Guide to an
Aviation Safety Management System

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UKFSC

Aviation Safety Management System

Forward

The aviation industry faces a challenging future over the coming years. Companies often emphasise service and punctuality, but must also be able to demonstrate that they are safe if they are to achieve a high level of public confidence. Flight safety must be a company's first priority and must extend to every aspect of their business. That not only means on the Flight Deck, but throughout Engineering, the Ramp and every other Company Department.

That is why it is important for all company employees to think and practice Safety in everything that they do.

A company must generate an approach to their business that uses a formal Safety Management System to address safety hazards. This approach must be at the planning stage, at any time there is a change to procedures and after any incident. Safety must be inherent in the way systems and processes are designed. By applying the principles of Safety Management, inherent systemic safety can be achieved.

Safety can be managed through the application of structured processes and practices. This guide provides some basic tools to assist in developing an effective Safety Management System.

Introduction

The evidence from numerous aviation accidents and incidents has shown that the lack of management control and human factors are detrimental to the safe operation of aircraft. The management of safety is not just the responsibility of Management, but it is Management who have to introduce the necessary procedures to ensure a positive cultural environment and safe practices.

Reviews of the safety performance of leading companies in safety-critical industries have shown that the best performers internationally use formal Safety Management Systems to produce significant and permanent improvements in safety. It is also important to develop a safety culture which encourages openness and trust between Management and the work force. For example, all employees should feel able to report incidents and events without the fear of unwarranted retribution. Reporting situations, events and practices that compromise safety should become a priority for all employees.

The aim of this guide is to introduce the elements of a safety management system. Each element will be measurable and its level of performance or efficiency will be measured at introduction and then at regular intervals. Specific and detailed targets will be set and agreed in each area to ensure continued incremental improvement of safety.

There are three prerequisites for successful safety management.

1. **A comprehensive Corporate approach to safety**
2. **An effective organisation for delivering safety**
3. **Robust systems to provide safety assurance.**

These aspects are interdependent and a weakness in any one of them will undermine the integrity of the organisation's overall management of safety. If the organisation is effective in all three aspects, then it should also have a positive safety culture.

It is important to adhere to some important management disciplines:

- The manager responsible for developing the Safety Management System (the Custodian) must ensure that all new safety management initiatives are well coordinated within a safety management development programme approved by top management.

- The development programme should be managed as a formal project, with regular reviews by top management.

- Each major change should be introduced only when the management team is satisfied that the change is compatible with existing procedures and management arrangements.

The Cost of Failure

An airline must be committed to reducing the number of incidents it experiences and to improving safety within all areas of its operation.

Incidents and accidents cannot simply be attributed to human error. It is often the failure of management systems that puts people at risk. By adopting proper management systems and controls, implementing adequate staff training and effective communication, most incidents and accidents can be avoided. It must be a Company's objective to eliminate them from every aspect of its operation.

Failure to control the factors that cause accidents can result in:

- injuries to staff, passengers or contractors.
- damage to aircraft and equipment.
- compensation payments.
- loss of public confidence.
- a reduction in the number of passengers carried.

The two main consequences of an accident are serious injury to people or substantial damage to equipment, with the associated high cost to the business.

It has been adequately proven that when managers and employees adopt a structured system to prevent and control accidents, and their associated losses, significant improvements are achievable. The elements and procedures of any safety management system do require regular reviews and safety performance has to be monitored and measured if the system is to remain credible and effective.

The required innovative techniques will be introduced to enable safety to be managed in a more structured way.

A Structured Approach to Safety Management

As previously stated there are three prerequisites for successful safety management:

1. a comprehensive Corporate approach to safety
2. an effective organisation for delivering safety
3. robust systems to provide safety assurance.

These aspects are interdependent and a weakness in any one of them will undermine the integrity of the organisation's overall management of safety. If the organisation is effective in all three aspects, then it should also have a positive safety culture.

There are three common reasons for the lack of control or the failure of systems:-

- inadequate safety management programme
- inadequate programme standards
- inadequate compliance with standards.

The use of safety audits is a key feature of any Safety Management System and is designed to systematically measure the quality and extent of safety management.

The system is designed to foster effective control at all stages of the loss causation model. (See Fig. 1).

Not only does the safety audit process quantify the effectiveness of the Safety Management System, it also assists in the improvement process. If negative aspects are identified, then by applying corrective practices or procedures, the safety performance will be improved and that improvement will be reflected in the results of subsequent safety audits.

The initial and subsequent safety audits provide the decision-making information required to produce action plans. Resources can then be effectively allocated to improve safety performance.

Potential Loss from Accidents and Incidents

The true cost of accidents or serious incidents are never immediately apparent and are often overshadowed by the emotion generated in the subsequent investigation or enquiry. The full magnitude is often hidden in activities generated by the repercussions to the continuation of the business.

Industrial studies have estimated that for every £1 of apparent cost there is a hidden cost of between £6 to £53. This can be visualised as the classic iceberg, the hidden mass of which could be lurking in an unrelated budget.

Apparent costs

Aircraft damage
Equipment damage
Medical
Loss of working time
Compensation costs

Hidden costs

Loss of revenue from cancelled flights
Immediate engineering costs
Material costs
Deferred maintenance costs
Sub-charter costs
Crew costs
Positioning flight costs
Legal costs
Management costs
Clerical effort
Investigation costs
Company reputation

<u>The Loss Causation Model</u>

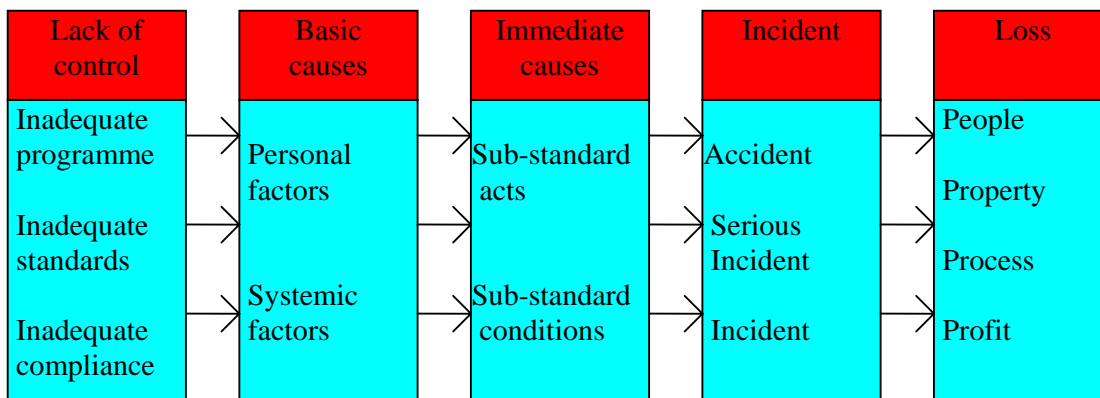| Lack of control	Basic causes	Immediate causes	Incident	Loss
Inadequate programme	Personal factors	Sub-standard acts	Accident	People
Inadequate standards			Serious Incident	Property
	Systemic factors	Sub-standard conditions		Process
Inadequate compliance			Incident	Profit

Fig. 1

Any accident or incident results in a loss and is the direct result of a number of Immediate Causes, which in turn are due to less obvious basic root causes. These are usually directly related to the lack of control. The principle of Loss Control is that by eliminating the Basic Causes, the sequence of events leading to the Loss and the Loss itself, can be prevented.

The Elements of a
Safety Management System

The elements of the Safety Management System outlined in this document and then discussed in more detail in the Implementation Document, are not exhaustive, but give an introduction to one approach to safety management.   It is important to understand that the information contained in this section is designed to explain the principles and does not constitute an action plan. The detailed action plans are contained in the Implementation Document, which should also give details of how each element is implemented, including the time scale, examples and resources required.

These elements are the individual building blocks of the system, but they should only be introduced in a planned and project managed process and their implementation should be phased to ensure the success of each stage. Aspects of some of the elements may already be in place, but may need to be modified in order to be compliant with the requirements of the Company's Safety Management System.

Corporate Approach to Safety

1. **Commitment to Safety**
    Leadership is an essential element in safety management, particularly the visible demonstration of commitment by all directors and managers.

2. **Management Safety Awareness and Training**
    All managers require instruction in safety management principles and techniques in order to provide effective management of safety performance.

3. **Positive Safety Culture**
    The philosophy of the Company's Senior Management towards safety, safe practices and safety assurance oversight will determine the extent of the safety culture.

4. **Recruitment, Selection and Development**
    The recruitment process and placement of employees must consider their overall suitability for the work they are expected to perform.

5. **Purchasing Control**
    Control of spares and workplace losses resulting from substandard equipment materials or services.

Organisation for delivering Safety

6. **Safety Meetings**
    A method of ensuring successful communication and resolution of safety related matters. The meetings must include directors and managers.

7. **Employee Competence**

The provision of training for employees to provide them with the competency and proficiency to perform their work in compliance with standards for safety, quality and profitability.

8. Safety Promotion and Communication

The management of the exchange of information between managers and staff to promote safety and reinforce safety awareness and attitudes.

9. Proactive Hazard and Risk Management

The proactive identification of hazards, the evaluation of risks and the introduction of controls.

10. Accident / incident Investigation

The examination of undesired events which caused actual injury, loss or had loss potential. The object is to provide feedback to improve safety performance.

11. Accident / incident Analysis

The methodical examination of the causes and actual consequences of undesired events.

12. Flight Data Recording Analysis

The examination of undesired events which have the potential to cause loss or have loss potential. The object is to provide feedback to improve safety performance.

13. Emergency Response Planning

Prompt, effective emergency response to reduce accidental losses and the consequences of natural and man-made disasters.

Safety Assurance

14. Safety Management System Monitoring

Comprehensive evaluations to verify that the Safety Management System remains valid and effective.

15. Safety Audits

Systematic auditing of safety performance.

16. Task Observation

A technique of constructive observation of tasks to ensure that they are performed safely and efficiently.

ONE   Corporate Commitment to Safety

Within an airline, the complementary but different aspects of Flight Safety (including airworthiness) and Health and Safety management must both be considered. Many of the principles of safety management are common to both areas, but for an airline the management of flight safety is paramount and is the aspect detailed here.

Managers can achieve their results only through the efforts of their staff. An effective safety management system requires commitment from both the staff and management, but this can only be achieved if the managers provide the necessary leadership and motivation. This is true at all levels of management, but it is essential that the process is led by the Board. The management's commitment to safety is fundamental and must be readily visible at all levels. Every opportunity for actively demonstrating this commitment to safety should be taken.

Safety management standards should be set which clearly allocate responsibilities. To provide a focus for the detail of the safety management system, a senior manager, (the custodian of the system), should be tasked with this responsibility and trained in safety management to provide guidance in the development of the safety programme. Monitoring of performance levels against the agreed standards is vital to ensure that the objectives are achieved. Managers should set a positive example in safety matters at all times.

Continued reduction in accidents and serious incidents has been achieved by companies that lead the world in safety management and which have adopted safe working procedures. Safe working procedures must be combined with disciplined behaviour to minimise accidents and serious incidents. Sustained leadership and motivation is required to achieve this often difficult aim. Effective leadership at all levels of management can focus the attention of all employees on the need to develop the right attitude and pride in the safe operation of the Company.

TWO   Management Safety Awareness and Training

For the successful operation of any management system, it is essential that the management team understands the principles on which the system is based. Effective training of management ensures this objective. Training should equip all those having supervisory responsibility with the necessary skills to implement and maintain the safety programme.

This element details the training of managers and supervisors in the following areas:

1. Initial training, soon after appointment to a supervisory position, to acquaint new managers and supervisors with the principles of the safety management system, their responsibilities and accountability for safety and statutory requirements.
2. Detailed training in the safety management system including the background and rationale behind each element.
3. Skills training in relevant areas such as communication, safety auditing and conducting group meetings.
4. Regular update and refresher training.

The training should be conducted to laid-down standards, using prescribed lesson plans. A record should be kept of the successful completion of each element.

Corporate training courses ensure that managers and supervisors are familiar with the principles of the Safety Management System and their responsibilities and accountabilities for safety. On-site training ensures that all staff are acquainted with the relevant information appropriate to their function.

It is also important that training is provided at an early stage for the safety custodian. The custodian needs to be aware of the detail of the safety management system and also proven techniques for implementing the elements. As the focal point for the system, the safety custodian should be thoroughly conversant with the programme and safety management principles.

THREE   **Positive Safety Culture**

Measuring and improving safety culture:

The most effective and strategic way to maintain a safe operation is to ensure that an airline has a positive safety culture. Simply put, everyone in the airline must be responsible for and consider the impact on safety of everything they do. This way of thinking must be so deep-rooted that it truly becomes a 'culture'. All decisions that are made, either by the Board, by a driver on the ramp or by an engineer working alone, must consider the implications on safety before any other consideration.

A positive safety culture must be generated from the 'top down' and relies on a high degree of trust and respect between workers and management. All workers must believe without doubt that they will be supported in any decisions made in the interests of safety and they must also believe that intentional breaches of safety that jeopardise the operation will not be tolerated.

Management must convince all employees that safety is management's prime consideration and while schedule delivery and costs are important, safety must come first.

What is Safety Culture?

It is the atmosphere or "way of working" within the company that influences safe behaviour. Safety cultures consist of shared beliefs, practices and attitudes. Culture is the atmosphere created, an invisible force, which shapes behaviour. A positive safety culture is the result of:
- Management and employee attitude
- Policies and procedures
- Supervisory responsibility and accountability
- Safety planning and goals
- Actions in response to unsafe behaviour
- Employee training and motivation.
- Employee involvement or "buy in".

Safety culture should start during the hiring process. If people with the right attitude are hired their behaviour will be the cornerstone of a safety culture.

Defining and Developing a Positive Safety Culture

The International Civil Aviation Organisation (ICAO) suggests that a positive safety culture is made up of the following attributes:
- Senior management placing a strong emphasis on safety
- Staff having an understanding of hazards within the workplace
- Senior management's willingness to accept criticism and an openness to opposing views
- Senior management fostering a climate that encourages feedback
- Emphasis on the importance of communicating relevant safety information
- The promotion of realistic and workable rules
- Ensuring staff are well educated and trained so that they understand the consequences of unsafe acts.

The Role of Management

Senior management must be a part of, not apart from, the safety culture. Management must not look down upon the organisation and direct it by edict, rather it should influence the culture as a participating component of that culture. It is not what management say they believe but what they do about it that is noted by others in the culture. Hence, there is no point in appointing a Safety Manager if that manager is "in name only", without the discretionary powers required to enact and enforce safety policies. If employees observe management condoning or indirectly promoting something unsafe, then they lose faith in the system. When employee groups feel that they cannot trust management, they will reject with suspicion any new initiatives. The first task for management is to gain and keep the trust of their employees.

Proactive Approach

With regard to safety, it is important to be proactive, rather than waiting for incidents and then reacting with 'local' fixes. Periodic safety audits can identify weaknesses in the system which can then be addressed. The philosophy of blame and punishment is divisive and only creates defensiveness. An integrated approach uses system-wide investigation and remedies aimed at upholding the shared value of system-wide safety. To that end, the organisation needs to encourage and reward vigilance and inquiry from all its members, seeking to fix the system rather than shooting the messenger.

Conclusion:

Development of a positive safety culture is considered an effective way to ensure a safe operation.

Before any improvement can be made to safety culture, a company must measure its current culture. Success or failure of any introduced safety enhancement or improvement programme will be readily apparent when safety culture is measured later. Several Government aviation agencies, such as NASA and the FAA in the USA and CASA in Australia have produced Safety Management Systems that detail methods for measuring and improving safety culture.

Steps in Safety Culture Enhancements:

- To improve safety culture effectively, a plan and programme are needed. Safety culture improvement is continuous, not a one-off action.
- The steps in such a process are:
  1. Assess and detail the safety management system
  2. Analyse the existing culture
  3. Identify areas for improvement
  4. Select ways for making improvement
  5. Intervene to improve the culture
  6. Monitor and evaluate the improvement.

FOUR   **Recruitment Selection and Development**

When recruiting a new employee or transferring an existing member of staff, their physical abilities and intellectual capacity should obviously match the requirements of the tasks they are to perform. Workers who are not suitable for the job cannot be expected to perform satisfactorily. Thorough selection procedures are therefore necessary.

The occupations within the organisation should be assessed to determine whether there are physical and health requirements necessary to the effective performance of the duties.

The selection procedure, particularly the interview, is designed to assess the ability, attitudes and motivation of potential recruits. Where appropriate, references should be reviewed to substantiate previous experience. Relevant documentary evidence in the form of certificates or licences should be requested where appropriate.

The objective of using such procedures are:

♦   To improve safety, quality, efficiency and employee morale.
♦   To minimise the risk of placing employees in jobs to which they are not suited.
♦   To reduce absenteeism and staff turnover.

FIVE   Purchasing Control

Substandard materials, equipment or services can cause considerable difficulty, danger and cost. This element gives an outline of systems to minimise such loss.

The purchasing control system should include the requirement that all new products, equipment and materials are reviewed to ensure that safety requirements are met. Suppliers should be required to provide safety information on supplied equipment and materials. Complete and detailed data on the composition and properties of materials and chemicals should also be required from suppliers. Data provided should include the requirements for the safe storage, safe use, safe disposal and specific first aid instructions. Chemicals should only be purchased through the approved channels and not 'over the counter' for unofficial trials by staff. No chemicals or hazardous materials should be allowed onto site until the purchase has been considered for safety implications and its use approved.

An item of particular importance to any airline is the procurement of services from contractors. The contractor selection procedure should include a review of the contractor's safety management arrangements and consideration of the contractor's previous safety record. These factors should be given equal weight with other considerations such as quality and prompt completion.

The contractor should be made aware of the requirements of the airline's safety management system and their responsibilities within it. Before the commencement of work and throughout the contract, close liaison should be maintained to ensure that safety standards are observed.

SIX   Safety Meetings

The importance of, regularly held, formal safety meetings cannot be over stated. The safety management system can only continue to be relevant to the company if the decisions made at these meetings are acted upon and supported by senior management.

The active representation of Board members and departmental heads is vital if safety committees are to be effective. The people who have the capacity to make and authorise decisions should be in attendance. Without the involvement of these decision makers, the meetings will just be "talking shops." Departmental heads should also hold regular meetings with their staff to allow safety concerns and ideas to be discussed.

The importance given by the Board and all levels of management to resolving safety issues at these meetings will demonstrate the Company's commitment to safety.

Safety Committees are an important tool of safety management and are invaluable in fostering a positive safety culture. These committees will help to identify problem areas and implement solutions. The details of safety improvements derived from these meetings should be widely communicated throughout the organisation.

The structure and number of committees will depend on the size of the organisation and it might be sufficient for a small operation to manage with one committee covering all areas. Larger organisations may require a formal structure of safety review boards and safety committees to manage their requirements. A method should also be established for all employees to have a written or verbal input into the appropriate meetings.

Safety Review Boards

The Engineering, Ground and Flight Safety Review Boards assist the Operating Boards in the discharge of their responsibilities and they provide a focused overview of matters important to safety. The Review Boards consider reports and matters raised by the Safety, Quality and Accountable Managers. The Review Boards are chaired by the Accountable Managers who report to the Operating Boards on all flight safety matters which are brought to their attention.

Safety Committees

The Engineering, Ground Handling and Flight Safety Committees review the performance of matters relating to flight safety within operations, engineering and the handling of aircraft and facilities as appropriate. They consider reports produced from the analysis of Confidential Reports, Safety Audits and any other relevant data. They also consider all proposals for improving flight safety and recommend or refer matters to The Engineering, Ground Handling or Flight Safety Review Boards.

The purpose of these committees and review boards is to coordinate the required processes to ensure that the operations of the Company and its sub-contractors are as safe as reasonably practicable.

SEVEN   Employee Training and Competence

Training is of fundamental importance to effective job performance. Effective performance means compliance with the requirements of safety, profitability and quality.

To meet this training need, it is necessary to establish a programme which ensures:

1. a systematic analysis, to identify the training needs of each occupation.
2. the establishment of training schemes to meet the identified needs.
3. the training is assessed and is effective, in that each training session has been understood and the training programme is relevant.

The systematic analysis of training needs is based on the assessments carried out in other elements of the programme. It involves the review of all occupations, analysis and observation of critical activities, accident and incident analysis and statutory requirements. The objective of all training is to equip employees with the skills and knowledge to carry out their duties safely and effectively.

All appropriate training methods should be used, but there will be no substitute for practical on-the-job instruction in some occupations. Whatever training techniques are adopted, it is important that the effectiveness of the training is assessed and that training records are maintained. Periodic reviews of the training programme are required to ensure that it remains relevant and effective.

EIGHT   Safety Promotion and Communication

Effective communication is vital to promoting a positive safety culture. The crucial point is not so much the apparent adequacy of safety plans but the perceptions and beliefs that people hold about them. A company's safety policies and procedures may appear well-considered but the reality among the workforce may be sullen scepticism and false perceptions of risk.

Research clearly shows that openness of communication and the involvement of management and workers characterise companies with positive safety culture while poor safety culture is associated with rumour-driven communications, step-change reorganisation, lack of trust, rule book mentality and "sharp-end" blame culture.

Critical safety topics should be selected for promotional campaigns based on their potential to control and reduce losses due to accidents and incidents. Selection should therefore be based on the experience of past accidents or near misses, matters identified by hazard analysis and observations from routine safety audits. Employees should also be encouraged to submit suggestions for promotional campaigns.

Recognition of good safety performance can have promotional value provided that it is based on safety performance measured against high safety standards. Awards for good accident records have unfortunately been found to encourage the concealment of accidents and are not recommended.

Communication is a major part of any management activity. To communicate effectively, a company must first assess the methods available and then determine those which are the most appropriate. All methods of communication must allow upwards as well as downwards transfer of information and must encourage feedback from all users of the safety management system.

NINE **Proactive Hazard & Risk Management**

Proactive hazard and risk management is the systematic examination of hazardous activities to establish safe and effective procedures and practices. It is an all-embracing process considering hazard identification, threat assessment and risk analysis to ensure systemic safety.

The process appears complex but is fundamental to ensuring a safe operation. It also produces benefits for many other areas of the safety management system and increases efficiency. Analysis of hazardous activities will identify areas of high risk that require monitoring, enable defences to be developed and contingency plans to be produced.

In order to use resources effectively, the analysis process is best carried out on activities which can be identified as 'critical', with the potential to cause the greatest loss. It is a commonly held view in most organisations that 80 per cent of problems result from 20 per cent of the activities.

The Hazard Management element is designed to give detailed step by step instructions for activities where it is possible to produce a procedure or work practice, based on hazard analysis, and incorporate the defences and controls required for each potential loss area.

The element stresses the importance of establishing a definite management commitment to analysis of activities in the form of management instructions. The instructions should stress the advantages of improving safety for staff and its benefits to loss control.

A routine monitoring system should be established to review the quality of the activity analysis and ensure that the programme standards are being achieved. A strategy that has been used in other industries for the completion of the analysis is:

- Firstly to conduct the exercise of identifying the major hazards, using a small team drawn from all appropriate disciplines.

- Then the detailed analysis of the major hazards is carried out, followed by all other hazards over an extended period, by supervisors working to a realistic programme.

TEN   **Accident / Incident Investigation**

Despite all the precautions taken to minimise them some accidents and incidents will inevitably occur. They can provide invaluable information for the improvement of the safety management system, provided there is an efficient method of gathering the information.

It is commonly believed that for each accident there are 10 serious incidents, 30 minor incidents and 600 near miss incidents.

The ratio indicates that concentrating management effort on the relatively few accidents is not an effective strategy when there are a great number of near miss incidents which could result in some form of loss. To reduce losses a systemic examination of the total pattern of accidents and incidents is required.

The investigation should seek to determine not only the immediate causes, but the underlying basic causes and inadequacies in the safety management system which imply lack of control. The appropriate management procedure should then ensure that remedial action is taken. Clearly, detailed investigation of each near miss incident would be capable of absorbing more resources than are available.

All accidents, incidents and near misses should be reported and their potential for creating loss should be assessed. All potential high loss accidents and incidents should be investigated fully. The potentially minor loss incidents should nonetheless be recorded and a brief investigation made if appropriate.

The records of accidents and near misses should be reviewed in a systematic manner at regular intervals. This allows trends and common accident causes to be recognised and corrective action to be taken. Element Eleven details the importance of analysis.

ELEVEN   Accident and Incident Analysis

The investigation of accidents, incidents and near misses yields more information than just the details of the individual events. This element is concerned, not with procedures for investigating accidents and incidents, but with how the data can be used.

Accident data can be analysed to look for trends. The summarised data can then be made available to managers, supervisors and flight safety representatives.

Analysis of trends can show that a large number of accidents and incidents occur at certain times, often involve experienced employees or are associated with certain types of equipment or procedures. The data obtained from accidents, incidents and near miss incidents is valuable in increasing the size of the data base, which improves trend analysis. This element measures the organisation's arrangements for calculating and distributing analysis of accident and incident data and the uses to which it is put.

TWELVE   **Flight Data Recording Analysis**

One of the most powerful tools available to a company, striving for improvements in the safe operation of its aircraft, is the use of FDR analysis. Unfortunately it is often viewed as one of the most expensive in terms of the initial outlay, software agreements and personnel requirements. In reality it has the potential to save the Company money by reducing the risk of a major accident, improving operating standards, identifying external factors affecting the operation and improving engineering monitoring programmes.

FDR analysis allows the monitoring of various aspects of the flight profile such as the adherence to the prescribed take-off, initial climb, descent, approach and landing phases. By selecting specific aspects it is also possible to concentrate on them in either a proactive way prior to changes in the operation or retrospectively. The introduction of a new fleet or new routes for example will inevitably expose the Company to new hazards and influence existing ones, potentially increasing the risk of a major incident.

Using the analysis of the FDR after an incident is becoming quite common, but the ability to compare a specific flight with the fleet profile gives the ability to analyse the systemic aspects of the incident. It may be that the parameters of the incident vary only slightly from numerous other flights, indicating the requirement for a change in operating technique or training. For example, it would be possible to determine whether a tailscrape on landing was an isolated incident or symptomatic of mishandling during the approach or over-flaring on touchdown.

Engine monitoring programmes are often computer based, but rely on the manually recorded subjective data being manually input. A time consuming and labour intensive process that limits its potential to be accurate and proactive. For example an engine may fail before a trend has been identified. Using FDR data, accurate analysis is possible within a short time scale, increasing the potential for preventative action. It also becomes possible to monitor other aspects of the airframe and components.

A properly constituted FDR programme has the greatest potential for improving the safety of operating techniques and increasing the Company's knowledge of its aircraft performance.

THIRTEEN   **Emergency Response Planning**

All the Company's operational locations must develop emergency response plans and maintain a robust means of co-ordinating them with the Company's main accident co-ordination centre procedures.

An emergency response planner should be designated with responsibility for preparing a fully comprehensive emergency plan with the co-operation of all departments. The plan should be based on a systematic assessment of possible emergencies, their probability and potential for injury, damage or financial loss. These plans should not be restricted to aircraft accidents, but be extended to all emergencies that have a flight safety or financial impact on the operation of the Company.

The plan should assign responsibilities to specific individuals, provide emergency procedures, control the notification of outside agencies, nominate channels and centres of communication, provide for 'in-house' emergency response and effective liaison with outside emergency services. Detailed instructions should be prepared for each airport, department or building where potential hazards exist. Specific procedures need to be developed for hazardous chemicals and equipment.

Methods for communicating to the public in the event of a major incident should be covered in the plan. Consideration must be given to circumstances where there is a possibility of a third party incident affecting the Company. There should also be a provision to control information released to the media.

Once the plans have been formulated it is important to ensure that staff are adequately trained. The training system needs to incorporate initial training on appointment and regular review of staff knowledge, followed by appropriate refresher training. The plans should be rehearsed regularly both to familiarise staff and to reveal any problems. There should also be routine testing of emergency systems and all testing, training and rehearsals should be recorded.

FOURTEEN   Safety Management System Monitoring

In order for the safety management system to maintain and improve its standards, it is essential to regularly monitor its validity and performance. The value of such assessment has long been promoted by management consultants, but was also highlighted by the inquiries into the Kings Cross Underground fire and the Clapham Rail disaster.

When the safety management system is first implemented a system safety assessment will have been carried out to evaluate the risks and introduce the necessary controls. As the organisation develops, there will inevitably be changes to equipment, practices, routes, contracted agencies, regulations, etc. In order for the safety management system to remain effective it must be able to identify the impact of these changes. Monitoring will ensure that the safety management system is updated to reflect the changes in organisational circumstances.

Monitoring the safety management system is the way in which it is constantly reviewed and refined to reflect the company's changing arrangements.

Statistical recording of all monitoring should be undertaken and the results passed to the safety manager for consideration at safety meetings and a copy sent to the accountable manager.

Management consultants say:

- What gets measured gets done.
- Performance measurement and motivation are almost synonymous.
- You cannot manage what you cannot measure.
- If loss must occur before you can act, that's reaction not control.

FIFTEEN   Safety Audits

Safety audits should be performed as part of the safety programme and are intended to ensure that correct procedures, practices and processes are being followed and that no obvious safety problems exist. The audit should be extended to include the activities of any contracted agencies, where they may affect the safety of the operation.

It is important that those chosen to perform the audit are suitably qualified and trained, in order that the validity of the audit is guaranteed. Consideration should be given to the integration of safety and quality audits to both reduce costs and enhance continuity.

The safety audit programme should ensure that over a period of twelve months all activities and areas of the organisation will have been audited. Audits may either be pre-arranged with the head of department, or take the form of an ad hoc visit. If deficiencies are observed during an audit the frequency of audits should be increased until the deficiencies are controlled or reduced to an acceptable level.

On completion of the audit, a debriefing session between the auditor and head of department should be held to agree the accuracy of the findings. After debriefing, a formal report should be issued to the head of department. This should include satisfactory and unsatisfactory findings. The unsatisfactory findings should be referenced to a requirement or procedure that is documented. This ensures that the head of department fully understands any areas of concern. The report should also include recommendations that are appropriate and helpful. The head of department should return a copy of the report to the auditor after annotating it with the departmental response, including any remedial actions taken and the time scale of any planned remedial actions. The findings of the audit report must be copied to the accountable manager, as he is ultimately responsible for the safety management system.

The auditor should agree a follow up action schedule with the head of department in order to ensure that the remedial action has been taken and is effective.

Report on the Kings Cross underground fire:

If the internal audit has become the yardstick by which financial performance is measured, then the safety audit should become the yardstick by which safety is measured.

SIXTEEN   **Activity Observation**

The objective and systematic observation of activities being performed can yield much useful information for the safety management system and help to reduce losses. The aim is to reveal problems and shortcomings which could lead to accidents. Typically, such shortcomings can be inadequate equipment or procedures, lack of effective training, or the use of inappropriate materials. The outcome should be action to reduce and control risks.

The observation of activities should only be employed with the full knowledge, agreement and co-operation of staff. Its purpose is to ensure that the controls developed to prevent or reduce the risk of loss are working effectively. It ensures that employees are able to follow the procedures and that the activities are performed in a safe and efficient manner. The observation of activities complements the analysis conducted in Element nine to refine and improve control measures.

Complete observation of all activities carried out by all employees is not always practical. The observation of activities should be conducted on the list of 'critical hazards' produced for Element Nine. These have already been identified as having the greatest potential impact on safety and profitability and therefore give the greatest return for the effort involved.

All new activities should be regarded as critical until it can be positively demonstrated otherwise. A local management instruction should be established indicating that the observation of activities will be carried out in a defined manner as a fundamental part of the safety programme. The instruction should point to the benefits of the observation process for the safety of the employees and the control of loss.

A reasonable target for the observation programme might be for each employee to be observed carrying out all their critical activities within a two year period. In addition to the programme of observation of complete activities it has been found useful to carry out multiple observations of parts of critical activities on a more frequent basis.