Transport Canada Transports Canada

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Introduction to

SAFETY MANAGEMENT SYSTEMS

Canada

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Aviation Safety Management

Introducing a Systems Approach to Safety Management

How to:

- Involve all staff in safety
- Develop a positive safety culture
- Maintain commitment
- Assess progress

Foreword

Aviation in Canada is growing and the Canadian public is confident that the aviation industry in Canada is safe. We are, however, facing serious challenges. For example, projected growth in aviation means that maintaining the current low accident rate will result in an unacceptable number of accidents. The challenge for Transport Canada and the industry is to find ways to lower the accident rate even further as the industry grows.

Flight 2005: A Civil Aviation Safety Framework for Canada identifies six Evolving Directions which represent the principal adjustments that we need to make over the next few years:

- Adopting a data-driven approach to enhancing aviation safety. This includes collecting and making more accessible the type of data that will support a proactive approach to safety;
- Using a risk-based approach to resource allocation to support those activities which will achieve the greatest safety benefit;
- Fostering and strengthening partnerships to put into effect the concept that responsibility for safety is shared by the regulator and the aviation community;
- Implementing safety management systems in aviation organizations;
- Taking account of human and organizational factors in safety management practices; and
- Communicating effectively with the aviation community on safety.

Implementing safety management systems is the cornerstone of the evolving directions. All the other directions will evolve within a safety management system environment. Safety management systems are based on the fact that there will always be hazards and risks, so proactive management is needed to identify and control these threats to safety before they lead to mishaps.

The material in this booklet is condensed from a number of sources to introduce safety management system principles and concepts. Applying this approach will require changes in the way both Transport Canada and the industry deal with safety, including regulatory changes. This booklet is not intended to be a guide to compliance with the Canadian Aviation Regulations (CARs), but we hope it will be useful to owners and managers who want to engage their entire staff in safety.

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April 2001

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About Safety Management Systems

Why safety management systems?

In recent years a great deal of effort has been devoted to understanding how accidents happen in aviation and other industries. It is now generally accepted that most accidents result from human error. It would be easy to conclude that these human errors indicate carelessness or incompetence on the job but that would not be accurate. Investigators are finding that the human is only the last link in a chain that leads to an accident. We will not prevent accidents by changing people; we will only prevent accidents when we address the underlying causal factors.

In the 1990's the term 'organizational accident' was coined because most of the links in an accident chain are under the control of the organization. Since the greatest threats to aviation safety originate in organizational issues, making the system even safer will require action by the organization. After conducting extensive research and consulting world leaders in safety, Transport Canada Civil Aviation has concluded that the most efficient way to make the Canadian aviation system even safer will be to adopt a systems approach to safety management. Transport Canada is supporting the adoption of safety management systems by undertaking:

- extensive discussion and consultation with all segments of the aviation industry;
- a comprehensive educational and promotional campaign; and
- changes to the Canadian Aviation Regulations (CARs).

What is a safety management system?

A safety management system is a businesslike approach to safety. It is a systematic, explicit and comprehensive process for managing safety risks. As with all management systems, a safety management system provides for goal setting, planning, and measuring performance. A safety management system is woven into the fabric of an organization. It becomes part of the culture, the way people do their jobs.

The 4 Ps of safety management

Philosophy - Safety management starts with Management Philosophy:

- recognizing that there will always be threats to safety;
- setting the organization's standards; and
- confirming that safety is everyone's responsibility.

Policy - Specifying how safety will be achieved:

- clear statements of responsibility, authority, and accountability;
- development of organizational processes and structures to incorporate safety goals into every aspect of the operation; and
- development of the skills and knowledge necessary to do the job.

Procedures - What management wants people to do to execute the policy:

- clear direction to all staff;
- means for planning, organizing, and controlling; and
- means for monitoring and assessing safety status and processes.

Practices - What really happens on the job:

- following well designed, effective procedures;
- avoiding the shortcuts that can detract from safety; and
- taking appropriate action when a safety concern is identified.

The organizational structures and activities that make up a safety management system are found throughout an organization. Every employee contributes to the safety health of the organization. In larger organizations, safety management activity will be more visible in some departments than in others, but the system must be integrated into "the way things are done" throughout the establishment. This will be achieved by the implementation and continuing support of a coherent safety policy which leads to well designed procedures.

What does it take to build a safety management system?

Management initiatives are not always successful and each time a new idea is introduced people ask whether this is a worthwhile initiative, or a fad that will pass soon enough. Having a good idea does not guarantee success. Many good ideas have failed in practice because one or more of the three critical elements was missing: commitment, cognizance, and competence. These three "C's" of leadership will determine, in large part, whether safety management achieves its goals and leads to a pervasive safety culture in an organization:

- **Commitment:** In the face of operational and commercial pressures do company leaders have the will to make safety management tools work effectively?
- **Cognizance:** Do the leaders understand the nature and principles of managing for safety?
- **Competence:** Are safety management policy and procedures appropriate, understood, and properly applied at all levels in the organization?

What is a safety culture?

An organization's culture is defined by what the people do. The decisions people make tell us something about the values of the organization. For instance, the extent to which managers and employees act on commitments to safety tell us more than words about what values motivate their actions.
A good gauge of safety culture is "How we do things around here." A safety culture may be slow to mature, but, with management support, it can be accomplished.

A safety culture is:

- **An informed culture**
  - people understand the hazards and risks involved in their own operation
  - staff work continuously to identify and overcome threats to safety

A just culture

- errors must be understood but willful violations cannot be tolerated
- the workforce knows and agrees on what is acceptable and unacceptable

A reporting culture

- people are encouraged to voice safety concerns
- when safety concerns are reported they are analyzed and appropriate action is taken

A learning culture

- people are encouraged to develop and apply their own skills and knowledge to enhance organizational safety
- staff are updated on safety issues by management
- safety reports are fed back to staff so that everyone learns the lessons

How do you encourage a positive safety culture?

- management practices what it preaches regarding safety;
- management allocates adequate resources to maintain an operation that is efficient and safe;
- management acknowledges safety concerns and suggestions:
  - management gives feedback on decisions, even if the decision is to do nothing;
  - if no action is contemplated, that decision is explained; and
  - feedback is timely, relevant and clear.

What does a safety management system do for an organization?

There are two ways of thinking about safety. Traditionally, safety has been about avoiding costs. Many organizations have been bankrupted by the cost of a major accident. This makes a strong case for safety, but cost of occurrences is only part of the story. Research shows that safety and efficiency are positively linked. Safety pays off in reduced losses and enhanced productivity. Safety is good for business.

A safety management system will provide an organization with the capacity to anticipate and address safety issues before they lead to an incident or accident. A safety management system also provides management with the ability to deal effectively with accidents and near misses so that valuable lessons are applied to improve safety and efficiency. The safety management system approach reduces losses and improves productivity.

The basic safety process is accomplished in five steps:

1. A safety issue or concern is raised, a hazard is identified, or an incident or accident happens;
2. The concern or event is reported or brought to the attention of management;
3. The event, hazard, or issue is analyzed to determine its cause or source;
4. Corrective action, control or mitigation is developed and implemented; and
5. The corrective action is evaluated to make sure it is effective. If the safety issue is resolved, the action can be documented and the safety enhancement maintained. If the problem or issue is not resolved, it should be re-analyzed until it is resolved.

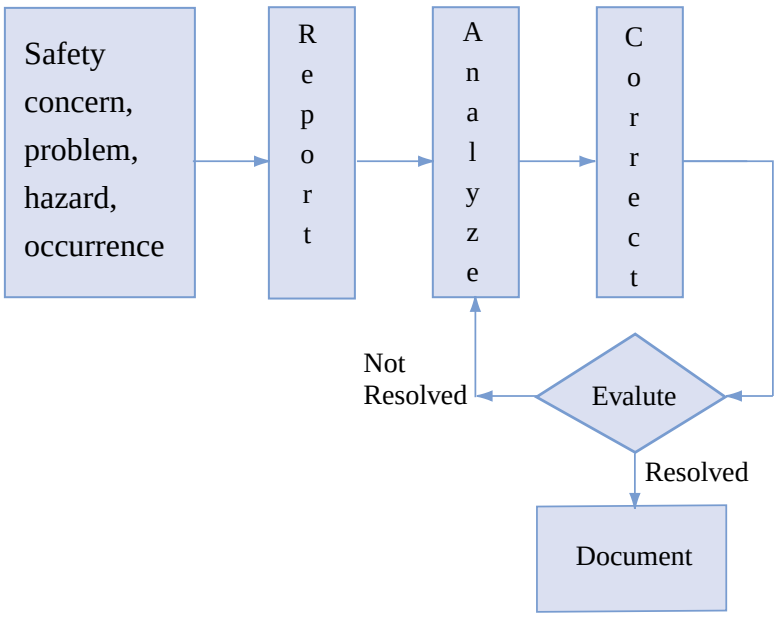

Figure 1 The basic safety process

How does a safety management system differ from traditional approaches?

Implementing safety management systems does not involve Transport Canada imposing an additional layer of regulatory and safety oversight on the industry. Safety management systems incorporate the basic safety process, described above, into the management of an organization. The traditional flight safety approach depended on a flight safety officer (or department in a larger organization) independent from operations management, but reporting to the Chief Executive Officer or Chief Operating Officer of the company. The safety officer or department had, in effect, no authority to make changes that would enhance safety. The safety officer or department's effectiveness depended on the ability to persuade management to act. A safety management system holds managers accountable for safety related action or inaction.

The safety management system philosophy requires that responsibility and accountability for safety be retained within the management structure of the organization. The directors and senior management are ultimately responsible for safety, as they are for other aspects of the enterprise. This is the logic that underlies recent Transport Canada Civil Aviation regulatory initiatives. When they come into force, the new regulations will require certain aviation organizations to identify their ‘accountable executive’. This is the person who has financial and executive control over an entity subject to the regulations. The accountable executive is the certificate holder. Should an organization hold more than one certificate, (eg., an operator who holds an air operator certificate and has an approved maintenance organization) there would be only one accountable executive.

The safety management system approach ensures that authority and accountability co-exist.

Some Features of Safety Management Systems

When an organization develops a safety management policy and procedures, they have to fit into the organization. Safety management has to be comprehensive, but should not be more complex than the rest of the company’s management program. Safety management must be compatible, and preferably, integrated into the overall management scheme. The following list will be helpful to the manager who wants to know more about how to make safety management a reality. Most items in this list will be familiar to managers. They are already part of the safety landscape. The fundamental changes are concerned with roles and accountability of management and the regulator.

1. Senior management commitment
2. Safety policy
3. Safety information
4. Establishing safety as a core value
5. Setting safety goals

6. Hazard identification and risk management
7. Establishing a safety reporting system
8. Safety audit/assessment
9. Accident and incident reporting and investigation
10. Safety orientation and recurrent training
11. Emergency response plan
12. Documentation

Each element is briefly described below with examples and benefits.

Senior Management Commitment

Regardless of the size, complexity, or type of operation, there is no doubt that senior management plays a major role in determining the company's safety culture. Without the wholehearted commitment of management, any safety program will be ineffective. Safety management will succeed to the degree that senior management devotes the time, resources, and attention to safety as a core management issue.

Benefit - Solid commitment ensures that safety management is accorded sufficient resources and attention.

Safety Policy

Senior management commitment will not lead to positive action unless that commitment is expressed as direction. Senior management must develop and communicate safety policy that allocates responsibilities and holds people accountable for meeting safety performance goals. In some small organizations, policies may be informally communicated while in other organizations policy is documented and communicated through formal channels. Some aviation organizations are required by regulation to meet defined standards in the formulation and documentation of safety related policy. The relevant CARs should be consulted to make sure that required standards are met.

Safety Policy should include, at a minimum:

- a clear declaration of commitment and objectives;
- a means for setting safety goals and regular review of safety performance;
- clear statements of responsibility applying to every department or functional area in the organization;
- clearly stated accountabilities converging at the top of the organization;
- a means for ensuring compliance with regulations;
- a means for ensuring adequate safety management knowledge and skills at all levels; and
- compatibility or integration with other management systems.

Once the policy is defined, procedures must be devised to implement the policy. Procedures must be consistent with policy and appropriate for the employees responsible for performing them. Well thought out procedures help ensure that practices are consistent with the policy.

Benefit - Management is confident that staff understand and accept that they have important roles in ensuring safety.

Safety Information

Management depends critically upon information to make decisions and lead the organization. Managers and staff should be able to access and use safety information relating to the organization's own performance. Therefore, management must establish a system to collect and analyze safety data. This would include:

- safety goals and evaluation of progress towards those goals;
- records of accidents and incidents including internal/external investigation findings and corrective actions;
- safety concerns raised by employees including analysis and resultant action;
- results of safety reviews and audits and when appropriate, corrective action; and
- records of all safety initiatives or interventions.

The safety information system should be large enough and complex enough to meet the organization's needs. A small company or agency may be able to keep all the relevant information in a small number of files. A larger enterprise may be better served by automating the record keeping. Some larger companies may even dedicate full time staff to the safety information system.

Managers and employees should also be looking outward and keep up-to-date on the latest developments in safety. Keeping current on safety provides a better background for understanding aspects of the organization's safety condition and developing novel solutions to difficult problems. This is accomplished by subscribing to safety related publications, making relevant Transportation Safety Board (TSB) accident investigation reports available, and encouraging staff to participate in safety related training, seminars and workshops.

Benefit - Safety data and information are available to the people who need it to do their jobs.

Establishing Safety as a Core Value

Safety is not accomplished solely by the owner, Chief Executive Officer, or any other individual in an organization. Safety involves everyone. A positive safety culture is invaluable in encouraging the kind of behaviour that will enhance safety. Positively re-enforcing safety conscious action sends the message that management cares about safety.

The best way to establish safety as a core value is to make safety an integral part of the management plan. This is done by setting safety goals and holding managers and employees accountable for achieving those goals. To be effective, goal setting requires practical, achievable goals which can be verified and safety goals are no different. Goals should be set and deadlines for meeting them established. Managers must follow through and hold those responsible to account for their progress toward the goals. Success or failure in meeting safety goals should be treated in the same way as success or failure at meeting any other types of goals.

Many organizations hold safety meetings from time to time. This is a good idea, but if safety is a core value, safety implications should be raised and addressed as a normal part of doing business. When operational or financial concerns are discussed, associated safety issues should be considered as well. For instance the selection of new equipment will probably involve evaluating factors like training, purchase price, operating costs, and maintenance. Safety aspects of the acquisition should also be considered. Requiring that safety be a part of every management decision underlines the importance of safety and ensures that safety is a normal part of the way all jobs are done.

Benefit - Staff become stakeholders in safety management, ensuring its effectiveness.

Setting Safety Goals

Goal setting is vital to an organization's performance. All organizations have their own ways of setting and expressing goals. In some organizations the goals are not stated very explicitly. Other organizations set goals formally and document the process. Regardless of how management goals are set, few organizations are good at developing safety goals. The most common weakness in setting safety goals is focusing on outcomes. This usually means counting accidents, but we know that safe companies can have accidents while less safe operations can be lucky and avoid accidents. Although the ultimate goal is 'no accidents', there are more precise and useful ways of measuring safety, especially in a safe system, than counting accidents.

Professor James Reason of the University of Manchester, a leading authority in the management of safety, compares managing safety to "fighting a guerrilla war in which there are no final victories". It is a never ending struggle to identify and eliminate or control hazards. We will never run out of things to do to make the system safer. Sound management requires that we identify them, decide how to achieve them, and hold ourselves accountable for achieving them. Risk management procedures can help managers decide where the greatest risks are and help set priorities. Sound safety goal setting concentrates on identifying systemic weaknesses and accident precursors, and either eliminating or mitigating them.

Benefit - Clearly stated goals lead to a commitment to action which will enhance the safety of an organization.

Hazard Identification and Risk Management

A hazard is a condition with the potential of causing injury to personnel, damage to equipment or structures, loss of material, or reduction of the ability to perform a prescribed function.

Risk is the chance of injury or loss. This concept includes both the likelihood of a loss and the magnitude.

Hazard identification and risk management should be undertaken, at a minimum:

- during implementation of the safety management system and then at regular intervals;
- when major operational changes are planned;
- if the organization is undergoing rapid change, such as growth and expansion, offering new services, cutting back on existing service, or introducing new equipment or procedures; and
- when key personnel change.

Transport Canada Civil Aviation has adapted the Canadian Standards Association Q850 decision-making process for risk management. The Civil Aviation approach calls for seven steps:

1. Initiate the Process
2. Perform Preliminary Analysis
3. Estimate Risk
4. Evaluate the Risk Activity
5. Control Risk
6. Take Action
7. Monitor Impact

Benefit - Hazard identification and risk management provide the information needed to control risk at acceptable levels.

Establishing a Safety Reporting System

Aviation is a dynamic industry and conditions are constantly changing. To alert management that something has changed, or a new hazard is emerging, organizations need input from all levels. Employees must have a way to report hazards and safety concerns as they become aware of them and every employee must know how to report their concerns.

When an employee reports a concern or hazard, the report should be acknowledged and analyzed. Acting on reported safety concerns will build employees' confidence in the system. If, however, a reporting system is not maintained and attended to, people will quickly stop using it. Some organizations will be required by regulation to institute a reporting system. A system that employees do not trust or use will not fulfill the requirements of the regulation.

Any safety concern should be reported, but here are some real life examples:

- high workload during passenger boarding;
- poor communication between operational areas;
- crews rushing through checks;
- inadequate checklists;
- inadequate tool or equipment control;
- difficulty obtaining parts;
- feeling fatigued on certain schedules;
- NOTAMS not being passed to crew;
- in-flight turbulence;
- unsafe ground movements;
- poor communication within maintenance;
- poorly designed task cards;
- lack of emergency equipment, procedures and training;
- emergency exit paths blocked;
- vehicles left in fire lanes or other unauthorized area;

- unruly passengers;
- confusing signs;
- poor lighting;
- dispatching overloaded aircraft; and
- failing to maintain operational control.

Not all safety concerns require a special reporting system. Some should be made on existing paperwork, such as reports or logs. Other hazards might not fit well into existing reporting systems. It is fairly easy to create a form or process.

The report must be analyzed to determine whether there is a real threat to safety and if so, what needs to be done. When the issue requires action, that information must go to the person who has the authority to take the action. This preserves the accountability of the safety management system.
The credibility of the system is preserved when the outcome is fed back to the reporter. If it is decided that no action is appropriate, that information, and the reasons for that decision should be fed back to the reporter. What really matters is that all staff know how to report safety concerns and that their reports are acknowledged, analyzed, and resolved in a timely manner.

Benefit - Staff have a way to bring their safety concerns to the people who can do something about them.

Safety Audit / Assessment

Safety audits or assessments should be conducted regularly, and in some cases may be required by regulation. These assessments will ensure that correct procedures are being followed and resolve any problems or misunderstandings.

Any safety assessment should include the activities of contractors engaged by the company where the services of the contractor might affect the safety of the operation. Examples could include maintenance organizations, people who accept cargo on behalf of your organization, or airport operators.

Small companies do not need a special department to plan and conduct regular internal audits. They do, however, need to know what is going on in the operation. Are staff following procedures, particularly when supervisors are not around? If not, why not? In a larger organization, a special group may be responsible for planning and conducting safety audits/assessments. In some organizations, the quality/inspection department would be responsible for planning and conducting audits. Regardless of who takes on the responsibility, an audit or assessment should be conducted regularly.

Benefit - Management is assured on a regular basis that policies, procedures and practices are correct and consistent, and is alerted when an area needs attention.

Accident and Incident Reporting and Investigation

Fortunately, accidents are rare. Incidents, however, are much more common. Furthermore, incidents and less serious accidents are often wake up calls that can alert employees and managers to hazards, risks, or possibilities that they had not considered before. Every incident and accident is an opportunity to learn valuable safety lessons. The lessons will be understood, however, only if the occurrence is analyzed so that managers and staff understand not only what happened, but why it happened.

Every incident and accident should be reported and investigated. The investigator, or team of investigators must be technically competent and either possess or have access to background information so that facts and events are interpreted accurately. The investigator should have the confidence of staff and the investigation process should be a search to understand how the mishap happened, not a hunt for someone to blame.

The investigation report must go to the responsible manager who has the authority to act on the findings.

Benefit - Your company learns from investigating incidents and is able to remove hazards or strengthen defences as required.

Safety Orientation and Recurrent Training

New employees should be trained in how safety is managed and encouraged to adopt the safety philosophy, policy, procedures, and practices of the company.

Over and above the regulatory requirements for specific training and checks, ongoing technical training in each employee's own discipline should be accorded a high priority. The commitment to provide both relevant orientation training and ongoing refresher/recurrent training for all staff is an essential element of any safety program.

In a small company, sitting down with new employees, or briefing as you show them around and introduce the other staff members, may be a good way to introduce your company's safety philosophy. A larger company would be well advised to train all new staff on the company's approach to safety. It could be part of existing orientation programs or delivered separately by specialist staff.

Benefit - All staff understand how safety is managed and what is expected of them to make it effective.

Emergency Response Plan

As stated previously, accidents are rare. This is good news. The bad news is that a good safety record can lull us into complacency so that if something really bad does happen, we may not be prepared to deal with it. Every aviation organization, operator, service provider, maintenance organization, and airport should have an emergency response plan. The survival of a company can depend on how it handles the first few hours or days following an accident.

An emergency response plan outlines in writing what should be done after an accident happens, and who is responsible for each action. When the plan is adopted, relevant staff should be briefed on the plan and their responsibilities. Appropriate staff should receive training in emergency response procedures.

The plan should be readily available and a copy should be at the work station of the person who normally answers the company telephone as this is likely to be the first person notified of an occurrence.

The Plan should:

- be relevant and useful to people on duty at the time of an accident;
- include checklists and emergency contact details;
- be updated when contact details change; and
- be exercised to ensure the adequacy of the plan and the readiness of the people who must make it work.

Benefit - Staff will know what to do in the event of an emergency or accident.

Documentation

The safety management program or system should be formally documented in appropriate manuals, directives and/or instructions.

Documentation should include:

- a policy statement from the Accountable Executive;
- the reporting chain and responsibilities of key personnel;
- the hazard identification and risk management process;
- the safety reporting process;
- audit/review processes; and
- all other activities of the program.

Records should be kept of:

- all activities related to identification of hazards, risk assessment, and action taken;
- results of all investigations of accidents and incidents, including analysis and action taken;
- all safety reports issued or received including analysis and action taken
- any safety recommendations;
- findings of internal audits, assessments and program reviews; and
- management action.

Documentation must be tailored to the needs of the organization. There are a number of commercially available database programs that help automate many of the functions so that more time can be devoted to safety and less to administration and clerical activities.

Benefit - Safety policy, responsibilities and procedures of the safety program are documented and available.

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