.
- set a date by which the corrective action must be completed.
- identify the management system reference (Ref.) to allow status tracking of the corrective actions.
- identify any statutory reporting requirements for the event.

The **'event owner'** should sign to indicate that they accept the report, including the actions and priorities, and enter any relevant comments.

The **relevant manager/s and CEO** should sign to indicate that they accept the report, including the actions and priorities, and enter any relevant comments.

Further recommendation corrective actions:				
Codes (from Part 3)	Actions	Person responsible	Date	Ref

Investigation report sign-off

Report number:

Involved person acceptance and comments

Name:	Signature:	Date: (dd/mm/yyyy)

Safety officer acceptance and comments

Name:	Signature:	Date: (dd/mm/yyyy)

Statutory reporting requirements Yes / No Completed Yes / No

Corrective action review required? Yes / No How: (specify)_____

Review date: _____

General comments

Name:	Signature:	Date: (dd/mm/yyyy)

CEO/General manager acceptance and comments

Name:	Signature:	Date (dd/mm/yyyy)

Data collection work/area:

Case study

Aviation safety incident investigation report

BUSH aviation and training

AT

Date

AT 0000 (hours)

D R A F T

Investigation team:

Name/department (leader) _____
Name/department _____
Name/department _____
Name/department _____
Name/department _____
Name/department _____

Contents of report

1. Incident/accident description

Incident/accident	
Location:	
Time:	
Date:	

Details of injured	
Name:	
Company:	
Injuries sustained:	
Medical treatment:	

Details of damage/impact	
Damage to equipment:	
Environmental impact:	

Risk rating	
Actual consequence level:	Level
Potential consequence level:	Level

Events leading up to the incident/accident

Incident/accident description

Photographs

- Insert photographs

Timeline

- Insert timeline chart

2. Key findings

The key findings outline why the incident/accident occurred. The contributing factors identified from the investigation have been categorised using the ICAO-recommended Reason model of accident causation. The analysis chart is shown as an appendix in section 6 of this report.

Contributing factors

Based on the evidence to hand, the investigation team believe the following were the main contributing factors to the incident:

Absent or failed defences

- Insert contributing factor
- Insert contributing factor
- Insert contributing factor
- Insert contributing factor
- Insert contributing factor

Individual or team actions

- Insert contributing factor
- Insert contributing factor
- Insert contributing factor

Task or environmental condition

- Insert contributing factor
- Insert contributing factor
- Insert contributing factor

Organisational factors

- Insert contributing factor
- Insert contributing factor
- Insert contributing factor

3. Conclusions and observations

The investigation concluded the following findings were or could have been contributory factors to the incident/accident:

- Insert conclusion or observation
- Insert conclusion or observation
- Insert conclusion or observation
- Insert conclusion or observation
- Insert conclusion or observation

4. Recommendations

The following recommended corrective actions are put forward for consideration.

The recommendations address the **absent or failed defences** and **organisational factors** identified as key findings of the investigation. These recommendations are applicable to [insert business group or site] and could benefit other Bush Air operations.

Heading

Detail and explanation

Heading

Detail and explanation

Management review of the investigation report

The management of [business group and site] should formally review the investigation report for completeness, quality of the investigation and to endorse the recommended corrective actions.

It is recommended that the following action plan is implemented:

Distribution

To maximise the effectiveness of the investigation report, its findings and conclusions should be distributed as widely as practicable internally within Bush Air and externally to industry bodies.

Implementation of corrective actions

Corrective actions will be formally presented to the responsible manager for implementation. An action plan and time frame will be agreed and endorsed by the appropriate level of management. An action plan is attached in section six of this report.

Implementation monitoring

The completion of corrective actions must be documented and communicated by the responsible manager to the CEO and copied to the aviation safety manager. Where corrective actions have not been fully implemented, ongoing monitoring should be maintained until implementation is complete.

Analyse effectiveness

The effectiveness of the corrective actions should be evaluated by a review of safety performance and through an audit within the next six months. A report will be prepared for management to detail compliance and progress achieved.

Document archiving

Investigative data and reports will be archived in accordance with procedures specified in the Bush Air SMS manual (BASMS).

5. Significant lessons

The investigation has raised a number of key lessons which are covered in the body of the report. The significant lessons for Bush Air are:

Heading

Detail and explanation

Heading

Detail and explanation

Heading

Detail and explanation

6. Appendices

Reason model analysis

The features of the Reason model analysis chart for the purposes of this interim report are:

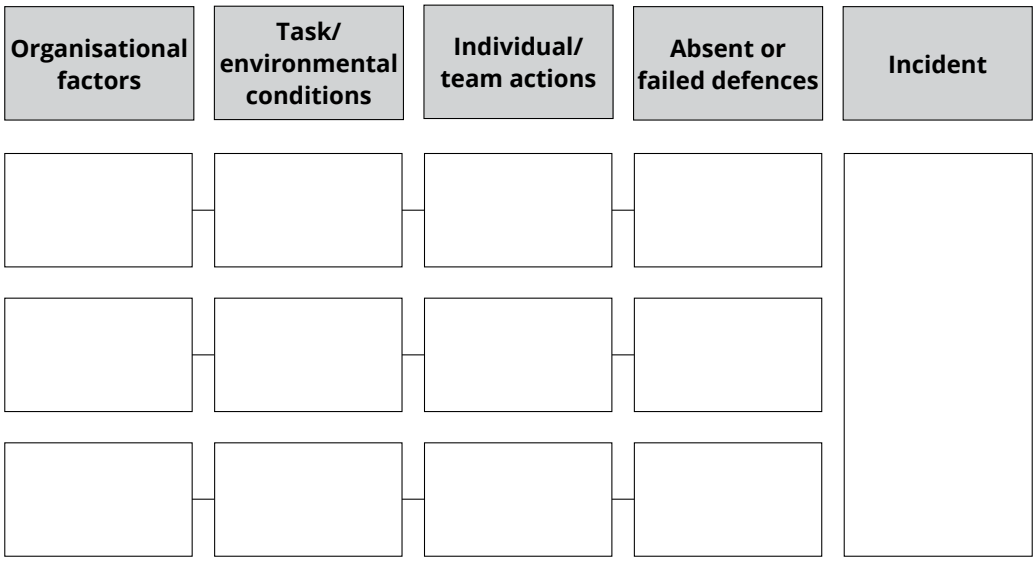
- It provides a graphical representation of all the key circumstances and factors relating to the incident
- It outlines the relationship of the various elements considered throughout this report.

The chart is also designed to:

- Provide a framework to organise the data collected
- Assist in assuring the investigation follows a logical path
- Aid in the resolution of conflicting information and the identification of missing data
- Provide a graphic display of the investigative process for management briefing.

Accordingly, this chart should not be considered in isolation but in the context of all the comments in this report and, no doubt, the additional matters that will be addressed in the final report.

Analysis chart



Corrective action plan					
Item Ref	**Recommendation**	**Responsible department**	**Responsible person**	**Completion date**	**Sign off**

Close-out of incident – All corrective actions have been completed. Where corrective actions have not been fully implemented, the following measures have been put in place to ensure ongoing monitoring until implementation is complete.

Name:	Signature:	Date:

Heading

Detail and explanation

Heading

Detail and explanation

7. Report sign-off

To maximise the effectiveness of the investigation report, its findings and conclusions should be distributed as widely as possible, especially to the various people involved in the incident.

The completion of corrective actions must be documented and communicated by the responsible manager to the CEO, as well as the aviation safety manager. Where corrective actions have not been fully implemented, ongoing monitoring should be maintained until implementation is complete.

Feedback to those involved and comments		
Name:	Signature:	Date:

Feedback to the involved person/s manager/s and comments		
Name	Signature	Date

CEO's acceptance of findings and comments		
Name	Signature	Date

Aviation safety manager's acceptance of findings and comments		
Name	Signature	Date

Checklist for assessing institutional resilience against accidents (CAIR)

YES = This is definitely the case in this company/organisation. **?** = Don't know; maybe; could be partially true. **NO** = This is definitely not the case in this company/organisation.

1. Mindful of danger	☐ YES	☐ ?	☐ NO
Senior managers are ever-mindful of the human and organisational factors that can endanger their operations.			

2. Acceptance of setbacks	☐ YES	☐ ?	☐ NO
Senior management accepts occasional setbacks and nasty surprises as inevitable. It anticipates that employees will make errors and trains them to detect errors and recover.			

3. Commitment	☐ YES	☐ ?	☐ NO
Senior managers are genuinely committed to aviation safety and provide adequate resources to serve this end.			

4. Regular meetings	☐ YES	☐ ?	☐ NO
Safety-related issues are considered at high-level meetings on a regular basis, not just after a bad event.			

5. Events reviewed	☐ YES	☐ ?	☐ NO
Past events are thoroughly reviewed at top-level meetings, and the lessons learned are implemented as company-wide reforms, rather than local repairs.			

6. Improved defences	☐ YES	☐ ?	☐ NO
After an occurrence, the primary aim of senior management is to identify the failed system defences and improve them, rather than divert responsibility to particular individuals.			

7. Health checks	☐ YES	☐ ?	☐ NO
Senior management adopts a proactive stance towards inadequate flight safety. It does the following: • takes steps to identify recurrent traps and remove them • strives to eliminate the workplace and organisational factors likely to provoke errors • brainstorms new scenarios of failure • conducts regular health checks on the organisational processes known to contribute to occurrences.			

8. Institutional factors recognised	☐ YES	☐ ?	☐ NO
Senior management recognises that error-provoking institutional factors (e.g., under-manning, inadequate equipment, inexperience, patchy training, human-machine interfaces etc.) are easier to manage and correct than fleeting psychological states such as distraction, inattention and forgetfulness.			

9. Information	☐ YES	☐ ?	☐ NO
It is understood that the effective management of safety, just like other management processes, relies on the collection, analysis and dissemination of relevant information.			

10. Sampling of 'vital signs'	☐ YES	☐ ?	☐ NO
Management recognises the necessity of combining reactive outcome data (i.e., near-miss and incident reporting) with active process information. The latter entails far more than occasional audits. It involves regular sampling of a variety of organisational processes (e.g., scheduling, budgeting, procedures and training), identifying which vital sign is in most need of attention and then carrying out remedial action.			

11. Employees attend safety meetings	☐ YES	☐ ?	☐ NO
Meetings relating to flight safety are attended by employees across the organisation.			

12. Career boost	☐ YES	☐ ?	☐ NO
Assignment to a safety-related function (quality or risk management) is seen as a fast-track appointment, not a dead end. Such functions attract the appropriate status and salary.			

13. Money vs. safety	☐ YES	☐ ?	☐ NO
Acknowledgment that commercial goals and safety issues can come into conflict. Measures are in place to recognise and resolve such conflicts in an effective and transparent manner.			

14. Reporting encouraged	☐ YES	☐ ?	☐ NO
Policies are in place to encourage everyone to raise safety-related issues. (One of the defining characteristics of a pathological culture is that messengers are punished, and whistleblowers dismissed or discredited.)			

15. Trust	☐ YES	☐ ?	☐ NO
The company recognises the critical dependence of a safety management system on the trust of the workforce, particularly in regard to reporting systems. (A safe culture – an informed culture – is the product of a reporting culture. This can only arise where this is trust.)			

16. Qualified indemnity	☐ YES	☐ ?	☐ NO
Policies relating to near-miss and incident-reporting systems make it clear that the organisation's stance includes qualified indemnity against sanctions, confidentiality and the organisational separation of the data-collecting department from those involved in disciplinary proceedings.			

17. Blame	☐ YES	☐ ?	☐ NO

Disciplinary policies are based on an agreed (negotiated) distinction between acceptable and unacceptable behaviour. All recognise that a small proportion of unsafe acts are indeed reckless, and warrant sanctions, but the large majority of such acts should not attract punishment. (The key determinant of blameworthiness is not so much the act itself – error or violation – as the nature of the behaviour in which it is embedded. Did this behaviour involve deliberate and unwarranted risk-taking, or a course of action likely to produce avoidable errors? If so, the act would be culpable regardless of whether it was an error or a violation.)

18. Skills – technical & non-technical	☐ YES	☐ ?	☐ NO

Managers encourage their employees to acquire the mental/behavioural (or non-technical), as well as the technical skills necessary to achieve safe and effective performance.

(Mental skills include anticipating possible errors and rehearsing the appropriate recoveries. Such mental preparation at both the individual and organisational level is the one of the hallmarks of high-reliability systems, and goes beyond routine simulator checks.)

19. Feedback/communication	☐ YES	☐ ?	☐ NO

The organisation has effective, tailored, two-way feedback channels to communicate the lessons learned from both reactive and proactive safety information systems. The emphasis is always on generalising these lessons, and communicating them widely.

20. Acknowledgement of error	☐ YES	☐ ?	☐ NO

The organisation has the will and the resources to acknowledge its errors, to apologise for them, and to reassure any victims that the lessons learned from such mishaps will help to prevent their recurrence.

Score

(Add up your score for each question to arrive at a total)
Score **1** for each question where you answered **YES** = This is definitely the case in this company.

Score **0.5** for each question where you answered **?** = Don't know; maybe; could be partially true.

Score **0** for each question where you answered **NO** = This is definitely not the case in this company.

Interpreting the score

16–20	So healthy as to be barely credible!
11–15	In good shape, but don't forget to be uneasy.
6–10	Not all bad, but there is still a long way to go.
1–5	The organisation is very vulnerable!
0	Jurassic Park!

With acknowledgement to Professor James Reason, published in *Flight Safety Australia*, January-February 2001

Example: Management of change template

Change management reference number: _____

Change title/project name: _____

1. What is the change?

Describe the change including timescales

2. Who?

Detail who is responsible to implement the change and who needs to be involved

3. Define the major components or activities of the change

This will help you identify the main risks of each component or activity that will be populated in table 7 below

4. Who does the change affect?

Consider who it affects: individuals, departments, and organisations? Who needs to be notified of the change?

5. What is the impact of the change?

Consider why the change is taking place and the impact on the organisation and its processes and procedures. Will it impact the safety culture? Does it meet all regulatory requirements?

6. What follow up action is needed? (assurance)

Consider how the change will be communicated and whether additional activities such as audits are needed during the change and after the change has taken place

7 Safety issues and risk assessment						
What is the issue? Hazard	**What could happen as a result?** Consequences/ safety risks	**How bad will it be?** Severity	**How likely is it to occur?** Likelihood	**Risk rating**	**What actions are we taking?** Mitigations There may be more than one action for each issue	**Action by whom and when**
1						
2						
3						
4						
5						
6						

The management of change processes and procedures have been followed and the change can be implemented	
Accountable manager acceptance signature	Name: Date:
Safety manager acceptance signature	Name: Date:

The identified risks are considered tolerable, and change is acceptable to implement	
Final acceptance signature	Name: Date:

image: Adobe Stock | Parradee

Safety cases

As part of your management of change process you may need to complete a safety case to accompany change risk assessments. Safety cases are often known by various names including business cases, significant change documentation, or assurance cases. According to ICAO safety cases are a document which provides substantial evidence that the system to which the change pertains meets its safety objectives.

Safety cases have strong parallels to formal risk assessments, but they are case specific. Like risk assessments they involve evaluation of potential hazards, however safety cases include the positive argument justifying the choices made around the change to provide for continued or improved operational safety.

While the management of change process is a continual ongoing SMS element regardless of the size or complexity of any changes, safety cases are generally only used when it is necessary to provide a deeper change risk assessment picture to stakeholders. These could include internal stakeholders such as executive committees or the CEO, or external stakeholders such as CASA or other regulatory bodies.

Safety case purposes

Safety cases are used for the following reasons:

- as a tool for managing change safely
- to provide a reasoned and evidenced argument that a system is or will be safe
- as a means to obtain regulatory approvals
- to provide a unique collection of data, information, and logical arguments for ongoing safe performance

The overall purpose of completing a safety case is to:

- support in managing safety in complex, dynamic, and evolving environments
- show specific safety claims are substantiated and risk are being managed to ALARP or SFAIRP
- allow operators of safety-critical systems to demonstrate they have adopted a thorough and systematic process for proactively understanding risks and controlling for these risks appropriately
- drive industry best practise to integrate safety cases as a key element in communication between regulatory bodies and organisations.

A safety case should first and foremost, provide assurance to operators of safety-critical systems that they have followed a systematic and thorough approach to managing changes safely. While meeting regulatory requirements or obtaining regulatory approvals should only be a secondary function.

Safety case basic considerations

Ideally safety cases should contain a focused data package with:

- comprehensive safety artifacts
- be inclusive of all safety analyses and findings
- a determination of the total summation of system risk.

Overall, your safety case should demonstrate that you have:

- systematically identified all major hazards associated with planned activities
- considered the context of these activities, including other interactions and interfaces
- used an appropriate methodology to assess risks
- acted on findings and implementing appropriate risk mitigations or controls
- set performance standards and assurance measures to monitor and evaluate risk mitigation or control effectiveness for both during the change implementation and post implementation.

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