Aviation Safety

Aviation Risk Management – Accountabilities, Challenges and Tools

ABSTRACT

Effective aviation risk management requires cohesive effort from both the civil aviation authority (CAA) providing guidance and oversight to organisations as well as within the organisation through effective hazard identification and risk assessment. Senior management may delegate safety responsibilities to qualified and properly-trained staff members but cannot delegate accountabilities to these same staff members. Senior management controls the resources to affect operational change and influence the safety culture and therefore must retain these accountabilities. The CAA and senior management of airlines must continually monitor aviation safety trends and develop mitigation strategies based on technical solutions, rigorous training programmes and personal human factor awareness training. Ongoing communications and incorporating best practices are essential in establishing effective aviation risk management programmes.
Mr Michael Doiron is President of Cirrus Aviation Safety Services and is currently a Safety Projects Officer with a major East Coast Helicopters company in Canada.

Mr Doiron has dedicated over 35 years of his career to aviation safety with Transport Canada. His experience includes being a Safety Management Systems (SMS) Manager and Director of SMS programmes for Southern California Safety Institute (SCSI), Canada, Safety Advisor for the Pakistan Airline Pilot Association Safety Management Institute, serving on the Board of Directors for SCSI California, member as well as Instructor with the International Society of Air Safety Investigators. He was also Manager of the Halifax Flight Information Center, Accident Investigator Transportation Safety Board of Canada as well as member of the Canadian Owners and Pilots Association and the Civil Aviation Search and Rescue Association.

Mr Doiron has received a number of awards from the industry and government in recognition of his contributions to aviation safety.
INTRODUCTION

It happens several thousand times a day – the safe arrival and departure of aircraft operations throughout the world. These safe operations are the result of many years of careful analysis of aviation risks and the implementation of mitigation plans to deal effectively with these threats. Risk management is not a programme to avoid risk. Rather, it is a process to capture such threats, provide effective tools to analyse them and develop mitigation strategies that monitor these plans to ensure a positive change had occurred. An effective internal company reporting system is required as a cornerstone of a successful Risk Management Programme. It would be extremely difficult for any organisation to become proactive or predictive unless it has an effective and reactive investigation process in place. We must first identify and understand the risks that are unique to our operations and develop a corrective action plan to ensure that these risks are effectively mitigated. It is only through this reactive process that we can begin to develop strategies to deal effectively with future challenges.

RISK MANAGEMENT FOR CIVIL AVIATION AUTHORITIES

Challenges

The CAA must provide adequate risk management training for safety inspectors to prepare them to respond effectively with risk management concepts as outlined in the Safety Management Systems (SMS) requirements. It must make the transition from traditional “check the box” audit concepts to a performance-based evaluation that is expected within the State SMS programme. It is no longer sufficient for safety inspectors to quote an SMS paragraph or chapter – they must have knowledge of these expectations and communicate effectively to the operators to ensure that organisations will effectively implement the elements of risk assessments within the SMS guidelines. The CAA must develop and provide effective risk management tools and models to assist operators with implementation and work closely with them to ensure they are familiar with the concepts.

Risk Management Tools

The risk management tools for CAAs include the provision of operational risk management guidance or models to organisations operating under the State SMS programme and scheduling of specialised risk management training for safety inspectors to prepare them for a variety of risk management responses from operators. Another tool is to conduct SMS and risk management information sessions within those areas for which the State provides oversight activities.
RISK MANAGEMENT FOR SENIOR MANAGEMENT OF AIRLINES

Challenges
Effective risk management tools for senior management must be developed in a similar way as for the other areas of the aviation community. Crew resource management, simulation, human performance in maintenance and ramp safety are well established in our training programmes. As part of their responsibilities, managers are expected to lead, plan, organise, control and direct operations. These same skills can be applied within the aviation safety risk management environment. There is a need to develop aviation management training programmes with emphasis on enhanced awareness of human performance, non-punitive programmes, key performance indicators (KPIs), utilisation of the Hazard Registry, and proactive initiatives that will contribute to the commercial viability of the organisation. Senior management may delegate various responsibilities to subordinates but the final accountability will remain with them. They will need the right tools to help in the risk management decision-making process.

Risk Management Tools
Senior management needs to develop change management tools to help identify hidden risks associated with planned future activities. They also need to establish high-level accountabilities for risk management decisions associated with managers that control the resources needed to implement change within an organisation. In addition, KPIs and measurement tools that provide managers with current risk management data to help facilitate making timely decisions is also necessary. Senior management will also require aviation awareness training on human performance, non-punitive programmes and techniques for internal investigations.

RISK MANAGEMENT FOR FRONTLINE SUPERVISORS

Challenges
There are times when frontline supervisors can feel the pressures of on-time performance, corporate expectations and the effects of limited resources. The frontline supervisors play an extremely important risk management role as safety “Watch Dogs” within an organisation. The supervisor must be constantly aware of the operational tempos and be able to recognise when operational staff are being pushed to their limits and develop organisational strategies on how best to deal with these pressures. There will also be challenges in encouraging frontline staff members to communicate effectively to supervisors concerning hazards and risk that they encountered during operations.

Risk Management Tools
One risk management tool is a risk management database that can provide early detection of undesirable trends or alert the supervisor to recurring safety events for early intervention. The organisation should also provide Company Aviation Safety Officer training for the supervisors to assist in conducting investigations, interviewing, heightening awareness of human performance and developing corrective action plans.
RISK MANAGEMENT FOR STAFF

Challenges
A number of CAAs are providing Fatigue Risk Management Systems training or guidance. The organisation needs to consider factors such as whether their staff are involved in long-range flights, conduct maintenance on critical components on the midnight shift, work irregular hours, how the organisation responds to human errors etc. The most important source of safety risk information will come from the staff. Do they know what to report, how to report and when to make the report, and what happens when they do? If they do not receive feedback or if they feel there may be negative consequences should they report, the most important source of safety risk information may be lost. Encourage the staff to report hazards and risks – train them on what is important to the organisation. After completing the risk assessments, incorporate the “Lessons Learnt” into the training programmes. This activity will ensure that the identified risks associated with the operations have been made available to all staff members and will contribute to a reduction in errors within the operation.

Risk Management Tools
There are a number of training programmes that will enhance and support risk management initiatives. Crew resource management for flight operations, human performance in aviation maintenance for maintenance engineers and the “SHELL” model (Hawkins, 1987) for all employees are some examples of these tools.

OPERATIONAL RISK MANAGEMENT

Automation Dependency
An Aviation Safety Reporting System analysis (Billings, 1997) showed that 74 per cent of 184 incidents that occurred between 1990 and 1994 involved Flight Management System mode confusion. Arguably, automation errors will increase in frequency as the level of automation increases. But despite the advances in automation, it is important that we do not lose sight of human capabilities. While automated systems can be very reliable, they are only a tool intended to make the aviator’s job a little easier. We must still guard against becoming too reliant on automated systems. The computer (automation) is supposed to work for the crew; it was never intended for the crew to work for the automation. Over-reliance on automation can reduce the basic flying skill set. Enhanced company resource management training must be developed to provide adequate awareness training for crew operating in a heavily automated environment.

Automation: Automation reduces workload in a sometimes already low workload phases of flight. The operator must be careful not to become too complacent and let the automation assume the responsibility for the safe operation of the aircraft. Human beings may not have the necessary skills to monitor such highly reliable systems. People can become automation dependant.
Programming Errors: Such errors that go unchecked or verified can have less than ideal outcomes. The Flight Guidance Computer (FGC)/Flight Director/Flight Management System (FMS) are only as good as its programming.

Mode Confusion: It encompasses an inappropriate mode selection (i.e. not understanding the implications of selecting a particular mode, not realising which mode is active or failing to recognise a mode change made automatically by the FGC). In one study (Flight Safety Foundation, 2010), 73 per cent of respondents had inadvertently selected a wrong mode.

Automation Surprises: These are defined as “weaknesses in a pilot’s mental model in the automated environment that results in the pilot being ‘surprised’ by the differences between the expected and actual performance of the aircraft”. Example: “What is it doing now?”

Silent Failures: Some modern aircraft are built so well that minor errors in the autopilot system are not noticeable to the crew. The main problem is the failure to monitor raw data equipment.

Undetected Errors over Extended Periods of Time: An example of this would be entering a wrong waypoint into the flight plan page of the FMS without double-checking the entry for accuracy. This erroneous input may not be evident until a considerable time after the error had occurred, and the flight is potentially off-course.

Flying Operations that are Not Suited for Automation: Tasks that cannot be automated by designers by default are assigned to become the crews’ responsibility. Unfortunately, this imposed division of duties does not necessarily favour the human operator.

Lack of Manual Flying Skill and/or Proficiency: As automation assumes more of the flying functions, there is a great deal of concern within the pilot community that basic flying skills are deteriorating. A proper balance of automation and raw data proficiency must be maintained.

Inter-Crew-communication/Coordination Difficulties: Data entry into FMS Computer Display Unit can be completed independently of the aircraft Captain’s direction. An example of this would be any aircraft with more than one FMS. Increased communication is necessary to ensure all air crew will share the same mental model of what information has been programmed into the FGC/FMS.

Risk Management of Operational Growth and Management of Change

By most measurements, expansion would be considered a success story. However, growth and operational changes also introduce future risk and threat activities that must be managed today. How many aircraft to purchase in the next five to 10 years? Where to recruit the qualified pilots and maintenance staff to fill the needs? There are many other companies looking for the same qualified staff. Recruitment may have to be from outside your own country – language, culture, validation of qualifications will then become major challenges. Embedded in this growth is also an aging workforce – air traffic control, airports, maintenance, flight operations – is there an attrition policy or programme to help deal with the gradual changes? This growth will also have an effect on airport and airspace capacity, language challenges and diversity issues.
Weather Risk Management

Weather has a significant impact on safety, air traffic management (ATM), fuel burn, and on-time performance. In response to calls for improvement, several initiatives now exist to improve aviation safety and ATM through the development of technology for the display and dissemination of weather-related information, improvements in observations and the accuracy of weather forecasts and specialised forecast products. Besides technological advancements, research continues to grow in pilot weather-related decision-making, cognitive engineering, expertise, instructional techniques and safety management. However, despite these improvements, weather continues to be a contributing factor in many accidents. In some instances, technology is designed to improve efficiency and safety, but people are not trained adequately, or in some cases not at all, on how to use it. We are still landing and taking off aircraft when the terminal area is blanketed with thunderstorms. There are still numerous injuries due to turbulence every month. And there are major weaknesses in pilots’ understanding of meteorology and training. It appears a unified, concerted approach to focusing efforts is needed as the status quo will have only limited effectiveness.

The greatest potential for improvement in safety, ATM, aircraft operations and fuel management is in a more unified effort for managing weather using a systems approach. Using a Weather Risk Management System (Dutcher, 2008), can assist management in formulating strategic plans to manage the risk and impact of weather hazards (e.g. thunderstorms, turbulence, reduced visibility and low-level wind shear) on safety and operations. Enhanced meteorological equipment, company weather risk management policies, development of airport procedures to be used during severe weather, enhanced crew severe weather training and ATC procedures can all contribute to reductions in the impact of serious weather events.

RISK MANAGEMENT FOR THE FUTURE

The European Aviation Safety Agency (EASA) has released an updated roadmap to tackle key aviation safety risks. Released in a document known as the ‘European Aviation Safety Plan’ (EASp), 86 key safety actions to address operational, systemic and emerging aviation safety issues are identified for implementation until 2016.

Listed below are several of the EASA-identified risk initiatives:

- Reduction of runway excursions;
- Preventing mid-air collisions;
- Preventing Controlled Flight into Terrain;
- Preventing Loss of Control in Flight; and
- Reducing ground collisions.
The US Federal Aviation Administration (FAA) plans to continue analysing data reactively to understand the causes of accidents and incidents, and to augment this approach through implementation of an SMS. The FAA is currently developing a comprehensive risk-based data process and enhanced methods of reporting that will capture all incidents.

The following are among the key areas identified as needing improved data collection and analysis (Dillingham, 2013):

**Runway and Ramp Safety**: Additional information about surface incidents could help improve safety in the airport terminal area, as data collection is currently limited to certain types of incidents, notably runway incursions.

**Airborne Operational Errors**: FMS Entries, Loss of Control, Automation Dependency.

**General Aviation**: Weather-related events, Loss of Control, Controlled Flight into Terrain.

**Pilot Training**: FAA is currently in the process of developing a comprehensive system to measure the effectiveness of its oversight of the annual pilot school inspection programme.

Transport Canada has made progress to date on a number of initiatives and continues to make the Canadian Transportation Safety Board (TSB)'s recommendations (TSB, 2012) a priority. For example, the department is working on:

- Preventing aircraft collisions through the use of new technology, updated regulations, advisories, online information and guidelines produced together with international partners;
- Implementing performance-based SMS;
- Reducing landing accidents and runway overruns;
- Preventing risk of collisions on runways;
- Reducing collisions with land and water; and
- Creating a safety culture nationally by emphasising the importance of SMS for air, marine and rail operations.

**CONCLUSION**

The CAAs are working on a number of risk management initiatives that will likely have an effect on many organisations. We must continue to monitor their progress to determine how we may be able to incorporate these “Lessons Learnt” into our own operations. We must be able to tailor the results of these initiatives so that they will fit our organisation. What are the key safety risk issues in the operation? What systems are currently in place to identify these safety risk issues? How are these issues identified? Who is going to fix them? How will these be fixed?
How to verify that these issues have been fixed and how to demonstrate to the CAA that these risks have been mitigated?

There are many stakeholders involved in the success of the risk management programme. Each requires specialised risk management tools that will contribute to or are associated with the successful completion of their duties or tasks. We must also look to the future to identify emerging threats that may harm our operations and work closely with the CAAs to deal with these risks effectively. Operational growth, weather risk management, runway incursion and excursions as well as automation dependency all require a systematic evaluation and mitigation plan to deal effectively with the associated risk. The success of the risk management programme starts at the top and involves everyone at each level of the organisation. There will always be challenges associated with limited resources in time and finances, but there are risk improvements that we can undertake today. Start small, start with what we have, and communicate the success to all staff members. Share our experience.

References


