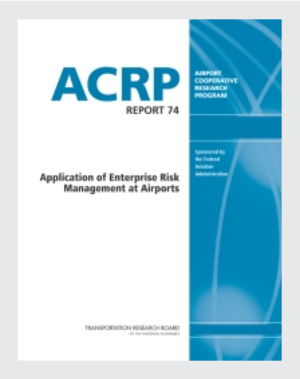

Application of Enterprise Risk Management at Airports

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AUTHORS

Marsh Risk Consulting; HNT B Corporation; and Direct Effect Solutions, Inc.

AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP REPORT 74

Application of Enterprise Risk Management at Airports

Marsh Risk Consulting
New York, NY

IN ASSOCIATION WITH

HNTB Corporation
New York, NY

AND

Direct Effect Solutions, Inc.
Pickerington, OH

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TRANSPORTATION RESEARCH BOARD

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AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

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The ACRP was authorized in December 2003 as part of the Vision 100-Century of Aviation Reauthorization Act. The primary participants in the ACRP are (1) an independent governing board, the ACRP Oversight Committee (AOC), appointed by the Secretary of the U.S. Department of Transportation with representation from airport operating agencies, other stakeholders, and relevant industry organizations such as the Airports Council International-North America (ACI-NA), the American Association of Airport Executives (AAAE), the National Association of State Aviation Officials (NASAO), Airlines for America (A4A), and the Airport Consultants Council (ACC) as vital links to the airport community; (2) the TRB as program manager and secretariat for the governing board; and (3) the FAA as program sponsor. In October 2005, the FAA executed a contract with the National Academies formally initiating the program.

The ACRP benefits from the cooperation and participation of airport professionals, air carriers, shippers, state and local government officials, equipment and service suppliers, other airport users, and research organizations. Each of these participants has different interests and responsibilities, and each is an integral part of this cooperative research effort.

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Primary emphasis is placed on disseminating ACRP results to the intended end-users of the research: airport operating agencies, service providers, and suppliers. The ACRP produces a series of research reports for use by airport operators, local agencies, the FAA, and other interested parties, and industry associations may arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by airport-industry practitioners.

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CRP STAFF FOR ACRP REPORT 74

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Crawford F. Jencks, *Deputy Director, Cooperative Research Programs*
Michael R. Salamone, *ACRP Manager*
Marci A. Greenberger, *Senior Program Officer*
Joseph J. Brown-Snell, *Program Associate*
Eileen P. Delaney, *Director of Publications*
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ACRP PROJECT 01-18 PANEL
Field of Administration

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FOREWORD

By Marci A. Greenberger
Staff Officer
Transportation Research Board

ACRP Report 74: Application of Enterprise Risk Management at Airports is a guidebook that begins with a summary of the principles of enterprise risk management (ERM), its benefits, and how it applies to airports. The guidebook then discusses implementation of the iterative ERM process including roles and responsibilities from the governing board to all staff members. The accompanying *CRP-CD-117* (available online at http://www.trb.org/Main/Blurbs/167515.aspx) is an electronic tool that can be used to support the ERM process and catalog identified risks in a risk register with expected likelihood of occurrence and expected severity of impact on the airport to generate a risk score and a risk map. Once the risk score has been developed, mitigation strategies can be put in place and documented using the response plan work sheets within the electronic tool. Because ERM is iterative and scalable to airports of any size and with varying resources, airport directors and managers of airports of all sizes will be able to use the framework outlined in this guidebook to more proactively manage threats and opportunities.

Enterprise risk management (ERM) is a proactive approach by which threats to and opportunities for an organization are identified, evaluated, and integrated across all disciplines. The aim of ERM is to determine how to exploit opportunities and mitigate, transfer, or avoid threats. Airports are conducting risk management activities, but they often aren't being coordinated on an enterprise level. Coordination allows information gleaned through the process to be used in the strategic planning process, the decision-making process, and the allocation of limited resources.

Airports are becoming familiar with risk management activities, as the Federal Aviation Administration (FAA) begins to require Safety Management Systems (SMS) at airports. ERM and SMS both use the same principles, tools, and techniques, so those airports that have implemented SMS will find the adoption of ERM to be familiar.

Marsh Risk Consulting was retained under ACRP Project 01-18 to identify the benefits of ERM, to delineate application and implementation steps for airports, and to provide an electronic tool to prepare a risk classification matrix. The guidebook also reviews lessons learned from the experiences of other industries that have implemented ERM as well as the experiences of airports that have implemented this approach.

CONTENTS

Note: Many of the photographs, figures, and tables in this report have been converted from color to grayscale for printing. The electronic version of the report (posted on the Web at www.trb.org) retains the color versions.

SUMMARY

Application of Enterprise Risk Management at Airports

Introduction

This guidebook presents the case for the adoption of enterprise risk management (ERM) in airports. The guidebook describes the principles and processes of leading practice ERM and provides practical guidance on their application within an airport operating environment. The guidebook builds on a foundation of research that evaluates current approaches to risk management and describes the benefits of implementing an enterprise-wide approach to the management of risk.

Context

ERM is a structured approach to managing risk exposures across an entire organization. This differs from the traditional risk management approach, which tends to analyze risk in narrow silos and does not typically consider the broader consequences of risk exposures across an organization. Over the past decade, the trend for organizations across all industries to implement risk management processes in line with the principles of ERM has increased. There are a number of key reasons for the increase in adoption of ERM:

1. Economic, geopolitical, and natural hazard events have illustrated the dynamic, complex, and interlinked risk landscape faced by organizations today. The poor macro-economic environment in the United States and Europe, the tsunami in Japan, the Arab Spring, the Icelandic ash cloud, and the Deepwater Horizon well blowout are just a few examples that highlight the uncertain, often unpredictable, and complex risk environment in which organizations must operate.
2. Over the past 20 years, the general approach to managing risk has been strongly influenced by a focus on internal controls. Regulatory guidelines and best practice codes, such as the Committee of Sponsoring Organizations of the Treadway Commission (COSO) and Sarbanes-Oxley (SOX), advocate risk management as a means of assurance that risks and opportunities are being effectively mitigated. The compliance-driven approach has been effective at managing risk from a bottom-up perspective; however, organizations are now interested in assessing risk exposures from a top-down holistic perspective and recognizing that risk events are often correlated and unpredictable.
3. With a growing focus on low-probability/high-impact events, colloquially known as "black swan" risks, organizations are concentrating on measures to improve resilience and contingency planning. An ERM approach is being used to facilitate the identification of critical and potentially vulnerable areas of an organization.

Airports are not immune to the dynamic risk landscape. The deterioration in macro-economic conditions, fuel volatility, and growing environmental concerns are some of the

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issues facing airports as they deal with long-term and possible structural changes to air service demand and airline operating models. Airport management needs to factor the implications of these changes into their strategic initiatives, financial policies, business models, and capital investment decisions. These new risks are in addition to the risks already inherent in operating and securing the "mini-cities" known as airports.

Approach

In order to develop a practical guide to implementing ERM at airports, research was conducted on airport-relevant leading practices. A literature review, survey, focus groups, and case studies all provided insight into the theory underlying the principles of ERM, how the principles are being applied in practice, and the extent to which ERM has been applied across organizations in and outside the aviation industry.

This research provided the foundation for developing a practical guide to implementing ERM in airports. It also recognizes (1) that any approach needs to be scalable, to take into account the varying size and complexity of airports and (2) that ERM should leverage existing processes where appropriate, such as a Safety Management System (SMS).

Findings

Value Proposition

A strong value proposition exists for adopting an approach to risk management that adheres to the tenets and principles espoused by ERM. Successful ERM allows for the collection and evaluation of timely and complete information on an airport's risk exposures (for example, fuel price volatility, passenger handling, terrorism, and aging infrastructure). This information can be useful in developing strategy, managing performance, budgeting, and planning. By embedding risk principles and practices into routine business processes, airport management can proactively manage risk exposures and make risk-aware decisions.

Enhanced risk awareness also allows airports to develop contingency plans that reflect analysis of plausible risk scenarios. Better visibility of an airport's risk profile helps ensure that emerging sources of risk are taken into account in emergency response, crisis management, and continuity plans.

Through the analysis of potential risks facing an airport and development of proactive response plans, ERM can identify strategies to protect an airport's balance sheet from unexpected losses or to capitalize on opportunities. Through identifying and mitigating risk exposures that could prevent the successful attainment of strategic objectives, ERM reduces volatility and thereby provides a degree of certainty with regard to expected outcomes.

In short, value from ERM has two dimensions:

- **Internal value.** This value is created by helping managers to better understand their risk profile, better anticipate financial performance, mitigate risks, make better-informed decisions, and leverage opportunities.
- **External value.** ERM also enables an airport to satisfy policymakers and external stakeholders' (auditors, regulators, partners, public users, and local communities) expectations on internal control and risk management.

ERM Implementation

There are many standards, guidelines, and codes that espouse principles of leading practice ERM. For example, there is a relatively new ISO 31000 standard for risk management, and the rating agency Standard and Poor's has published its view on best practice risk management. While there are differences among the standards that reflect the characteristics of specific industries or target audiences, the six components of leading practice ERM can be summarized as follows:

1. **Governance and infrastructure—**the structure and positioning of the risk management framework within the organization.
   Effective risk management needs to be supported by a comprehensive and dynamic risk management structure that facilitates risk reporting, oversight, and challenge. The organization should be fully aligned in terms of structure, roles, responsibilities, and process and should require central coordination to manage risk holistically across the organization.
2. **Risk identification, assessment, and prioritization**—the mechanisms by which risks are mapped and prioritized for mitigation and control activities.
   Risk identification is the cornerstone of a robust ERM program. A lack of awareness or oversight of risks can translate into ineffective management and inappropriate pre- and post-loss mitigation strategies. Identified risks should be assessed in terms of financial and non-financial impact and likelihood to enable prioritization and focus of resources for mitigation and control. A breadth of functional expertise is critical to the risk identification and assessment process, incorporating operational excellence, strategic decision-making, technical knowledge, and the external operating environment.
3. **Risk treatment and control—**the measures that are planned, resourced, and implemented to reduce the likelihood of a risk materializing and the associated impact if the risk were to occur.
   An effective ERM framework will not, and does not seek to, control and completely mitigate every risk that an organization faces. Rather, an effective framework seeks to ensure that risks are managed within acceptable tolerances and that management has oversight of critical risks.
4. **Risk reporting, monitoring, and communications—**the framework that communicates risk information internally across the organization and externally to stakeholders to enable proactive risk management and process improvement.
   To embed ERM and ensure it is a sustainable process, reporting and monitoring mechanisms are needed so that risk management activities are being periodically reviewed and the effectiveness of the process continues to add value to the airport.
5. **Risk culture—**the organizational perceptions and behaviors towards risk and risk control.
   Enterprise risk culture embodies the sentiment of an organization towards risk management. Creating buy-in of the process is critical to ensuring its longevity and optimized effectiveness within an organization.
6. **Third parties—**the processes and procedures that support effective partnerships and minimize the risk posed from other organizations.
   The network of customers, suppliers, and other stakeholders with whom an airport operates exposes the organization to an array of commercial pressures and supply dependencies. A focus on external risk to the organization should be considered, and effective ways to build partner leverage should be developed.

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Embedding and Sustaining

There are two key principles for ERM:

1. Any approach must add value to the organization.
2. The approach must be proportionate to the size and complexity of the organization.

In order to ensure adherence to these two principles, airports embarking on plans to implement ERM should focus on practical and pragmatic steps to design an ERM governance structure and establish the basic fundamentals of risk identification and risk assessment. Processes and methodologies do not need to be overly complex or sophisticated, and the overall approach to ERM should be subject to continuous improvement, so that the ERM program matures over time.

By developing the ERM program over time and at a pace that suits the airport's culture, the organization will be able to embed and sustain the process. Consideration should be given to exploiting existing processes (such as SMS) in the collection and analysis of risk information. In particular, airports should focus on ways to utilize risk information within decision-making processes, as this will help determine the methodologies required to evaluate, report, and monitor risk exposure information.

Conclusions

The following key conclusions are drawn from the project research:

1. ERM is increasingly being adopted by industries around the globe. This is largely being driven by recognition that risk events are often complex, unpredictable, and interlinked. Consequently, organizations value a top-down holistic approach to risk management that considers risk exposures from an enterprise-wide perspective.
2. Airports vary in complexity and size, and ERM approaches need to be tailored to each individual airport's operations and culture. ERM is based on principles, and the methodologies employed should correspond to the operating environment. The approach does not need to be especially resource intensive and should develop over time as guided by a maturity model.
3. Successful implementation can produce probability and impact information on risks and opportunities facing an airport. This powerful information can be used to influence decisions relating to strategy and the allocation of resources.
4. Where appropriate, ERM should leverage existing processes to reduce duplication and inefficiency and to help embed and sustain ERM. This is critical for fostering a "risk aware" culture.

Recommendations

The following activities are recommended for establishing or reviewing an ERM program:

1. Assess the airport's current approach to managing risk and evaluate the answers to the following questions:
   - Does the management team know the key risks and opportunities facing the airport?
   - When did the airport last quantify and analyze the potential risk impacts?
   - How does the airport manage key risks? How is an appropriate blend of retained, insured, transferred, and managed risk determined?
   - Does senior management stay current on the top risks of the airport and also identify emerging risks in the operating environment?

  - How well is the cost of risk managed?
  - Assuming the airport suffered a business interruption, how effective would the organization's response be?
  - What is the airport's critical stakeholders' understanding of the airport's approach to managing risk?

  The answers to the questions above can help to determine whether the organization is beginning or refining its ERM approach.
2. Evaluate the current approaches to managing risk, taking into account existing resources, systems, processes, and reporting. Determine the strengths and weaknesses of each, as well as the potential to leverage existing processes in the development of an ERM program.
3. Determine the future state of ERM by setting modest goals that take into account the size and complexity of the airport. Use these goals to evaluate resource requirements, set timeframes, and evaluate success. Reference the ERM maturity model in determining future state of ERM and for ensuring continuous improvement.
4. Set modest goals and be practical in the approach.
5. Learn from others in the industry and review lessons learned.

Airports around the world can benefit by developing and implementing ERM. This document provides an introduction to ERM and the necessary steps for establishing an effective program to holistically and proactively manage risk.

SECTION 1

Introduction

1.1 Objective

The intent of *ACRP Report 74: Application of Enterprise Risk Management at Airports* (guidebook) is to assist airport operators with the development and implementation of enterprise risk management (ERM) across their organizations. Throughout this guidebook, ERM is defined as a holistic approach and process to identify, prioritize, mitigate, manage, and monitor current and emerging risks in an integrated way across the breadth of the enterprise.

Airports are unique in operations, customers, structure, stakeholders, and objectives; consequently, the approach to ERM implementation should be tailored to each airport. The information provided is not intended as a prescriptive approach to ERM, but rather as guidance on how to create the ERM framework and develop ERM processes. Where examples are referenced, they are for explanatory purposes and not to advocate any particular system or approach.

1.2 How to Use This Guidebook

The guidebook is designed to be informative and practical. It is structured to facilitate an airport operator's ability to establish a comprehensive approach to ERM that is based on the individual needs of the airport operator and the level of ERM experience of the reader.

Successfully implementing ERM requires considering a number of issues and following a step-by-step approach. This guidebook presents each step in the order in which it is recommended that it be completed. The organization of the guidebook is the following:

- Section 1 provides an overview of the guidebook, outlining its objective and how it should be used.
- Section 2 introduces the reader to the concept of ERM, using widely accepted ERM guidance and standards, as well as examples of ERM in practice at airports to illustrate the concept. By presenting the benefits of ERM and the value it has created for airports, this section addresses challenges that airport operators may face in gaining buy-in to an investment in ERM.
- Section 3 explains the first major step in establishing ERM—developing the governance and infrastructure. This section guides the reader through planning and designing the ERM policy, strategy, and governance structure, building on the processes and structures that are already established at the airport.
- Section 4 is designed to guide the airport operator through each step of the ERM process. The reader will learn about practical approaches to completing each element of the ERM process and how the electronic tool (provided on *CRP-CD-117*) that supports this guidebook can be used to record, monitor, and report on the ERM process.

- Section 5 contains information to help implement ERM across an airport. It describes the concept of risk management maturity and the role of risk champions, communication, and training in establishing an ERM culture.
- Section 6 focuses on the linkage between the Safety Management System (SMS) and ERM as well as the integration required among ERM, strategic planning, and decision-making.
- Finally, Section 7 provides information on how to ensure ERM is sustained and continuously improved.

Illustrative examples and case studies are provided throughout the guidebook to help the reader understand concepts or processes. If an airport has granted permission, specific names are included; otherwise, a general size and location descriptor is provided. The appendices to this guidebook provide supporting materials where required. Definitions and acronyms are provided in Appendix A.

SECTION 2

Airport ERM

Airports have always focused on preventing hazards and finding ways to reduce the risks associated with their operations. However, merely promoting safety in operations and insuring against natural disasters is not sufficient. Airports must also manage the broad array of strategic and operational risks facing an ever-changing aviation industry, including growing financial constraints and increasing regulatory requirements.

Many airports face resource constraints, and staff are stretched thin by the multitude of activities they are asked to accomplish. In such an environment, ERM can be an important management tool that assists airport staff in driving decision-making and allocating resources on a risk-based basis. In many aspects of airport management, just as in private business, the key to long-term success is not just avoiding the downside of uncertainty, but also anticipating how uncertainty can be turned into opportunities and positive outcomes.

Through ERM, potential risks and emerging opportunities are proactively identified, assessed, monitored, and addressed on an organization-wide basis. Understanding financial, operational, strategic, and reputational risks and opportunities, the airport can capture the full gambit of the uncertainty that is faced in all facets of airport operations. The "big-picture" perspective of the enterprise and consideration of long-term implications ensure that efforts are directed at the issues and activities that are truly important to everyone. In summary, ERM assists airport management in proactively managing the uncertainty that their organization faces and improves the long-term outcomes of the organization's activities and decision-making.

2.1 What Is ERM?

ERM is a structured, consistent, and continuous system that is applied across an entire organization to manage uncertainty. Risks are uncertain future events that can influence an organization's ability to achieve its objectives. The term "risk" is usually applied in one of three distinct applications:

- **Risk as threat versus exposure.** Risk considered as a threat implies potential negative events that could result in financial or reputational harm to the organization, whereas risk considered as exposure could also be positive.
- **Risk as variance.** This interpretation of risk includes the distribution of all possible outcomes, both positive and negative. Stated differently, risk is synonymous with variance.
- **Risk as opportunity.** This understanding of risk is based on the concept that a relationship exists between risk and return. The greater the risk, the greater the potential return and the greater the potential for loss.

Table 1. Comparison of ERM and traditional risk management.

	ERM	Traditional Risk Management
Risk identification and assessment	▪ Critical airport risks are identified, quantified, and weighted against opportunity ▪ Risk/opportunity drivers are identified ▪ Effectiveness of risk controls is evaluated ▪ Risk/opportunity materiality is considered ▪ Risk/opportunity ownership is assigned	▪ Focus on hazards and transferable risks ▪ Insurable risks are identified and assessed based on the relative availability of insurance
Risk mitigation strategies	▪ A variety of options are considered including risk transfer options and organizational change ▪ Strategies are developed for pursuing opportunities that take into account potential risks	▪ Balance of available insurance policy limits against retained levels of financial loss (deductibles, retention levels) ▪ Risk management is intuitive and indistinct from standard operating process
Monitoring and reporting	▪ Ongoing ▪ Integral to airport strategy ▪ Helps to ensure the integrity of financial reporting	▪ Static ▪ Revisited in response to an event or annual audit
How risks are viewed	▪ There is an aggregated view of risk across the enterprise ▪ The balanced relationships between opportunities and risks are evaluated ▪ Entity level portfolio of risks and opportunities	▪ Risks are viewed in silos ▪ Risks as individual hazards
Risk categories	▪ All risk/opportunity categories are considered (e.g., hazard, financial, strategic, operational, people, legal, regulatory, etc.)	▪ Risk categories tend to focus on hazard, safety, and financial
Ultimate goal	▪ Risk/reward optimization—preserve and create value	▪ Mitigation of insurable risks ▪ Minimize risk transfer spend

A fundamental difference between traditional risk management and ERM is that traditional risk management focuses on risks independent of business concerns and organizational strategy. However, additional differences exist, as outlined in Table 1.

2.2 Value of Implementing ERM at Airports

ERM is a valuable approach that informs and directs management decisions at all levels of an organization. Understanding an airport's risk exposures can be valuable in forward-looking processes such as strategizing, performance management, and planning. Integrating risk practices into routine processes and decision-making allows airport management to effectively identify and manage causes of volatility (sources of risk) and ultimately make informed and "risk/reward-aware" decisions.

The value derived from ERM has two dimensions:

- Internally, value is created by helping managers to better understand their risk profile, better anticipate financial performance, mitigate risks, make better-informed decisions, and leverage opportunities.
- ERM also enables an organization to satisfy policymakers and external stakeholders' (auditors, regulators, partners, public users, and local communities) expectations of internal control and risk management.

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2.2.1 Risk Awareness

ERM provides a framework for the aggregation of risk and opportunities across an airport, resulting in better visibility. Airports already manage risk, particularly health and safety exposures and business continuity risks; however, risks do not just fall into select silos of an airport's governance structure. Uncertainty affects the organization at an enterprise-wide level. The risk and opportunity awareness that ERM provides senior management helps to identify dependencies across the organization, as well as major risks that may have an enterprise-wide impact. The many facets of airport management and the management team's diverse responsibilities make gaining this collective view of risk important because such a view provides a focus on what matters for the enterprise as a whole. Greater visibility of an organization's risk profile can enhance business and strategic planning by ensuring that risks and opportunities are taken into consideration in decision-making.

2.2.2 Proactive Preparation for Catastrophic Events

ERM also aids airports in developing plans for addressing events that are very unlikely to occur, but that will have a very significant impact if they do materialize. These events include natural catastrophes, terrorist attacks, ash-producing volcanic eruptions, extreme weather, or airplane crashes. Employing techniques such as scenario analysis helps organizations to consider their response to "high-impact/low-frequency" risks that are highly unpredictable.

Better visibility of the risk profile is particularly important for airports today in order to ensure that emerging sources of catastrophe are identified and managed. The changing nature of transnational and domestic terrorism has required airports to respond in innovative ways to mitigate risk. Other emerging risks requiring enterprise-wide recognition and response include the global financial crisis and associated credit challenges, environmental impacts arising from usage of scarce resources, emissions, noise, and pandemic outbreaks (H1N1 Influenza, H5N1 Influenza, and SARS) where the spread of outbreaks is accelerated by domestic and international air travel.

2.2.3 Business Uncertainty

In the aviation industry, the market is changing; tighter competition, aging infrastructure, increased reliance on non-aviation revenue, and the increasingly unstable financial status of airlines (influenced by the economic climate as well as wage pressures, increasing fuel prices, and the cyclical nature of demand) are all characteristics of a changing business environment. By implementing an enterprise-wide approach to management of uncertainty, the airport can be in a better position to monitor its market environment, identify emerging changes in that environment in early stages, and quickly implement preexisting risk-response plans or initiate strategies to capture opportunities.

2.2.4 Addressing Financial Uncertainty

Through identifying the many different types of potential risks an airport faces and providing proactive response plans, ERM can identify strategies to protect an airport's balance sheet from unexpected losses. Through identifying and mitigating those risk exposures that could prevent the successful attainment of strategic objectives, ERM reduces volatility and thereby provides a degree of certainty with regard to expected outcomes. An example of how ERM can improve financial certainty is through the maintenance of, or even upgrade in, credit ratings from Standard & Poor's for those airports reliant on loans or credit. In its credit rating assessment, the rating agency explicitly takes into account an organization's approach to ERM. An organization

with a demonstrably solid approach to risk management may be in a better position to receive an upgrade in its rating.

2.2.5 Policymaker and Stakeholder Expectations

Airport policymakers and stakeholders, including regulators, suppliers, airline partners, local communities, public users, and auditors, place a high level of accountability for managing uncertainty on the airport senior management team and board. Airports need to demonstrate that risk is effectively considered and controlled, especially during strategic decision-making. Transparency in the risk management process is not only required as a defense when something goes wrong, it is increasingly sought by policymakers to provide assurance that the organization's internal controls and management decision-making are effective. In response to a question about the drivers to establishing ERM and the value it has created, a large airport in North America commented:

> Stakeholders expect management to capitalize on opportunities, protect revenues and assets, and comply with laws and contractual obligations. If there is a negative event, all stakeholders want to know whether management should have foreseen the cause and addressed it—ERM facilitates the airport's management of business risks by taking the right risks to get the right rewards.

When applied appropriately, ERM can bring airports multiple benefits. It can help organizations achieve their stated objectives and better deliver on intended outcomes. This value from ERM can be realized, but it requires

- A supportive organization;
- A simple, understood process;
- Methods, tools, and techniques;
- Policymaker buy-in;
- Leadership; and
- Committed and competent people.

2.3 ERM Guidance/Standards

Numerous best-practice, risk management guidelines, requirements, and standards exist, varying in content and methodology according to the jurisdiction or governing body that employs them. Each individual standard exhibits particular strengths and incentives for adoption; however, all ERM standards aim to

- Ensure appropriate ERM accountability,
- Enhance organization flexibility and resiliency, and
- Account for the full spectrum of risks.

Outlined below are brief descriptions of four standards that are frequently adopted by organizations of all sizes, both inside and outside of the aviation industry: COSO ERM Integrated Framework; ISO 31000; the AIRMIC, ALARM, IRM: Risk Management Standard; and Basel II.

2.3.1 COSO Enterprise Risk Management—Integrated Framework

Following a number of highly publicized business failures, scandals, and frauds in the 1990s and early 2000s and the subsequent introduction of laws, regulations, and listing standards calling for strengthened corporate governance and risk management, the Committee of Sponsoring Organizations of the Treadway Commission (COSO) issued its framework for enterprise-wide risk management in September 2004: Enterprise Risk Management—Integrated Framework.

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The goal of the framework is to enable organizations to standardize ERM so that they can more easily benchmark, establish best practices, and have more meaningful dialogue about the critically important issue of risk management. One concern regarding the COSO ERM framework is that its overarching nature can appear overwhelming for some organizations, particularly those that are small in size or have not previously established an ERM culture.

2.3.2 ISO 31000

ISO 31000 is a family of standards relating to risk management, codified by the International Organization for Standardization, a non-governmental organization that forms a bridge between the public and private sectors. The purpose of ISO 31000:2009 is to provide principles and generic guidelines for risk management. ISO 31000 seeks to provide a universally recognized paradigm for practitioners and companies employing risk management processes to replace the myriad of existing standards, methodologies, and paradigms that differed across industries, subject matter, and regions.

Currently, the ISO 31000 family includes the following:

- ISO 31000:2009-Principles and Guidelines
- ISO/IEC 31010:2009-Risk Management—Risk Assessment Techniques
- ISO Guide 73:2009-Risk Management—Vocabulary

ISO 31000:2009 provides generic guidelines for the design, implementation, and maintenance of risk management processes throughout an organization. This approach to formalizing risk management practices is generally adopted by companies that require an ERM standard that accommodates multiple "silo-centric" management systems.

2.3.3 AIRMIC, ALARM, IRM: Risk Management Standard

In the United Kingdom, the Risk Management Standard was originally published in 2002 by the Association of Insurance and Risk Managers in Commerce (AIRMIC), the Public Risk Management Association (ALARM), and the Institute of Risk Management (IRM). The Risk Management Standard has subsequently been adopted by the Federation of European Risk Management Associations (FERMA) and referenced by the U.S. Risk and Insurance Management Society (RIMS).

This was more of a guidance document for risk management and has wherever possible used the terminology for risk set out by the International Organization for Standardization (ISO) in its document ISO/IEC Guide 73 Risk Management—Vocabulary—Guidelines for use in standards. The guidance is not intended to produce a prescriptive box-ticking approach or to establish a certifiable process; instead, the guidance provides a best-practice guideline against which organizations can benchmark themselves. This guidance was effective when it was released in 2002 but has now been superseded in terms of currency and validity by ISO 31000.

2.3.4 Basel II

Basel II is the second set of recommendations on banking regulatory issues produced by the Basel Committee on Banking Supervision. This risk management regulation is focused exclusively on financial services. Its objective is to ensure that capital allocation is more risk sensitive, to separate operational risk from credit risk, to explore measures for the quantification of risk, and to align economic and regulatory capital more closely.

2.4 Elements of an ERM Framework

Airports are both quasi-public entities and business operations and therefore are directed by policymaking bodies, may be part of a larger governmental entity, and must tailor their operating activities and business decisions to satisfy multiple stakeholder agendas. Through ERM and a comprehensive risk reporting structure, the different requirements of each stakeholder can be managed.

Each airport has a unique combination of operating environment, governance structure, and organizational culture. An airport's ERM framework should reflect this. Nonetheless, there are also a number of common fundamental elements that every airport should consider when implementing an ERM framework: governance and infrastructure, identification and prioritization, controls and risk response, monitoring and reporting, implementation, integration with key processes, and continuous improvement and sustainability. These elements can be described as follows:

- **Governance and infrastructure**—An enterprise-wide approach with executive and board-level sponsorship, policies, standardized processes, a clear vision of risk materiality, and defined accountabilities is communicated throughout the organization. Section 3 of this guidebook provides guidance on this element.
- **Identification and prioritization**—Risks and opportunities, including new and emerging risks and opportunities, are systematically and consistently identified across the airport, including projects, strategic decisions, and partnerships. Risks are assessed and prioritized to focus time and resource on the critical risks. Sections 4.1 and 4.2 of this guidebook provide guidance on this element.
- **Controls and risk response**—Current controls are assessed as to whether they effectively mitigate the risk to the required level. Risk-response planning is focused on those risks that require additional controls to mitigate the risk to an acceptable level. Sections 4.3 and 4.4 of this guidebook provide guidance on this element.
- **Monitoring and reporting**—There is a strong governance framework in place to facilitate risk reporting and monitoring at all levels of the organization. Reporting is supported by tools and systems where appropriate. Management fully understands and monitors the risks and opportunities the organization faces, as well as the effectiveness of the ERM framework. Independent assurance is sought where required. Sections 4.5 and 4.6 of this guidebook provide guidance on this element.
- **Implementation**—A plan is in place to guide and drive ERM implementation, reflecting the target level of ERM maturity. All employees understand the benefits of ERM and have the knowledge, skills, and tools to embed the ERM process. Section 5 of this guidebook provides guidance on this element.
- **Integration with key processes**—The ERM framework is aligned with key processes—strategic planning, budgeting, and SMSs—to avoid duplication and ensure value is created throughout the airport. Section 6 of this guidebook provides guidance on this element.
- **Continuous improvement and sustainability**—The ERM framework is reviewed against performance metrics, issues addressed, and improvement opportunities implemented. Staff are informed of developments in best practice and given the opportunity to advance their risk management skills and knowledge. Section 7 of this guidebook provides guidance on this element.

2.5 Examples of Airport ERM in Practice

Provided below, as examples of airport ERM in practice, are descriptions of ERM implementation experiences at three airports (Columbus Regional Airport Authority, Dallas Fort Worth International Airport, and Greater Toronto Airport Authority).

2.5.1 Columbus Regional Airport Authority

The financial crisis was Columbus Regional Airport Authority's original driver to implement ERM as it would provide better internal awareness of possible risks to airport operations. The initiative was a directive from the President and CEO of the organization, and the CFO is the primary sponsor.

The ERM program manager, who drives the ERM process, meets with each department to work on and review its inventory of risk. The departmental risks are aggregated at the enterprise level as required. The program manager also attends staff meetings to share ERM updates, answer questions, and share ideas from other divisions.

The airport found that the most challenging elements to implementing ERM were getting the right resources committed, ensuring the delivery of training, and getting support for integration at the very top of the organization. However, the biggest win since implementing ERM has been the sharing of "internal sins," exposing mistakes to learn from and applying risk mitigation techniques for future avoidance, creating a culture willing to talk about mistakes and lessons learned without consequence. Discussion of risk now has a greater level of maturity.

2.5.2 Dallas Fort Worth International Airport

From Dallas Fort Worth International Airport's perspective, ERM is a structured, consistent, and continuous improvement process applied across the entire airport enterprise that brings value by

- Proactively identifying, assessing, and prioritizing material risks;
- Aligning ERM with strategic objectives and business processes;
- Developing and deploying effective mitigation strategies; and
- Embedding key components into the airport's culture:
  - Risk ownership, governance, and oversight;
  - Reporting and communications; and
  - Leveraging of technology and tools.

ERM was initiated at the airport in 2008 and officially began with an executive staff briefing in June of 2009. ERM has a defined mission, executive sponsorship structure, and process. Prior to implementing ERM, the airport reviewed its current risk management processes and established a plan to develop a formal ERM model that would best suit the current operating environment of the airport.

The ERM effort has been led by the risk management department with strong support by senior management who served on the initial task force to review the program and continue as executive sponsors of the ongoing effort. The executive sponsors provide oversight on ERM policy and strategy, and they receive regular updates from the risk council. The risk council serves as the mechanism to implement ERM and comprises 4 executive sponsors, the risk officer, and 13 council members who are managers across the various functional areas of the organization.

With respect to overall business decision-making, ERM is viewed as a process that drives a structured and disciplined approach to enterprise initiatives. ERM provides the methodology for measuring business risks and increases awareness of opportunities and potential risks. Through ERM, the airport can aggregate risks and benefits from an enterprise perspective, which leads to better capital allocation and enhanced efforts to protect the airport's competitive position.

2.5.3 Greater Toronto Airport Authority

Building on three formal risk assessments that were performed in 1999, 2005, and 2007, the Greater Toronto Airport Authority decided, in 2009, to enhance its risk management program with the design of an ERM framework. This ERM framework provides the following:

- A proactive approach to risk that is built into the strategic planning and performance management processes and is supported by all organizational units
- An efficient, independent risk function designed to support risk-takers and senior management with direction, tools, aggregation, and analysis
- The use of common risk definitions to help create a common vocabulary and organize the risk management process
- Transparent information flows that aid decision-making processes

ERM implementation had extensive support from the executive leadership team and the policymakers. The ERM framework was structured with a top-down direction, including board of directors and executive management setting the tone at the top for ERM to be fully embraced and sustained over time.

The airport recognized the importance of developing a risk-aware culture—an environment where employees are managing risks by making conscious choices in their day-to-day working activities about risk identification, assessment, and response. With the institution of a defined ERM framework, these risk management activities are further developed as employees proactively plan how to manage risks in the future.

The guiding principles under this culture are the following:

- Risk-taking is encouraged where risks are known, are within the defined risk appetite, and can be expected to generate desired returns.
- Corporate risk is partnered with the business areas in order to raise awareness, educate, and gain consensus on desired risk management outcomes.
- A culture of risk transparency, disclosure, and open dialogue is encouraged with the goal of "no surprises."
- The risk awareness of employees is enhanced through education sessions and management communications, increasing the likelihood that employees think about risk when making daily decisions and taking actions.

The tangible benefits of ERM are linked with the strategic plan and objectives of the airport and are clearly communicated and understood by all employees to foster the development of a risk-aware workforce that views risk management in terms of achieving strategic goals and priorities.

SECTION 3

Governance and Infrastructure

Governance and infrastructure provide the platform and structure on which to build and develop ERM across an airport. It is important to consider each step outlined in this section, to ensure that the pillars providing the foundation for ERM are established and tailored to the airport culture, structure, and objectives. In this section, the following elements will be discussed: establishing an ERM policy and strategy, determining risk appetite, attaining executive sponsorship and appropriate positioning, and developing a governance structure. Senior management support and participation is critical for these activities.

3.1 ERM Policy and Strategy

As with launching any other process across an airport, it is important to ensure that the strategy and policy are established from the beginning and endorsed by senior management and the board. Airports should ensure that a strategy and policy for ERM are developed.

3.1.1 ERM Policy

The ERM policy should concisely communicate why and how risk management will be implemented across the airport. The ERM policy is a formal acknowledgement of the airport's commitment to take an enterprise-wide approach to managing risk and strives to accomplish uniformity across the ERM implementation process. The ERM policy should include (at a minimum):

- The rationale for ERM
- A reference to the risk appetite of the airport (see Section 3.2)
- The role of employees in the ERM framework
- Sign-off by the CEO or board.

An example of an ERM policy is provided in Figure 1.

3.1.2 ERM Strategy

The purpose of the ERM strategy is to provide an overview of the airport's ERM framework. The strategy should act as a reference policy for those with risk management responsibilities. A team-based approach is often most effective when developing an airport's ERM strategy. Elements that the team should consider when developing the ERM strategy are provided below:

1. **Outline the purpose of the airport's ERM strategy**. The following is a sample statement of purpose:
   – "To ensure that the airport takes an enterprise-wide approach to managing potential opportunities and risks that may impact the achievement of its objectives."
2. **Outline the aims of the ERM framework**. Aims may include the following:
   – Minimize the impact and/or likelihood of risks occurring.

Airport X believes that risk management is a process that is key to our success. Airport X has taken an enterprise-wide approach to risk management; it forms a part of our vision, values, and objectives, including operating effectively and safely, as well as providing confidence to all third parties.

Airports are inherently risky, and it is therefore our policy to identify, assess, and manage all categories of risk in a proactive way. Managing risks is an integral part of the day-to-day running, monitoring, maintenance, and development of Airport X, and risks are considered in all key strategic decisions and third-party relationships. The ERM framework that enables this to be achieved is outlined in our ERM Strategy Document, which has been communicated to all staff with risk management responsibilities.

The aim of our ERM framework is that it will fit our purpose, reflect our size and the nature of the various airport operations, and use our skills and capabilities to the fullest. Risk management processes will be employed on a consistent and coordinated basis, and risk reporting will inform our operations. In implementing our ERM framework, we seek to provide assurance to all our stakeholders that the identification and management of risk plays a key role in the delivery of our strategy and related objectives.

Airport X has taken steps to ensure that our employees are aware of risk and the culture of the airport supports effective risk management. We will involve, empower, and give ownership to all of our staff in the identification and management of risk. Risk management activity will be regularly supported through discussion and appropriate action by senior management. This will include a thorough review and confirmation of the significant risks, evaluating mitigation strategies, and establishing supporting actions to be taken to reduce risks to an acceptable level. To guide our risk response, the level of risk that the board considers acceptable for the airport to be exposed to is defined.

Signed:

Title:

Date:

Figure 1. Example ERM policy.

- Break down silos and ensure an enterprise-wide approach to managing risk.
- Integrate key risk processes across the airport to add value and reduce duplication of effort.
- Minimize the total cost of risk.
- Identify areas of opportunity to create value.
- Satisfy the risk management requirements of key stakeholders.
- Raise awareness of risk management.

3. **Include a statement on risk appetite**. Provide a statement on risk materiality and the level of risk the airport is willing to accept.
4. **Provide an overview of the ERM process:**
   - Consider representing the process in a diagram.
   - Provide an overview of how each step will be completed.
   - Include templates that support the process, particularly risk reporting templates.
5. **Outline roles and responsibilities:**
   - Provide a structure chart for ERM.
   - Outline the responsibilities that align with each role in the structure chart.
   - Consider the skills required for each role, and outline the training that will be provided.
6. **Include performance management:**
   - Outline how the performance of the ERM framework will be monitored and improvements will be made.

3.2 Determine Risk Appetite

An organization's risk philosophy is a set of shared beliefs and attitudes characterizing how the organization considers risk in its business operations, from strategic planning and implementation to day-to-day activities. A risk philosophy should reflect the organization's mission and values, governing structure, and the industry and regulatory environments within which the organization operates. The philosophy will also be a product of the "tone-at-the-top," reflecting the executive team's attitudes toward and objectives for the management of risks and the team's operating style. This risk philosophy will influence how the enterprise risk management process and components are applied, that is, how risks are identified, assessed, managed, and monitored.

Risk materiality and the associated terms of risk appetite and risk tolerance have become a focus for risk management guidance over recent years. COSO defines risk appetite as the following: "The amount of risk, on a broad level, an entity is willing to accept in pursuit of value. It reflects the enterprise's risk management philosophy, and in turn influences the entity's culture and operating style" (COSO Enterprise Risk Management Framework, Committee of Sponsoring Organizations of the Treadway Commission, 2004). Risk tolerance is arguably a more empirical measure of how much loss an organization can withstand on its balance sheet before certain parameters, for example, banking covenants, are breached.

The two concepts of risk appetite and risk tolerance are important in helping define risk materiality, which helps an organization determine whether a risk is significant—what is considered a high risk (either by its probability, its impact, or a combination of the two, should the risk materialize) and what is considered a low risk. In deciding risk significance, an organization can prioritize risks effectively, improve resource allocation, and demonstrate consistent decision-making.

3.3 Developing a Risk Appetite Statement

Risk appetite is a consideration that should be made at the airport's senior management/board level. Recognizing that there is minimal guidance on how to develop a risk appetite, the IRM published a paper in September 2011 titled *Risk Appetite and Tolerance Guidance Paper.* This paper does not have any industry focus; however, the proposed methodology is applicable to airports and can help guide an airport through the process of establishing risk materiality. *Risk Appetite and Tolerance Guidance Paper* is available (as of June 5, 2012) at www.theirm.org/publications/documents/IRMRiskAppetiteFullweb.pdf.

The paper outlines a four-stage approach to developing a risk appetite:

- Designing
- Constructing
- Implementing
- Governing

Each stage is aligned to raise some of the questions the IRM thinks senior management should answer as it develops an approach to risk appetite.

Once an airport's risk appetite is agreed upon, it should be approved by the board (or equivalent), form part of the risk management strategy, and be effectively communicated throughout the organization. The risk-appetite statement that is prepared may

- Provide direction for and boundaries on the risk that can be accepted at various levels of the organization, how the risk and any associated reward are to be balanced, and the likely response.
- Consider the context of the organization's understanding of value, cost-effectiveness of management, rigor of controls, and assurance process.
- Define the control, permissions, and sanctions environment, including the delegation of authority in relation to approving the organization's risk acceptance, highlighting of escala-

Table 2. Sample risk appetite statements for different areas.

Area	Sample Risk Appetite Statement
Financial	▪ To maintain an international investment grade of X
Safety	▪ To achieve recordable case rate or lost time injuries not more than X per 1000 hours worked (within 3-year timeframe) ▪ Zero tolerance on loss of life or serious injury
Energy efficiency	▪ To ensure reduction in energy consumption per unit produced by no less than X% in 10 years
Regulatory	▪ Zero tolerance on compliance breaches
Reputation	▪ To reduce the number of national media negative press coverage incidents

tion points, and identifying the escalation process for risk outside the acceptance criteria, capability, or capacity.
- Include quantitative statements—described as limits, thresholds, or key risk indicators—which set out how certain risks and their rewards are to be judged and how the aggregate consequences of risks are to be assessed and monitored.

Sample risk appetite statements for different areas are shown in Table 2.

An airport can also consider a situational risk/reward framework with an understanding that management can accept different risk/reward approaches for different risk types. For example, an airport can be risk averse and seek to avoid operational, environmental, and compliance risks. The airport may apply a conservative approach in managing its financial risks. However, an airport may pursue activities that provide possible rewards in customer service and community relations. Figure 2 illustrates this concept.

3.4 Sponsorship and Positioning

Managing risk and opportunity is the responsibility of all airport employees. However, as with all process improvement and implementation activities, attaining endorsement from the top of the organization for ERM is essential. Those airports with mature ERM have achieved it by ensuring that support of the ERM framework by senior management and the board is visible.

3.4.1 Identify an Executive Sponsor

A key step in positioning ERM in the organization is to identify an executive sponsor for ERM. The role of this individual is to ensure the link between ERM and senior management and drive implementation across the airport. This person should

- Have respect within the airport and the visible support of the CEO and/or board.
- Have the authority to make decisions and deploy resources as necessary.
- Understand what is required, be an engine for change in the organization, and be prepared to follow through.

The executive sponsor will coordinate and oversee ERM through planning, development, and implementation. It is recommended that the executive sponsor identify an ERM manager to assist in these stages, as well as handle the day-to-day coordination of ERM. At larger airports, the ERM manager is likely to need to be supported by a team. Together, the executive sponsor and ERM manager should obtain the necessary resources for ERM and communicate its benefits to ensure buy-in across the airport.

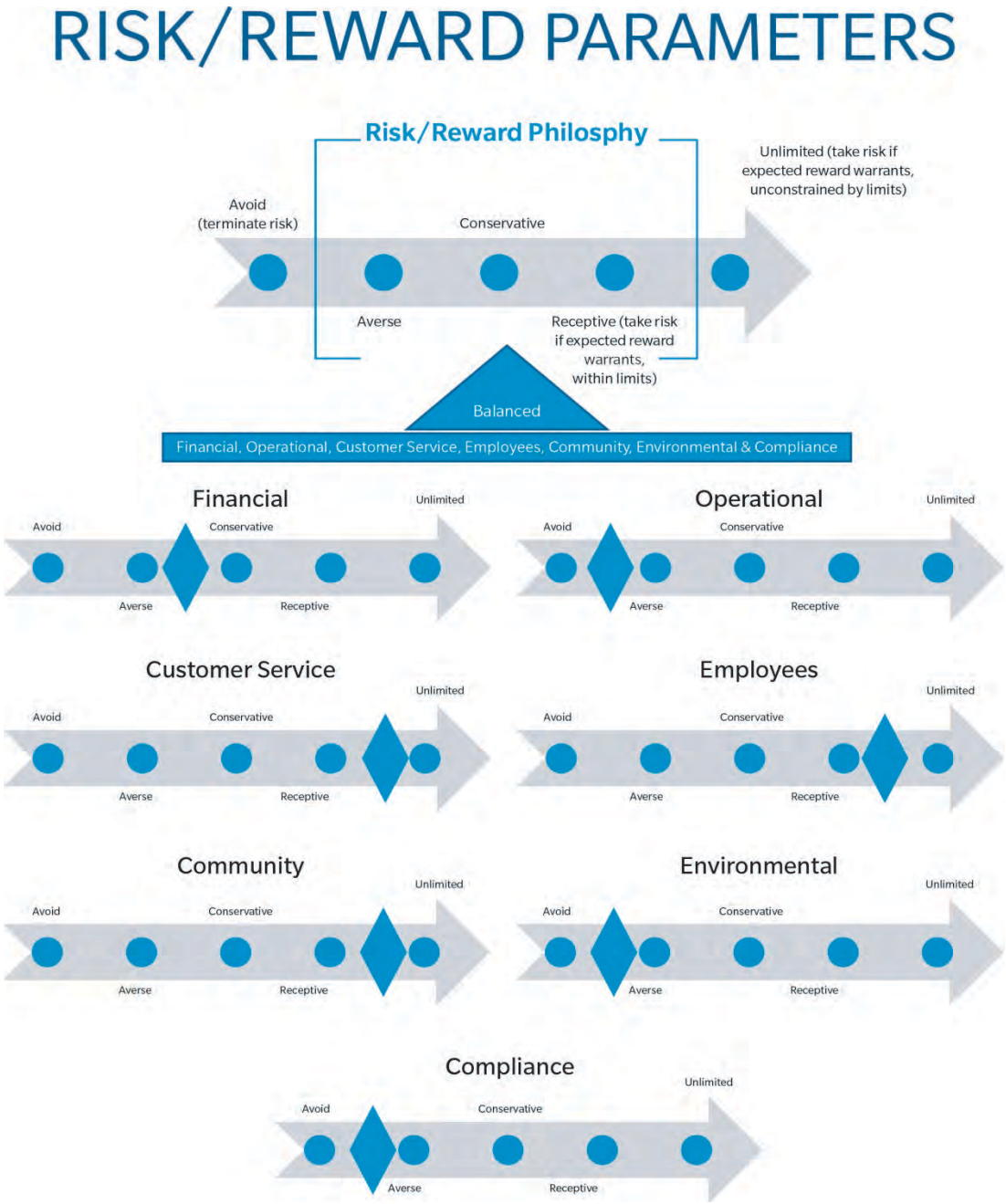

Figure 2. Example risk/reward approach.

3.4.2 Gain Management Commitment

Successful ERM implementation requires airport senior management to be fully committed to the ERM framework and processes. Below are some frequently asked questions with associated answers to help overcome common challenges:

- **At this airport, I am too busy dealing with today's issues; I don't have the time and energy for ERM. Do I have to get involved?** ERM is not about dramatically increasing workload or introducing additional processes. ERM is directed toward developing an organization-wide awareness of potential risks and opportunities and using risk/reward awareness as part of daily operations and decision-making. As much as possible, ERM should be incorporated into existing processes.

- **What will be the immediate results and efficiencies?** ERM is not something that will automatically result in short-term savings and efficiencies. Effective risk and opportunity management is concerned with allocating resources toward the most damaging risk areas and the most promising areas of opportunity and making risk/reward decision-making an integral part of operations. This can lead to better performance by the organization in reducing uncertainty and promoting quicker recovery and more stable financial performance. An ERM program promotes the proper allocation of resources and staff efforts to the issues that are most important to the overall organization and efficiencies by ensuring an appropriate blend of risk mitigation and acceptance and capturing of opportunities.
- **We don't have the people or resources to do ERM; how can I possibly do this?** While the establishment of an ERM system requires some dedication of people and resources, once it is in place, it can serve as a strategic "preventative maintenance" program. Through ERM, the management team proactively anticipates the significant risks and opportunities the airport faces and develops response plans in advance. That investment in time can avoid wasted staff time and resources in the future by laying out clear action plans and by reducing the negative impact of the risk or capturing the benefits of an opportunity.
- **Management is aware of what the top risks and opportunities are. It is common sense. Why is a risk register needed?** Most individuals will view risk and opportunities in different ways based on past experiences, personal beliefs, and their outlook. These all impact risk perception. Having a structure and process will improve consistency and alignment, ensuring that there is a clear consensus on the prioritized risks facing the airport.
- **We focus on proactive management of safety risks and respond to other risks when they occur, and we have never had any problems. Why introduce ERM now?** Safety is a critical element of airport operations. However, safety is only one element that is required for successful airport operations and management. Airports face risks throughout all of their functional areas that need to be managed. In addition, airports will provide additional value to customers and stakeholders by also focusing on capturing opportunities. Reacting and responding to risks and opportunities as they materialize is typically more time consuming and potentially a lot more damaging to the airport. ERM is a proactive tool intended to help identify and prevent consequential risks from materializing. Therefore, ERM will enable efficient planning and avoidance of some of the situations that may require crisis management and a panic approach to problem solving.
- **I am not a risk management professional; how do you expect me to do ERM?** ERM is based on risk management principles, but they are applied at a higher strategic management level. It is not necessary to be a risk management professional with special expertise in insurance or safety management programs. Rather, ERM consists of straightforward processes focusing on risk and opportunity awareness and risk/reward decision-making that are already incorporated informally in the responsibilities of most airport management teams. ERM systemizes these informal processes and can become a natural part of normal daily operations and decision-making, given a little time and effort.
- **ERM seems to simply be documenting what we already do. Isn't that just bureaucracy?** Documenting the airport's inventory and assessment of risks and opportunities and the agreed-upon response strategies is an important way to gain a common understanding across the entire management team and streamline reaction time when risks or opportunities emerge. However, ERM can largely be incorporated into existing processes and can be tailored to suit the needs and structure of the organization.

3.5 Develop a Governance Structure

Airports vary in their size and organizational structure; therefore, there is no prescribed ERM governance structure. There are some key roles that need to be in place to support ERM, but the structure most appropriate for a particular airport will be influenced by the maturity of the

current risk management processes, resource capabilities, skill sets, existing processes, size, and structure.

An example of an ERM governance framework is provided in Figure 3. Please note: this is just an example structure, and the framework should be tailored to the given airport.

The board/commission/council and a board committee (for example, an audit or risk committee) sit at the top of the process and are ultimately responsible for providing oversight for ERM, ensuring that key risks to the airport's strategy are appropriately managed and that their support of the ERM program is communicated.

In this best-practice structure, ERM is coordinated by a central accountable ERM manager with the skills and knowledge to support the process. In less mature airports, this coordination responsibility may rest with Internal Audit; however, this may result in this function losing independence and objectivity and thus becoming unable to perform internal audits of the ERM process. The ERM manager is positioned to report to the airport senior management team/ERM committee. This is the level where oversight and challenge are provided to both the output of the ERM processes and the ERM policy and strategy. Senior members of the management team are able to provide insight as to whether the airport has the appropriate controls and response strategies in place to manage its key risks and whether any emerging risks are missing from the risk profile. The management team can also be assured that sufficient resources are allocated to address top risks and capture top opportunities. The leading practice governance framework also advocates that the airport senior management team/ERM committee receive assurance on the effectiveness of the ERM process and the status of outstanding response plans from Internal Audit.

To ensure ERM is embedded throughout the organization, the structure illustrated in Figure 3 supposes that departments own and manage risks relevant to their operations. Mature organizations will reinforce the enterprise-wide aspect of ERM through the establishment of a Risk Champion Network. This network is a middle-management-driven forum for sharing risk management information and experiences across departments, providing a channel for ERM

Figure 3. Example ERM structure.

and risk management education while also facilitating cross-functional discussion on significant risk management issues. This approach is operating successfully in many North American airports and airports around the world.

Each role in the best-practice structure is outlined in Table 3 with an overview of example responsibilities.

Table 3. Example ERM responsibilities.

Role	Example Responsibilities
Board	▪ Approve the ERM policy, strategy, and framework ▪ Review the key risks to the airport and the controls that are in place and provide assurance to stakeholders that the risks and opportunities are being effectively mitigated ▪ Promote their support of ERM
Airport Senior Management Team/ERM Committee	▪ Provide guidance and oversight to the ERM framework ▪ Challenge the effectiveness of the ERM framework ▪ Regularly review the ERM policy and strategy to ensure that it underpins the airport's strategy and objectives ▪ Agree on the risk appetite for the airport ▪ Ensure all emerging risks are appropriately managed ▪ Allocate sufficient resources to address top risks ▪ Create an environment and culture where ERM is promoted, facilitated, and appropriately undertaken by the organization
Audit Committee	▪ Gain assurance for the organization that ERM is being properly undertaken ▪ Review risks arising through key third-party relationships and ensure that these risks are adequately managed ▪ Ensure insurance and other risk financing is used effectively within the ERM process
Internal Audit	▪ Create an audit plan that is aligned to the top risks ▪ Review and challenge the effectiveness of the ERM framework ▪ Review the progress of planned response actions ▪ Test and validate existing controls
ERM Manager/ ERM Team	▪ Coordinate the airport's ERM activity ▪ Implement the ERM policy and strategy, methodologies, and tools ▪ Assist in the delivery of the ERM process and aggregation of risk profiles across the organization ▪ Highlight any significant new or worsening risks to the airport senior management team/ERM committee. Similarly, highlight any significant or emerging opportunities ▪ Provide guidance, training, and advice on ERM ▪ Promote and share risk management best practices across the organization
Departments	▪ Ensure that the ERM process and risk reporting procedures are completed, as per the airport's ERM strategy, for each area under its responsibility ▪ Monitor the key risks in each area of its responsibility
Risk Champions	▪ Communicate the benefits of ERM across their operational area ▪ Help facilitate the ERM process and risk reporting procedures across their operational area ▪ Help ensure that the commitment of key stakeholders is obtained ▪ Share best practices across the Risk Champion Network
All Staff	▪ Take due care to understand and comply with the ERM processes ▪ Monitor their own area on an ongoing basis to identify new and emerging risks and opportunities and escalate as required

SECTION 4

The ERM Process

The ERM process is a continuous process that involves the identification and prioritization of risks and opportunities and the implementation of actions to mitigate top risks and capture opportunities. In addition, the ERM process focuses on reporting on risk and opportunities across the organization to allow for an aggregated view of risk and opportunities. This builds on the concept of the Plan-Do-Check-Act (PDCA) cycle also known as the Deming Cycle of continuous improvement.

Guidelines, standards, and organizations promote various approaches and illustrations of the ERM process. The key is to take the principles outlined in these approaches and adapt them to a particular airport—its culture, current systems, and processes. The ERM process that this guidebook promotes follows the PDCA cycle and is outlined in Figure 4. Every element of this process is scalable, adaptable, and can align to any airport.

4.1 Identification of Risk

Risk identification is the first major component of a best-practice ERM process and is the platform for the rest of the process. The aim of risk identification is to generate a comprehensive list of risks and opportunities that might affect the achievement of an airport's objectives.

4.1.1 Risk Identification Techniques

Risk identification sessions can and should occur at any level of the airport: the board level, departmental level, even at the single team level. There are a variety of techniques and methodologies that can be used to identify risks and opportunities, the most prevalent of which are structured discussions via facilitated workshops, interviews, surveys, and questionnaires. Each airport should tailor its approach to risk identification according to its size, existing processes, and culture. The important point to remember is that the technique(s) adopted should ensure that a variety of people from across the airport can provide input into the process. This will ensure that most risks and opportunities are identified.

The first step in risk identification is to create a risk inventory or risk list to identify current and emerging risks and opportunities. A number of techniques can be employed for this; airport management should use the techniques that work best in its organization. Risk identification techniques to consider include the following:

- **Analysis of previous losses, events, incidents, or lessons learned.** Such an analysis can help identify any common causes, which will allow related risks to be considered.
- **Process flow analysis.** This kind of analysis can help in understanding the processes that exist and the risks that can interrupt the critical path of each process.

Figure 4. Example ERM process.

- **Business impact analysis.** This kind of analysis can help in understanding the airport's contingency resilience and the impact that a business interruption would have to key processes.
- **Questionnaires.** Questionnaires can be used to capture a wide range of perceptions from a large group of people in a relatively short amount of time. If this is the chosen technique, questionnaires should be sent to people carrying out different activities at all levels of the organization. Ask participants for their thoughts on 5 to 10 key risks and opportunities for the airport and their area of responsibility, as well as their thoughts on the controls currently in place to manage those risks or opportunities. To help participants understand what is being asked, provide an example of a risk and associated controls. See the bulleted list below for example risk identification questions.
- **Interviews.** Interviews enable risks to be explored in great detail. They can be time consuming to perform, but they can result in the collection of robust risk and opportunity information. When conducting a risk identification interview, provide the interviewee with an overview of the purpose of the interview, ascertain the interviewee's opinion of the effectiveness of the ERM framework, and identify the current controls for the risks identified. Make sure to probe for opportunities and emerging risk issues as well. See the numbered list below for an example risk identification interview agenda.
- **Facilitated workshop.** A facilitated workshop is useful for bringing together a number of stakeholders who will all have differing perceptions of risk and opportunities and the potential consequences if those risks or opportunities were to materialize. A larger airport may facilitate a number of risk identification workshops across the organization whereas a smaller airport may only require one or a limited number.

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- **Scenario analysis.** This kind of analysis is a good way to identify those events that are very unlikely to occur but would be very significant if they were to materialize. Future scenarios can be envisioned by considering what future developments may occur in the airport, industry, or wider operating environment and identifying the associated risks and opportunities.
- **Review the previous risk register (if one exists).** This is focused on determining whether any risks or opportunities have changed significantly and therefore need to be reviewed; whether any risks or opportunities are missing from the risk register; and whether there is anything planned in the upcoming 12-month period that will give rise to a significant risk or opportunity.

These risk identification techniques are not mutually exclusive. An airport can use whatever technique or combination of techniques works best for the organization. In terms of who should be involved in the risk identification process, it is important that representation is provided from all departments to ensure that key risks and opportunities for the airport are identified.

Example risk identification questions are the following:

- What are the top five risks facing the airport or your department?
  - What are the causes of each of these risks?
  - What are the consequences of each of these risks?
- What are the top three current controls in place against each of the risks identified?
  - How effective are these controls?
- How are the risks currently monitored?

An example of a risk identification interview agenda is the following:

1. Introduction and background: introduction of interviewer, review objectives, timeframes, and expectations.
2. Overview of interviewee's role: confirmation of interviewee's key activities and responsibilities.
3. Risk strategy: interviewer asks questions to gain an insight into current and future risk strategy of the airport/department.
4. Determination of the key risks: interviewer asks interviewee to provide an overview of the key risks to achieving the objectives of the airport and ensures that the cause and consequence of each risk is identified.
5. Wrap up and close: interviewer determines whether there are any points that have not been discussed.

4.1.2 Categories of Risk

In terms of the types of risk that an airport should be considering during this process, it is not possible to develop a set of risks, opportunities, and categories that would fit all airports. Likewise, there in no one right way for listing or categorizing risk. Table 4 provides an example risk universe, highlighting some of the risks that an airport may consider. Some example opportunities are the following:

- Attracting new service, frequencies, and destinations
- Enhance business model through new airline agreement
- Commercial development of available land
- Community partnerships
- Renewable energy
- Further optimization of internal process
- Optimizing terminal concessions
- Attracting new internal service

Please note that each airport will need to consider risks and opportunities that are not listed as each airport will have a unique risk profile.

Table 4. Example risk universe.

Risk Category	Identified Risks	Risk Category	Identified Risks
Strategic	▪ Airlines/operators withdrawing ▪ Obtaining planning consents ▪ Land for future aeronautical needs ▪ Competitive pressure (e.g., off-airport parking competition) ▪ Outsourcing strategy ▪ Business diversity	**Operational**	▪ Industrial action ▪ Aging infrastructure ▪ Airfield operations safety ▪ Airline service degradation ▪ Business continuity planning ▪ Airport security ▪ Inefficient contracting process ▪ Project risk (e.g., construction of new terminal or facilities or rehabilitation of runway/apron)
Human Capital	▪ Employee skill set ▪ Maturing workforce ▪ Employee recruitment ▪ Employee retention, especially of key licensed personnel ▪ Lean workforce ▪ Employee screenings ▪ Knowledge transfer	**Financial**	▪ Debt management ▪ Decline in air travel ▪ Economic downturn ▪ Fuel price volatility ▪ Investment management process ▪ Revenue concentration ▪ Capital funding availability ▪ Cost containment and budgeting ▪ Financial reserves
Safety	▪ Passenger handling ▪ Fuel handling ▪ Ground operations ▪ Passenger terminal hazards ▪ Occupational health and safety	**Hazard**	▪ Terrorism ▪ Pandemic ▪ Environmental release ▪ Adverse weather ▪ Fire/explosion ▪ Natural catastrophe
Legal/ Regulatory	▪ Environmental non-compliance ▪ FAA changes ▪ Fraud/ethics violation ▪ Regulatory changes	**Technology**	▪ Data privacy/loss ▪ Data protection ▪ Systems failure

4.1.3 Articulation of Risk

It is important to ensure that risk descriptions are brief but fully communicate the risk or opportunity in question. Properly articulating the risk allows opportunities to be uncovered and evaluated. The following wording groups are often used to begin the process of articulating risk and opportunity:

- Failure to . . .
- Reduction of . . .
- Loss of . . .
- Disruption to . . .
- Inability to . . .
- Increase in . . .
- Realization that . . .
- Empowerment of . . .

An example of a well-worded risk description is the following:

- **Risk:** inability to recruit suitably skilled staff
- **Cause:** uncompetitive compensation packages, lack of skilled labor in the marketplace
- **Consequence:** key positions remain vacant, work overload of existing staff

An example of a well-worded opportunity description is the following:

- **Opportunity:** enhancement of the pricing terms with key security contractor
- **Cause:** new entrant into the security market puts downward pressure on prices
- **Consequence:** procurement savings

It is recommended that a risk register be used for recording identified risks and opportunities. A template of a risk register is provided on *CRP-CD-117,* an electronic tool provided with this guidebook. The electronic tool is discussed in more detail in Section 4.7.

4.2 Prioritization of Risk

The identified risks need to be assessed so that an airport can focus mitigation efforts on better controlling the biggest risk areas and capitalize on the largest opportunity areas. There are a number of methodologies that airports can apply to the risk-prioritization process; however, one of the most prevalent is to evaluate risk from two perspectives—impact (severity) and likelihood (probability). Risk impact refers to the effect on the airport should the risk materialize, whereas likelihood refers to the chance of that risk materializing.

4.2.1 Risk Assessment Criteria

To assess each risk in terms of impact and likelihood, assessment scales should be developed. Tables 5 and 6 represent illustrative risk-assessment criteria for impact and likelihood, based on a scale of 1 to 5. It is important for each airport to develop assessment criteria that are tailored to its operations, strategy, and size. In terms of customizing the assessment criteria, the following should be considered:

- **Materiality:** the airport's risk appetite and tolerance statements can be used to inform the development of the assessment criteria.
- **Number of assessment scales:** this will depend on the desired level of complexity.
- **Financial impact:** the risk appetite can be used to determine the financial impact scales.
- **Impact descriptors:** financial impact is not always the only impact a risk can have for an airport. Impact to reputation, disruption to operations, or environmental damage may also be significant.
- **Likelihood horizon:** it is recommended that the likelihood scale is aligned to the time horizon of the airport's strategy.

Table 5. Example impact assessment criteria.

Level	Description	Financial Impact	Reputation
1	Nominal Impact	<1% of budget	Public concern limited to a few complaints to the airport
2	Low	1% to 5% of budget	Minor adverse local/public/media attention and complaints
3	Moderate	5% to 10% of budget	Adverse long-term regional/short-term national media/public attention
4	High	10% to 15% of budget	Adverse long-term national media/public attention
5	Very High	> 15% of budget	Prolonged internal, regional, and national condemnation

Table 6. Example likelihood assessment criteria.

Level	Description	Frequency	Probability
1	Rare	< Once in 10 years	This event may occur in certain circumstances but is not expected to occur within a 10-year period
2	Unlikely	Once in 10 years	There is the possibility that this event will occur, but reoccurrence of the event is not expected within a 10-year period
3	Possible	Once every 5 years	There is the possibility that this event will occur, but reoccurrence of the event is not expected within a 5-year period
4	Likely	Once a year	There is a strong possibility that this event will occur within the next calendar year
5	Highly Likely	> Once a month	This event is expected to occur more than once per month or numerous times per year

Developing risk-assessment criteria is essential to improving consistency in risk prioritization across the organization and removing subjectivity from the process. When individuals assess each risk in terms of impact and likelihood, an element of subjectivity is brought into the process due to risk perceptions. Using prescribed risk-assessment criteria should give management assurance that the results of the exercise are not influenced by one person's risk perception or skewed by subjectivity. Robustness of the process can be further increased by employing a number of different knowledgeable people and subject matter experts in the assessment process.

It is advisable to review the assessment criteria on an annual basis to ensure that any material changes to the airport are incorporated.

Assessing each risk and opportunity in terms of impact and likelihood and multiplying the two provides a risk score that can be used to prioritize the risks and opportunities:

$$\text{Impact Score} \times \text{Likelihood Score} = \text{Risk Score}$$

It is typical to use the risk score to prioritize risks and opportunities, and, in most cases, this is an effective method. Nonetheless, with this approach, it is possible that outlying risks are not afforded the priority warranted. For example, very high-impact/low-probability risks (sometimes known as "black swan" events), would receive a risk score of $1 \times 5 = 5$ when using the example assessment criteria shown above. A risk scored as having a moderate impact and possible likelihood would receive a score of $3 \times 3 = 9$. Consequently, the "medium" risk would be prioritized ahead of the very high-impact/low-probability risk. It is important to understand that the risk score method may prioritize risks in a way that does not reflect the level of effort that each exposure warrants, i.e., it may be that an airport would like to dedicate more resources to managing a very high-impact/low-probability risk than to managing a "medium" risk exposure.

The results of the prioritization exercise should be reviewed and "common-sense checked" to ensure that risk outliers are duly considered and taken into account. It is also important to consider the interdependencies between risk exposures and to recognize that the impacts of risks are not always discrete. The materialization of a risk may lead to the materialization of another risk. For example, an overdue renovation of a passenger terminal may result from a lack of skilled

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staff, which may, in turn, lead to a supply chain risk, contract risk, and finally a reputation risk. The presence of multiple parties is likely to increase the risk of an event setting off a series of unintended and unplanned correlated incidents. This compounding of risk events is extremely difficult to anticipate.

Some organizations may apply words to the risk prioritization process, e.g., high, medium, low. Considerations with using this approach include the following:

- Illustrating top risks and opportunities can be difficult with a large list of risks and opportunities when the priority is described in words, e.g., medium-low or high-high.
- Manipulating risk/opportunity data can be more time consuming because simple spreadsheet sort functions generally do not operate as efficiently with words as they do with numbers.

4.2.2 Assessment Techniques

In generating risk-assessment scores for impact and likelihood, there are several techniques that can be employed to ensure that a number of people have input to the process. Expanding the number of perspectives incorporated into the assessment may limit the extent to which results are skewed by individuals' perceptions and attitudes.

One technique is to develop a questionnaire. The questionnaire should ask each participant to assess each risk in terms of impact and likelihood using the assessment criteria. Developing this using an online solution will help in collating the information. The average impact and likelihood scores should be recorded in the risk register. This approach can get around the problem of coordinating multiple data sources; however, it does not provide opportunity for discussion among key stakeholders. It is, therefore, advisable that once all the results are collated, a subject matter expert performs a sense check on the risk scores generated.

An example risk-assessment question is the following:

> Please assess the impact and likelihood of the following risks using the assessment criteria provided. If you feel unable to assess the risk, for example due to a lack of knowledge surrounding the risk area, then please opt out.

Another useful technique is to facilitate a risk-assessment workshop. During this, each risk and opportunity can be discussed and a consensus reached on the impact and likelihood scores. Some tips for hosting a risk-assessment workshop include the following:

- A week before the workshop, send each participant
  - a list of all the risks identified,
  - the aims and objectives of the workshop, and
  - risk-assessment criteria.
- Schedule the workshop to ensure participant concentration and commitment are maintained.
- Limit the number of participants to ensure that you can keep control.
- Include breaks and inform the participants of the timing of these at the beginning of the workshop.
- When the workshop has been completed, send an email to thank participants and attach any outputs.

An example risk-assessment workshop agenda could be the following:

1. Introduction and objectives.
2. Overview of the risk management process.
3. Risk validation—take the group through the risk list to ensure that all participants understand the background and wording prior to risk assessment.

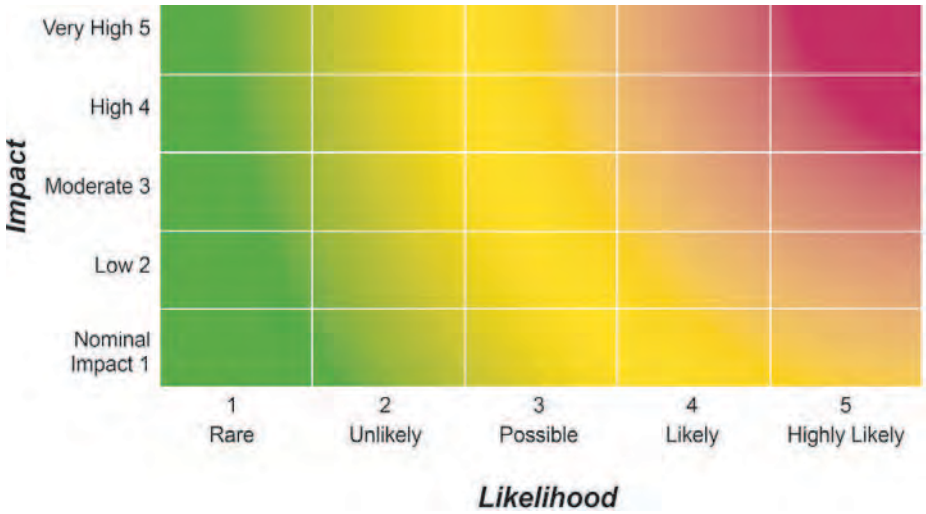

Figure 5. Example risk map.

4. Risk assessment—ask the participants to assess both the impact and likelihood of each risk using the risk-assessment criteria.
5. Review the top risks and "common-sense check" the results.
6. Next steps—ensure that participants are aware of what will happen following the risk-assessment workshop.

4.2.3 Risk Map

Impact and likelihood assessments also allow for a risk map (or heat map) to be created. This is a simple illustration of the airport's risk profile and can be used for communicating with boards, senior management, and other stakeholders. The positioning of the risk on the risk map will guide the control response. This is explored further in Section 4.4. A sample risk map is provided in Figure 5.

4.2.4 Quantitative Assessment Techniques

There are also quantitative techniques that can be used to analyze key risks and opportunities. The techniques need to be appropriate to the analysis that will be undertaken. One such technique is Monte Carlo simulations, where random variables are generated based on defined input variables. Multiple iterations are performed to identify the range of potential outcomes.

Each airport should adopt those assessment techniques—quantitative, qualitative, or a combination of the two—that generate the risk information required. It is important to get the balance right between quality risk assessment information and information overload; some organizations spend too much time looking into the details of risk assessment and fail to move on to mitigating the risks or capturing the opportunities.

4.3 Review of Risk Controls

The majority of airports that complete the ERM process will find that they already have various controls in place for the identified risks. This stage in the process is focused on reviewing and assessing whether these controls effectively mitigate those risks to the required level so that

Table 7. Example control assessment criteria.

Scale		Description	Control Type
1	Completely effective	Full compliance with statutory requirements, comprehensive procedures in place, no other controls considered necessary, ongoing monitoring only	Control is likely to be of a preventative nature (e.g., prevents the risk from occurring) and a system or automatic process (e.g., password protection, security authorization process)
2	Partially effective	Reasonable compliance with statutory requirements, reasonable standards established, some preventative measures in place, controls can be improved	Control is likely to be either reactive (e.g., business continuity plan) or of a deterrent nature (e.g., training) and as such would not be considered as effective as a purely preventative control
3	Not effective	Insufficient controls, weak procedures, limited attempt made to implement preventative measures	Control is either not in place or not working as intended

a decision can be made about whether additional controls may be required. During this review, opportunities should also be evaluated to ensure that strategies are in place to maximize value.

4.3.1 Control Assessment

The controls in place for each of the top risks should be identified and recorded in the risk register. Then, a small group of people with a good understanding of the risk and the controls should use control assessment criteria to decide whether those controls are (1) completely effective and no additional controls are required, (2) partially effective and additional controls need to be considered, or (3) not effective and additional controls must be put in place to control the risk. Example control assessment criteria are provided in Table 7. Airports should tailor this form to the organization.

4.3.2 Residual Risk Assessment

Following the assessment of current controls, the airport will have the opportunity to conduct a residual risk assessment—an assessment of the risk exposure after controlling measures are taken into consideration. The process for completing a residual risk assessment is exactly the same as the process outlined in Section 4.2, except that the assessment scores for impact and likelihood should be decided when current controls are taken into consideration. The risk register in the electronic tool provided on *CRP-CD-117* allows for the recording of both inherent (before controls) and residual (after controls) risk assessments.

Completing a residual risk assessment is valuable in that it helps an airport to

- Ensure the integrity of the risk-assessment process because all risks with high inherent and residual risk scores are considered.
- Measure the effectiveness of current controls.
- Focus resources on those high risks that are not adequately controlled.
- Identify areas of opportunity or competitive advantage.
- Target audit activities toward important controls.

4.4 Risk Response Planning

Risk response planning is essential to ensure that steps are taken to mitigate key risks to the airport. The aim is to reduce the risk profile of the airport to an acceptable level, based on the amount of risk the airport is willing to accept. This does not mean that every risk

can or indeed needs to be mitigated until it falls into the green area on the risk map. Some risks, by their nature, cannot be mitigated to a very low impact or likelihood, and others the airport may decide to accept at a higher level. The benefits (reduced likelihood or reduced impact) of proposed treatments should be considered against the cost of implementing them.

Following the risk and control assessment, it is important to "common-sense check" the risk ratings to ensure there is agreement on those risks that are considered unacceptably high and outside of the organization's risk appetite. It is important to remember that the responses that are developed need to either reduce the likelihood of a risk materializing, reduce the impact of the risk should it materialize, or both. In addition, due to limited resources, it is normal for risk response planning to initially focus on the top 5 to 10 risks resulting from the prioritization exercise.

4.4.1 Determining the Nature of Risk Treatment

For those risks that require additional treatment, Figure 6 outlines four primary responses: avoid, modify, transfer, or retain the risk.

Avoid the risk. If the risk is undesirable, e.g., it is off-strategy, offers unattractive rewards, is outside of an organization's risk appetite, or the organization does not have the capability to manage the risk, then the airport can avoid the risk. One example of how to avoid a risk is stopping a certain process or activity completely.

Modify the risk. This involves putting in place additional risk control measures that reduce the likelihood and/or the impact of the risk to an acceptable level. Examples include strategy, process, people, or systems improvement.

Transfer the risk. This involves transferring the cost of the risk to a third party through insurance, contracts, or outsourcing the activity.

Retain the risk. The airport decides to accept the risk as it is and does nothing further to mitigate it. Risks that are accepted may still require monitoring and review.

If an organization is dealing with opportunities, opportunity responses will need to be considered, e.g., exploit, share, enhance, or accept.

Figure 6. Risk response options.

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Risk response options are typically assessed on the basis of the following:

- The extent of risk reduction the new controls will drive relative to the organization's risk appetite
- The extent of any additional benefits or opportunities created
- The associated costs
- Existing best practice to mitigate the risk and how other comparable airports mitigate the risk

4.4.2 Assignment of a Risk Owner

Best practice ERM requires that risk owners are assigned to the top risks as identified during the prioritization exercise. Nonetheless, it is up to each airport to decide how many risks are assigned a risk owner; this may occur for all risks or just the top risks to the airport. Over time and as the process matures, the majority of risks can be assigned to risk owners.

The responsibilities assigned to a risk owner include monitoring the risk, escalating any significant changes in risk impact or the likelihood of the risk occurring, and ensuring the completion of all outstanding response actions. The risk owner should be someone with knowledge of the risk area and enough seniority to drive the completion of response actions.

4.4.3 Developing Risk Response Plans

A risk response plan is a tool to record, assign responsibility for, and monitor those additional mitigation measures that the airport deems necessary to have in place to ensure the risk is managed to an acceptable level. The risk response plan should be developed by the risk owner in collaboration with relevant stakeholders.

An example risk response plan is provided in the electronic tool provided on *CRP-CD-117*, as well as outlined in Figure 7. Each airport should tailor the risk response plan template to align

Risk Response Plan

Risk No:	H7
Risk	Employee Recruitment
Risk Owner & Review Period	HR/Q1 2012

Risk Scoring	**Impact**	**Likelihood**	**Risk Score**
Inherent	4	3	12
Residual	3	3	9

Risk Cause(s)	**Risk Consequences(s)**
Uncompetitive compensation	Vacancies
Lack of skilled workers	Staff overworked

Current Controls
Pay analysis
Training

Description of Controls
Conduct annual compensation study
Design on-site training curriculum

Additional Response Required	**Priority**	**Owner**	**Target Completion**
Campus recruiting	H	B. Reed	Q3 2012
Evaluate contractors	H	A. Smith	Q4 2012

Last Review Date	Q4 2011

Figure 7. Example risk response plan.

with the information it would like recorded and monitored. Nonetheless, the risk response plan should include, at a minimum:

- Each response to be completed
- The person responsible for completing each response
- The target completion date for each response

If the airport feels that documenting an individual response plan for each top risk and opportunity is not necessary, the information above can simply be recorded in the risk register as additional columns alongside each of the relevant risks and opportunities.

4.5 Monitoring Risk

Few risks and opportunities or action plans remain static. Risks and opportunities change, priorities change, actions are completed, risk responses that were once effective may become irrelevant, and so on. Therefore, it is important to monitor risk response plan effectiveness and risk profile.

4.5.1 Monitoring Risk Response Plan Effectiveness

As the internal and external variables at an airport constantly change, management needs to periodically determine whether risk responses are still effective and adapt them as required. There are a variety of ways that this can be achieved, from a periodic review of the effectiveness of risk response plans by management to more formal methods such as establishing key control indicators (measures that indicate the effectiveness of mitigation measures). In some cases, an airport may want Internal Audit to include the testing of risk response plans and progress of actions against target completion dates in any review they might perform.

4.5.2 Monitoring Risk Profile

Each airport's risk profile will constantly change and will be influenced by factors including strategy, new initiatives and projects, changing stakeholder agendas, and public opinion. To ensure that senior management is effectively managing this changing risk profile, it is important that the ERM process is continuous.

Each airport will need to decide how frequently risks and opportunities should be identified and assessed. Some may choose to complete the process every quarter while others may only have the resources to complete the process once a year. Best practice suggests review every quarter; however, this is not always possible. To overcome this challenge, airports should consider embedding a review of the risk register in scheduled management meetings. During these meetings, three questions should be asked:

- Are there any risks or opportunities missing from the risk register that should now be included?
- Have any of the risks or opportunities in the risk register changed significantly in terms of impact and/or likelihood so that they now require additional mitigation efforts?
- Is there anything planned in the next 6 months that may give rise to a key risk or opportunity?

Any significant changes to the risk profile noted during these management meetings or during the formal ERM process should be recorded in the relevant risk register and reported as required.

Key risk indicators (KRIs) are another tool to monitor the risk profile of the organization. KRIs can be used to monitor the causes and drivers of key risks and opportunities. They can indicate

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a change in the likelihood or impact of a risk or opportunity and assist in the decision-making process for risk mitigation and opportunity capture. Examples of KRIs include the following:

- Aviation and non-aviation revenue
- Bird strikes
- Mandatory FAA incident reports
- Passenger volumes
- Employee turnover rates
- Customer satisfaction rates
- Aircraft movements
- Equipment downtime
- OSHA incidents

If an airport would like to use KRIs to facilitate the monitoring of key risks and opportunities, the risk owner together with relevant individuals should develop them. Please remember that the KRI should be an indicator of change in the impact and/or likelihood of a risk or opportunity.

4.6 Reporting Risks

There is no prescribed format for risk reporting, but it is one of the most important elements of the ERM framework. Risk reports should be formatted so as to be user-friendly, actionable, and usable in decision-making. The reports should also capture both risks and opportunities.

4.6.1 Determining a Risk Reporting Process

To develop a risk reporting process that is sustainable and ensures the necessary risk information reaches the right people in a timely manner, the airport should

- Determine what information needs to be reported.
- Define a reporting structure linking into overall governance structure, answering the following questions:
  - Who will prepare information?
  - Who will receive information and act accordingly?
  - Which stakeholders will be informed?
- Decide the frequency of reporting:
  - This will vary by airport, but formal risk reporting to the board should take place at least annually.
- Assess the requirements for building technical infrastructure to support monitoring and reporting.
- Consider how the organizational culture fits with proposed reporting processes.

4.6.2 Risk Reporting Formats

There are many types of risk reporting formats that have proven to be effective in airports. It is important to remember the following:

- There is no one set format for risk reporting; this is dependent on the size and nature of the airport.
- Reporting should provide the audit/risk/executive committee with assurance that key risk exposures and opportunities have been identified, impacts assessed, and mitigating controls/capture strategies evaluated.
- Management information should provide a view on increasing and decreasing risk exposures and opportunities, as well as a means of identifying new risks and opportunities.
- Reporting should incorporate all categories of risk.

- The information should allow for informed decision-making, which may be used to continuously improve ERM.

The risk register and/or risk map are obvious tools for reporting risk and opportunities; however, they are not the only tools that can be used. Customized risk dashboards or highlight reports may be used to track the status of risks and guide the escalation process, e.g., a RAG reporting system where red, amber, and green are used to differentiate risk and prioritize control efforts. Example risk reports are provided in Figures 8, 9, and 10.

The reporting processes developed to support ERM do not have to involve the latest piece of software or sophisticated methodology. A simple reporting system based in Excel may do a lot more for your organization initially than a software-based tool. However, a risk management information system (RMIS) can assist in recording, consolidating, and reporting risk information across an airport, especially in larger airports. An RMIS is typically a computerized system that supports the ERM process. An RMIS may require a significant investment in terms of cost and management time, but these systems are being used effectively in airports.

Risk reporting should do the following:

- Monitor and report on the effectiveness of the ERM process to the board and others.
- Provide relevant and sufficient risk and opportunity information in a timely manner that is user-friendly and drives decision-making and action.
- Ensure that the views of the board and senior management on risks and opportunities are filtered across the organization in a timely manner.
- Focus on the most significant risks and opportunities, ensuring an adequate response where needed.
- Include qualitative and quantitative information where appropriate.
- Highlight key messages.
- Compare results against benchmarks.
- Show trends of "early warning indicators."

0 -1 Reformat Risk Inventory		Risk Owner = Dept. Head	Risk Area = Roles & Responsibility				
Executive Management	Risk Category	Risk Owner	Risk Area	Risks		Controls	Opportunities/Initiatives
CFO	FINANCIAL	Treasury	Debt Management	Ability to access competitive instruments in the financial markets		Established relationships with financial institutions	
		Treasury				Cash management strategy	Training and development of staff
		Treasury	Interest rate	Management of volatility associated with interest rates		Long term investment strategy	
		Treasury				Regular monitoring and reporting of trends	Adopt integrated reporting system
		Treasury	Capital Development Project (Management)	Management of ongoing capital development projects		Dedicated staff to manage and monitor financial position of TRIP	
		Treasury				Integrated risk review of new capital projects	Develop project risk KPI index

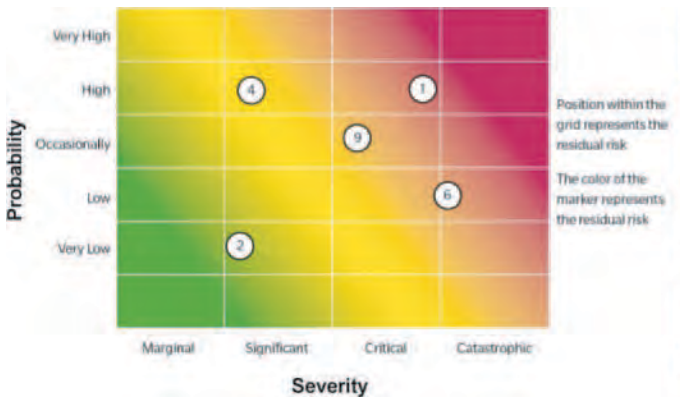
Figure 8. Example risk report: executive leadership ERM risk inventory.

Issue Ref	Issue	Status	Risk Category	Issue Owner	Priority	Exposure	Proposed Action/ Comments
1.1	Staff turnover airside is impacting performance		People		Urgent		Monitor position closely
1.2	Lower growth rates than strategic plan		Process		Urgent		Report to board
1.3	IT software issues increasing		External		Action required		Review existing controls and ensure reduction in rate
1.4	Terminal renovation overdue		Process		Action required		Monitor position closely
1.5	Environmental legislation is increasing cost		Process		Critical		Review Root Cause Analysis

Update of Previous Improvement Actions

Action	Issue Ref	Owner	Status	Comments
Review contractors' health and safety processes			Complete	Urgent
Revise reporting process for fraud			Complete	Urgent
Provide report on systems development risk			Complete	Action required
Risk committee needs to consider XXX in respect of the strategic plan			Delayed	Action required
Business continuity process to be audited			On track	Critical

Figure 9. Example risk report—key issues.



Risk ID	Risk	Risk Owners	Key Actions	Action Owner
1	Lack of key staff	J Brown	Staff training	N Harvey
			Career development programs	W Bruce
2	System failure	P Smith	Increase IT security	N Brannan
			Review firewalls	D Ure
4	Reliance on third parties	J Bloggs	Review outsourcing contracts	A Harwood
6	Environmental non-compliance	D Flight	Escalate to legal and compliance	G Brown
9	Overdue terminal renovation	A Plane	Review cost and schedule plan	D Evans

Figure 10. Example risk report—top five risks to the group.

4.7 Electronic Tool

4.7.1 Overview

An electronic tool has been developed to support the ERM process as outlined in this guidebook and is provided as *CRP-CD-117* (affixed to the inside back cover of this guidebook). The main features of this tool are a section to record the airport's risk assessment criteria, a risk register to record risk information, risk maps to provide an illustration of the airport's inherent and residual risk profiles, and response plan worksheets.

The electronic tool has been developed in MS Excel so that it can be easily customized to the recording and reporting needs of individual airports. Each worksheet should be tailored to individual airport needs.

4.7.2 How to Use the Electronic Tool to Support the ERM Process

User instructions are provided in the electronic tool and in Appendix C. The instructions contain important information on opening the tool and should be reviewed prior to using the tool for the first time. An explanation as to how the different worksheets should be used to support the ERM process and commentary on what information is to be recorded in each column of the risk register is provided.

4.7.3 Executive Management Reporting

If completed in accordance with the guidebook and instructions for use, the electronic tool should contain most of the information required by an airport senior management team and the risk committee. However, these groups may not have the time to sift through all the information in the electronic tool, so it is important to extract the information that will be of most interest:

- What the risk profile of the airport looks like
- What the key risks and opportunities are to the airport
- What the airport is doing to mitigate those risks and capture those opportunities

To effectively illustrate the risk profile of the airport, plot the risks on the risk map template in the electronic tool. The senior management team/risk committee will be able to clearly understand the top risks by looking at their position on the risk map.

The risk response plans in the electronic tool provide the basis for reporting what the airport is doing to mitigate risks or capture opportunities. The senior management team/risk committee is likely to find the individual response plans for each of the top risks informative. However, if this is deemed too much information, simply extracting the outstanding response actions, the person responsible, and the target completion date may suffice.

SECTION 5

ERM Implementation

5.1 Develop an Implementation Plan

As with any other process implementation, an implementation plan should be developed. A summary ERM implementation plan is provided in Table 8. Please note: this example implementation plan provides the high level steps that will need to be completed when implementing ERM, but each airport should develop a plan based on the unique aspects of the organization.

5.2 Scalability

The principles of ERM can be applied whether an organization is small or large, has relatively straightforward operations, or has more complex processes. The tools and techniques that support the principles, however, should be fit for their purpose and appropriate to the airport and are therefore likely to vary and correspond with the size and complexity of the organization. For example, the principle of risk and opportunity identification may be applied in a small airport by undertaking one group workshop with selected personnel brainstorming potential exposures; for a large hub airport, this principle may need to be applied by organizing multiple workshops supported by web surveys in order to attain relevant data from across all operations.

The critical tenet underpinning successful ERM is ensuring that any policies, processes, and methodologies used are fit for their purpose. Table 9 illustrates how the principle of scalability needs to be considered when developing an ERM framework. This table is purely illustrative, does not define categories of airport size, and therefore should not be read as offering prescriptive advice.

5.3 ERM Maturity

Across industries, sectors, and organizations, levels of ERM maturity vary. This means that processes, methodologies, and tools utilized within an ERM framework can vary in their degree of complexity and sophistication. Implementing ERM at an airport takes time, commitment, and investment. While the framework for ERM will be similar across all airports, there will be differences in the approaches taken. These differences reflect differing processes and staffing approaches, and the ERM framework will need to be tailored to suit the organization's culture, size, operating environment, management style, and strategy. This customization is critical to ensuring that ERM provides value.

In this regard, the ERM approach and underlying maturity should be driven by the airport's objectives for ERM and what the airport requires in terms of risk information. Over time, processes

Table 8. Example implementation plan.

No.	Task	Description
1	Develop implementation project plan	▪ Summarize all tasks and associated responsibilities, resources, and timelines ▪ Ensure that all members of the implementation team understand ERM
2	Identify an executive sponsor and ERM manager	▪ Designate a leader to drive ERM implementation across the airport
3	Establish ERM overview documentation	▪ Define target level of risk management maturity (see Section 5.3 for guidance on risk management maturity). ▪ Develop and document ERM policy: sign-off by the CEO or board
4	Develop ERM process documentation	▪ Review current process to identify areas requiring modification/ improvements ▪ Develop and document ERM strategy ▪ Define reporting processes ▪ Define how ERM will link with strategic planning, budgeting, and decision-making as well as how it will integrate with the SMS process ▪ Develop and document the ERM organization chart with terms of reference, roles, and responsibilities as required
5	Develop and document ERM templates	▪ Develop the templates to record all risk and opportunity information; these templates are likely to include a risk register and report templates ▪ Link into the reporting capabilities of the RMIS or other software tool, if one is adopted
6	Develop a process for performance management	▪ Develop a process to monitor the performance of the ERM framework and action improvements as required
7	Provide ERM training	▪ Develop a training program based on the ERM training needs of each role in the organization chart ▪ Tailor training to align to the needs of different groups
8	Develop ERM communications and promotion program	▪ Position ERM across the airport ▪ Educate all staff on their responsibilities
9	Facilitate the ERM process within each department	▪ Facilitate risk and opportunity identification and evaluation workshops in each department ▪ Identify where additional response is required to reduce the risk to an acceptable level or to capture desired opportunities

and procedures may evolve to allow for increased levels of ERM maturity; but, at all times, an ERM framework must be fit for its purpose and appropriate to the needs of the airport. Consequently, it is important to note that not all airports may want to achieve the highest level of ERM maturity. The level of ERM maturity should increase as the organization demands it. For a small airport, a relatively basic ERM process may be sufficient to generate robust risk data that meet the needs of key stakeholders. Typically, there is a correlation between the size and diversity of an organization and the corresponding sophistication of an ERM approach.

Figure 11 illustrates a roadmap of ERM maturity. This is a summary of the maturity model outlined in Appendix B, which can be used to inform the airport's ERM strategy, objectives, and key performance indicators.

Table 9. Applying scalability to ERM.

Principle	Small Airport	Large Airport
Governance and infrastructure	Resource with responsibility for ERM	Full-time role/team for ERM
	Excel-based recording of risk data	Automated capturing of data in an RMIS
Risk identification and prioritization	Biannual workshop for risk identification	Multiple users capturing risk data in RMIS
	Qualitative assessment of risk exposures	Quantitative assessment of risks and opportunities
Controls and risk response	Actions manually tracked	Actions automatically tracked and email reminders sent automatically
Monitoring and reporting	Risk reports manually produced	Reports automatically generated from RMIS
	Reporting on airport exposures	Risk reporting broken down into operating segments/functions

5.4 Resourcing

Developing an airport's approach to ERM does not necessarily need to be resource intensive. While it is necessary to have resources in place to champion the role of ERM and develop the required governance and infrastructure, airports should not be intimidated by the potential sophistication of ERM. It is not necessary for an airport to invest a huge amount of time and effort in ERM before deriving any benefits. It is possible to exhibit real progress through the determination of a policy to identify and assess risks on a regular (i.e., semi-annual) basis, for example. The development of a risk register will be iterative and improve over time, but value may be derived from a first draft, which may be the outcome of a process driven by just one person.

Should risk assessment demand quantitative analysis, it is likely that additional expertise will be required. In general, as ERM exhibits greater maturity, there will be additional resource

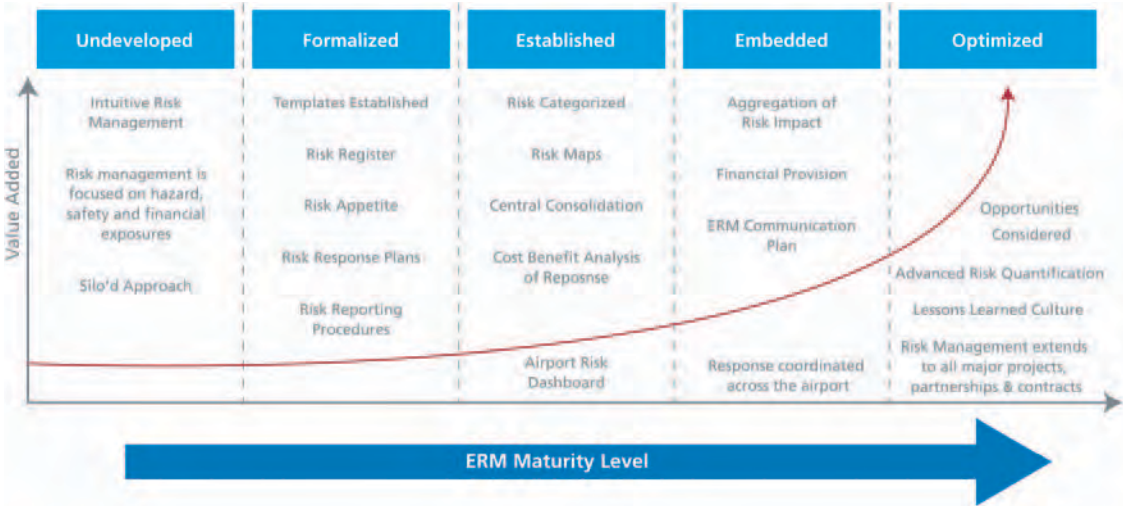


Figure 11. Roadmap of ERM maturity.

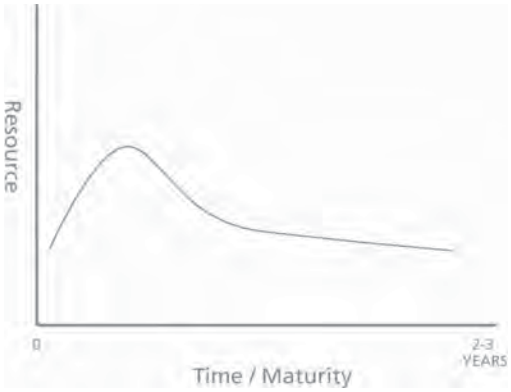


Figure 12. ERM resource requirements.

requirements. At the same time, as an ERM process becomes integrated and embedded within business as usual, dedicated hours of ERM resource effort should begin to reduce.

Figure 12 illustrates typical resource requirements in terms of relative hours for developing ERM over a time horizon of 2 to 3 years. As specific quantitative/risk expertise is required for assessment of certain risk exposures, the resource effort is likely to increase from a relatively low standing start. As the ERM culture becomes pervasive, the integration and embedding of process should reduce the resource requirements specifically committed to ERM.

5.5 Establish an ERM Culture

In "best practice" organizations, assimilation of ERM into organizational culture is central in contributing to ERM's long-term success. ERM culture refers to people embracing the ERM strategy and process as well as creating a culture that is willing to talk about mistakes and lessons learned without consequence. Leadership from the top, a network of risk champions, good communication, and effective training and education are all factors that may positively influence ERM culture.

5.5.1 Risk Champions

One approach that organizations are using to drive the implementation of ERM is the establishment of a risk champion network. The role of a risk champion includes the following:

- Communicating the benefits of ERM across their operational area
- Helping to facilitate the ERM process and risk reporting procedures across their operational area
- Helping to ensure the commitment of key stakeholders

Risk champions should reside in operations and embed risk management in the day-to-day running of the airport. Examples of how risk champion networks can help develop a culture that supports ERM include the following:

- Facilitating a biannual risk champion network meeting to share ERM experiences, lessons learned, and best practices across the organization.
- Providing risk-champion-led training on the ERM process. The employees will often engage more in training if a member of their own team is delivering the training.
- Having risk champions provide communications on ERM. Again, the employees are more likely to review communications from a member of their own team.
- Designating a risk champion as the point person for any ERM queries within a department. Risk champions may be more approachable than the ERM manager.

5.5.2 Communication Plan

ERM requires engagement from staff across the airport. Communication on the airport's ERM strategy, policy, and process is essential to ensuring a consistent, truly enterprise-wide approach to risk management. Information is typically reported upward to boards and senior managers, but many organizations overlook the critical need to report downward as well.

Communication not only needs to include the right message, it needs to be targeting the correct people in a format to which those people will respond. To achieve this, the airport should consider developing an ERM communications plan. The steps to developing a communication plan are the following:

1. **Define the objectives for ERM communications.** These may include
   - Ensuring buy-in from all key stakeholders,
   - Ensuring knowledge transfer to all stakeholders, and
   - Ensuring the provision of information in a timely and appropriate fashion.
2. **Identify the information to be communicated.** This could include
   - ERM policy and strategy,
   - Benefits of ERM, and a
   - Structure chart with roles and responsibilities.
3. **Identify target groups and design bespoke communications packages:**
   - Who are the target groups?
   - What do they need to know about ERM?
   - What do we want them to do as a result of the communication?
   - What vehicle for communication is most appropriate: risk reporting process, intranet articles, cascading meetings, or email bulletins/newsletters and training?

5.5.3 Training and Education

Ultimately, the litmus test for an organization's risk culture rests with its employees. A strong ERM culture is evidenced by employees who understand the organization's ERM strategy, the ERM process, and their role and responsibilities.

In strong risk cultures, employees are trained to understand how to make educated risk- and reward-related decisions that they may encounter during their specific jobs. ERM training should be tailored to the audience, for example:

- The board should be educated on ERM and the interface with their role as policymakers.
- Departmental staff should be trained on the ERM process, the templates and tools that support it, and the risk/opportunity information that is expected to flow up and down the organizational hierarchy.
- Risk champions will need to be educated on ERM and the airport's ERM strategy so that they can support the ERM process, as well as communicate the benefits of ERM across their area of responsibility.

The approach, principles, and guidelines outlined in this guidebook, together with the airport's specific ERM strategy, can be used as the basis for developing training materials.

SECTION 6

Integration of ERM

A successful ERM program links to existing airport processes such as Safety Management System (SMS) and strategic planning and leverages existing processes, where appropriate.

6.1 ERM and SMS

ERM and SMS are complementary frameworks that should be integrated to ensure that maximum value is created for the airport. ERM provides the top-down view of risk and the overarching framework to bring together an airport's bottom-up risk processes, such as SMS.

Safety has always been a key focus for airport operations. However, pursuant to a recent Notice of Proposed Rule Making (Docket No. FAA–2010–0997; Notice No. 10–14, 62008 *Federal Register,* Vol. 75, No. 194, Thursday, October 7, 2010, Proposed Rules), the Federal Aviation Administration (FAA) will require that Part 139 commercial air service airports implement SMS for all airfield and ramp areas. An SMS is described as a formalized approach to managing safety by developing an organization-wide safety policy, developing formal methods of identifying hazards, analyzing and mitigating risk, developing methods for ensuring continuous safety improvement, and creating organization-wide safety promotion strategies.

Like ERM, SMS is an organization-wide effort, requiring a commitment from senior management. SMS also has a proactive approach, rather than a reactive approach, at its foundation. The components of SMS are outlined in Figure 13. SMS focuses on the identification of risks (hazards), the assessment of the likelihood and severity of risks (hazards), and the development of strategies and action plans to mitigate the risks. Like ERM, SMS is not a prescribed process but rather a framework. The FAA envisions SMS as an adaptable and scalable system and has recognized that an organization should develop SMS to meet its unique operating environment.

As defined by the FAA, the four components of SMS are the following:

- **Safety Policy.** The safety policy provides the foundation or framework for SMS. It outlines the methods and tools for achieving desired safety outcomes and details management's responsibility and accountability for safety.
- **Safety Risk Management (SRM).** SRM uses a set of standard processes to proactively identify hazards, analyze and assess potential risks, and design appropriate risk mitigation strategies.
- **Safety Assurance.** Safety assurance is a set of processes that monitor the organization's performance in meeting its current safety standards and objectives as well as contribute to continuous safety improvement. Safety assurance processes include information acquisition, analysis, system assessment, and development of preventive or corrective actions for non-conformance.
- **Safety Promotion.** Safety promotion includes processes and procedures used to create an environment where safety objectives can be achieved. Safety promotion is essential to creating an organization's positive safety culture. Safety culture is characterized by knowledge

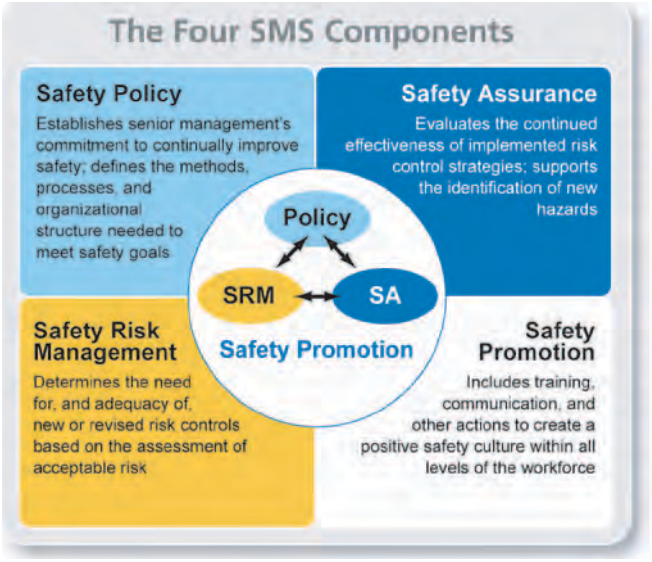


Figure 13. Components of SMS.

and understanding of an organization's SMS, effective communications, competency in job responsibilities, ongoing training, and information sharing. Safety promotion elements include training programs, communication of critical safety issues, and confidential reporting systems.

Some of the suggested tools for assessing risks under SMS also form the basis of ERM. One of the tools illustrated on the FAA website is a predictive risk matrix that graphically depicts the various levels of severity and likelihood as they relate to the levels of risk (e.g., low, medium, or high). This matrix is shown in Figure 14.

Commercial airports will be focusing on SMS principles and formalizing their processes because they are required to develop SMS implementation plans within 6 to 9 months after publication of the final rule. This provides all airports with a great opportunity to facilitate the introduction of a formal ERM program by identifying the common elements between ERM and SMS and creating a common framework, reducing the administrative burden associated with implementing two processes.

Figure 15 outlines the similarities between ERM and SMS. These similarities represent an opportunity to integrate the two processes. Practical examples of how to integrate include the following:

- Including SMS training as an element in overall ERM training
- Completing hazard identification during the wider identification exercise
- Adapting ERM reporting templates to highlight and track hazard mitigation

6.2 ERM and Strategic Planning/Decision-Making

Many airports have a formal or informal strategic planning process in place. As defined in the recently published *ACRP Report 20: Strategic Planning in the Airport Industry* (2009), strategic planning is defined as the process undertaken by an organization to define its future and formulate a road map to guide the organization from its current state to its vision for the future. Strategic planning is based on the fundamental concept that aspects of an organization's future can be influenced by actions taken in the present. Therefore, strategic planning requires a review

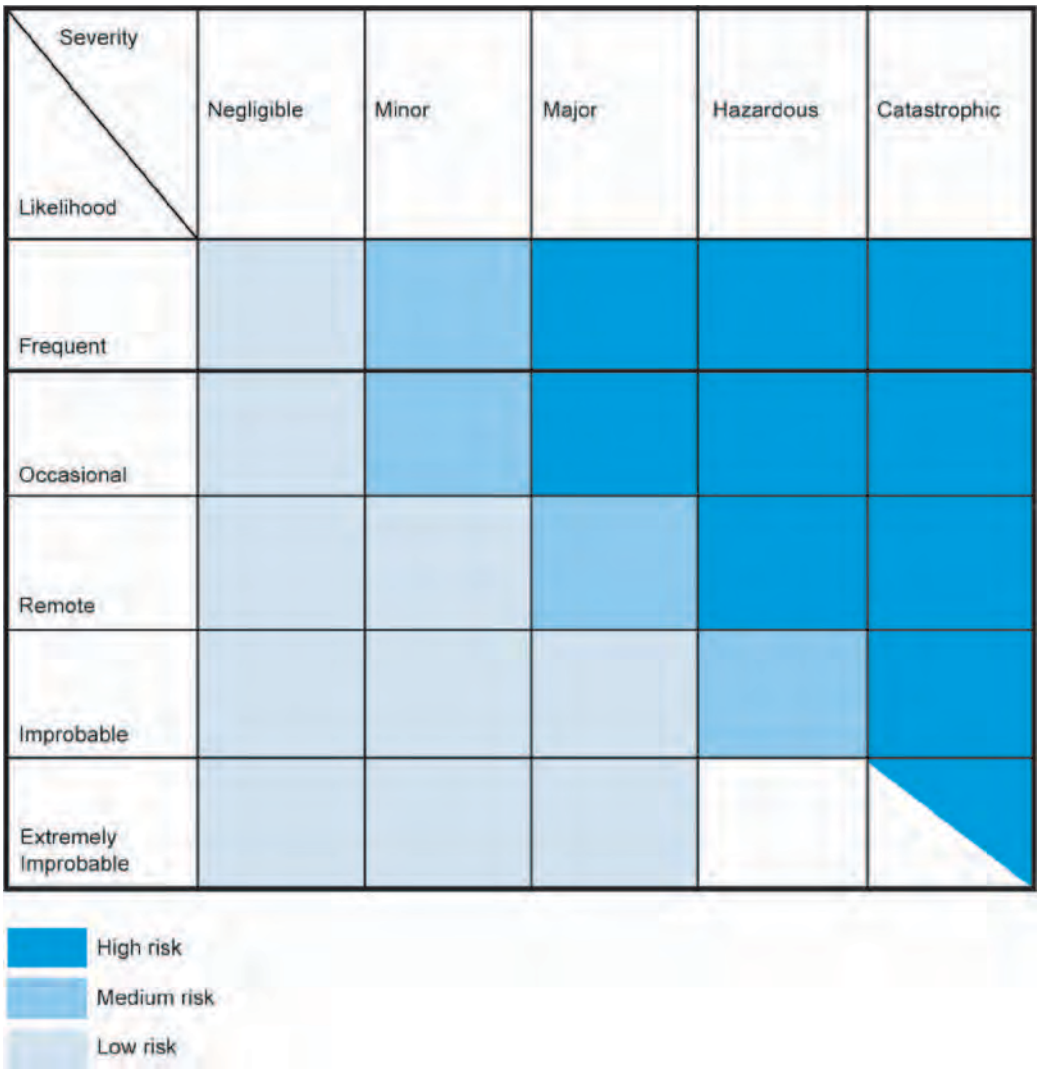


Figure 14. FAA risk matrix.

of existing and potential challenges that an organization is, or may be, facing; development of a vision for how the organization will look in the future; and definition of the steps and actions that must be executed to achieve the organization's vision.

Integrating the ERM and strategic-planning processes will ensure that those risks that may prevent the successful attainment of strategic objectives will be identified, allowing organizations to proactively consider threats and opportunities while determining strategic objectives. The risk assessment and mitigation strategies of ERM can therefore effectively guide the selection of the strategic initiatives and action plans. Integration will also help set the scene for the ERM across the entire organization and establish information flows between those with strategic responsibilities and those with operational responsibilities. Figure 16 demonstrates how one airport has effectively integrated ERM into its strategic plan framework.

An example of how this integration can be implemented would be a requirement that senior management and the board review the strategic plan annually and consider how risk information and strategic planning could be mutually beneficial to the airport, such as:

- How changes in the proposed strategy are expected to impact each of the airport's significant risks.

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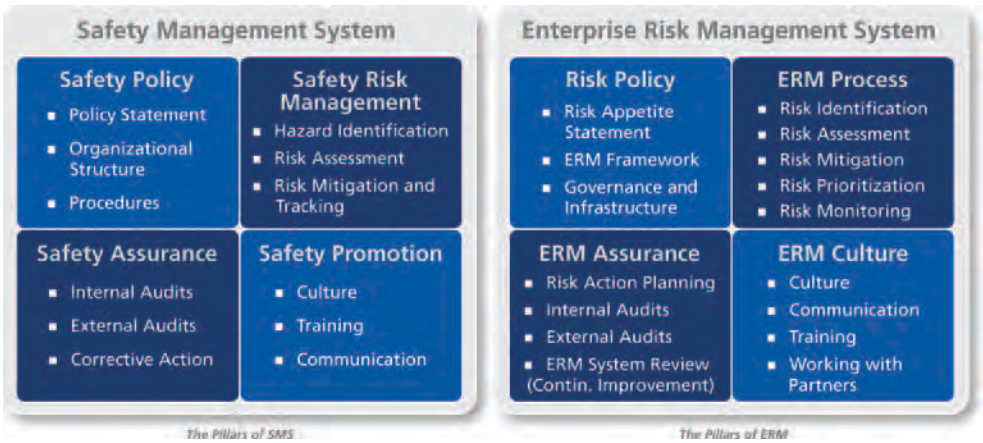

Figure 15. SMS versus ERM.

- If the proposed strategy will result in the airport facing significant emerging risks in the next 5 years.
- How these changes will affect the risk profile of the airport—will it be more or less tolerable?
- Whether the proposed strategy will cause the airport to take on a higher level of risk than it has defined as appropriate in its risk philosophy and risk appetite statements.
- If there are alternate strategic approaches that could be considered that would reduce the risk the airport is assuming.
- The expected reward for the additional risk the airport is assuming.
- Initiatives to reduce the risk profile of the airport and the benefit of these investments to the airport.

Figure 17 illustrates where ERM can be incorporated into the strategic-planning process, as referred to in *ACRP Report 20: Strategic Planning in the Airport Industry* (2009).

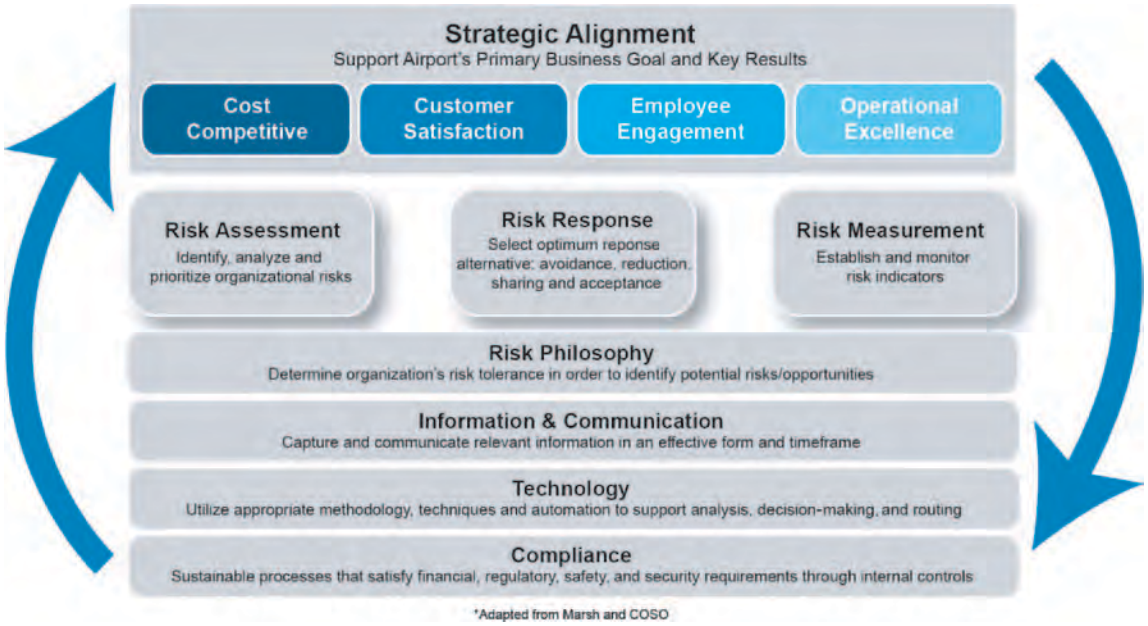

Figure 16. Example ERM and strategy alignment model.

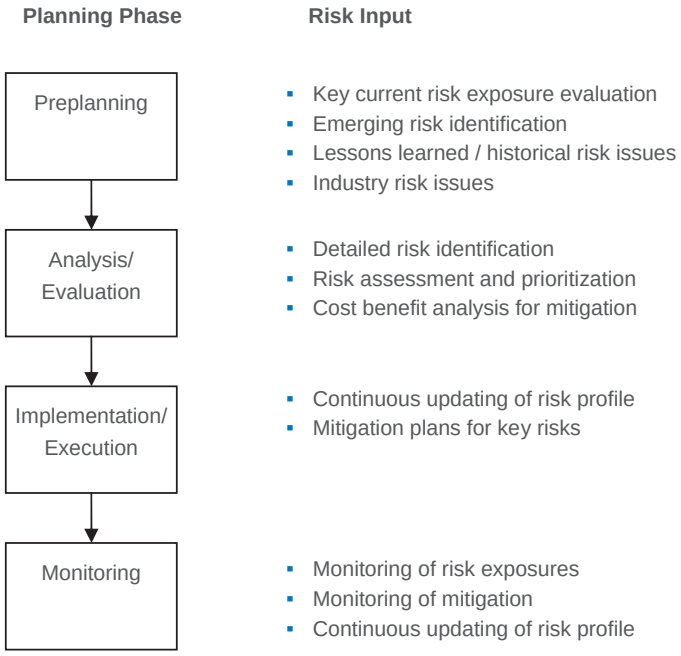

Figure 17. Risk input into strategic planning.

SECTION 7

Continuous Improvement and Sustainability

7.1 Evaluating the Success of ERM Performance

To ensure that the ERM framework continues to be relevant, continuous improvement is essential. Continuous improvement should focus on the ERM strategy and process as well as ERM skills and understanding across the airport.

It can take time to refine ERM and improve methodologies. Regulators and risk management professionals indicate that good practice is to continuously improve the risk management methodologies in line with recommendations from regular assessments and to adapt to changing economic conditions and new opportunities. Key performance indicators (KPIs) can facilitate this assessment by grading progress and achievements.

Each airport will need to develop KPIs that align to its specific objectives for ERM and target level of ERM maturity. Those airports that are interested in a high level of ERM maturity will likely need to develop more challenging KPIs than one aiming for a lower level of maturity. Example KPIs include the following:

- Percentage of staff with ERM responsibilities that have undergone ERM training
- Number of risk identification exercises completed
- Number of ERM communications

For an organization to understand how it is performing overall in risk management, it should benchmark itself against other organizations as well as best practices. Also, organizations should share best practices with one another inside and outside of the aviation industry.

7.2 Staff Development

The knowledge and skills of those engaged with the ERM process need to be kept up-to-date and continuously improved in line with best practice. These skills will vary by role and responsibility, but may include risk identification, project management, recording and reporting information, and communication.

It is important to ensure that processes are in place to identify skills or knowledge gaps and initiate training to address these. Personal development discussions, formal feedback loops, and/or the risk champions may be useful in identifying gaps.

7.3 Hints and Tips to Sustain ERM

It is important that the investment made to implement ERM continues to add value. Table 10 provides some hints and tips to sustaining ERM.

Table 10. Hints and tips to sustain ERM.

Lesson	Comments
1. Put someone in charge who has credibility and clout	▪ Developing and implementing ERM requires a significant investment of time and resources. Be prepared to back this up by having the appropriate person leading the process ▪ The individual should have respect within the airport and the visible support of the CEO and/or board ▪ They should have the authority to make decisions and deploy resources as necessary ▪ They should understand what is required thoroughly, be an engine for change in the organization, and be prepared to follow through
2. Secure and maintain executive support—participation drives buy-in	▪ Without visible support and participation from senior executives, the process will fail ▪ A named process sponsor should be in place and be willing and able to communicate with others about the process ▪ There may be benefit in having a process steering group in place that monitors progress and can work to remove or overcome barriers
3. Engage with the business early and continually	▪ Spend time up front understanding the airport's needs ▪ The ERM process as a whole, its inputs and deliverables, will be a better fit for the airport if the airport departments are involved from the onset and can validate the proposed approach ▪ Involvement of employees will better enable correlated risks to be identified and emerging risks to be spotted ▪ Involve departmental representatives in any technology selection or development process; half of the battle is user acceptance ▪ Agree on the content and format of reports and other deliverables before "going live"
4. Demonstrate the value of ERM throughout	▪ The greatest obstacles will arise if employees perceive no value in the process ▪ Set KPIs to track success ▪ Reinforce the message throughout the project life-cycle. Provide answers to "Why are we doing this? What's the value?" ▪ Develop and present a vision of what the end-state will look like (e.g., fewer losses, greater certainty, strategic positioning)
5. Start simply and be realistic	▪ Have a vision and spend time planning where you want to get to ▪ Start with the things that are simple to implement and easy for departments to understand and perceive value in (e.g., risk identification and mitigation) ▪ Ensure that sufficient time and resources are available ▪ Tailor the approach to existing operations and processes ▪ Do not attempt to go to detailed quantitative analysis if it is not required
6. Use language people can understand	▪ Avoid the use of jargon wherever possible ▪ Use terminology that is consistent with best practices; it will help when communicating outside the organization ▪ Explain all terms used and take time to ensure that they are understood and used consistently across the organization
7. Don't be afraid—it won't be perfect the first time	▪ Make a start; doing something is better than doing nothing ▪ Be realistic in your expectations of early results ▪ Expect that your first results may not be completely accurate ▪ Refine and improve over time
8. Use technology early to get value from the data	▪ Do not make the mistake of letting the technology determine the outcome, but don't avoid the use of technology ▪ It is better to adjust your process somewhat than not use technology at all ▪ Spend time determining what you really need ▪ There are many options and solutions; choose the one that fits best ▪ Use technology to make data gathering more efficient and analysis and reporting more flexible and useful

(continued on next page)

Table 10. (Continued).

Lesson	Comments
9. Make reports simple and easy to understand	▪ Less is more; the marginal value of additional detail declines steeply ▪ Validate the format and content of reports with the people who will use them and customize them for their audience ▪ Deliver information electronically whenever possible ▪ Align risk reports to other business reports whenever possible
10. Keep the process alive; don't let it gather dust	▪ Thick, paper-based reports find a home on the shelf ▪ Follow through on actions relentlessly ▪ Improve the process over time ▪ Keep employees and the board interested ▪ Communication and expectations must travel both up and down the airport hierarchy ▪ Celebrate success

APPENDIX A

Definitions and Acronyms

Definitions

The following terms are used throughout this guidebook:

Audit: The process by which procedures and/or documentation is measured against pre-agreed standards.

Control: Any management action or intervention that reduces the frequency/probability of a risk occurring and/or reduces its impact if it does occur.

Enterprise risk management: A holistic approach and process to identify, prioritize, mitigate, manage, and monitor current and emerging risks in an integrated way across the breadth of the enterprise.

Enterprise risk management framework: A series of key components that collectively provide the ERM principles, concepts, processes, terminology, and direction for the delivery of effective ERM to enable the achievement of key strategic/operational objectives.

Extreme or catastrophic event: An event of immense proportions that has severe consequences, often damaging a large proportion of the organization's assets. A very rare event, which results in an extreme loss greater than an unexpected loss.

Financial impact: An operating expense that occurs following a risk event, which, as a result of the event, cannot be offset by income and directly affects the financial position of the organization. The realization of an unexpected financial loss. Following an opportunity event, the organization may realize a positive financial benefit.

Governance: The system by which organizations are directed and controlled. Boards of directors are responsible for the governance of their organizations. Governance includes the system and structure for defining policies, providing leadership, and managing and coordinating processes and resources to meet an organization's strategic goals.

Hazard: A source of potential harm or a situation with a potential to cause loss.

Health and safety: The process by which the well-being of all employees, contractors, visitors, and the public is safeguarded.

Inherent risk: A possibility that cannot be managed or transferred away that some human activity or natural event will have an adverse effect on the asset(s) of an organization. This is a risk to which an entity is exposed due to the nature of the environment in which it operates.

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Key control indicator: An indicator that is used to help measure the effectiveness of mitigation measures. These indicators can be used to determine whether mitigation is effective and/or adequate.

Likelihood: A measurement of how often an event might occur and how probable it is that the event will occur. Likelihood is often used as a synonym for probability and frequency, especially in a qualitative context where a precise analytical calculation cannot be obtained. Likelihood (assessed as high, medium, or low) can be used in risk assessment as a proxy for probability to assist understanding of the more complex probability measure.

Loss: The negative effect of a risk event, which may be financial (such as loss of cash) or non-financial (such as loss of information or goodwill).

Mitigation: The action of reducing (if not eliminating) the frequency and/or impacts of a risk by use of controls, contingency, insurance, etc.

Opportunity: The positive effect of an event, which may be a financial gain or non-financial, such as enhanced goodwill.

Probability: The extent to which an event is likely to occur during a given period of time (it can be measured mathematically by the ratio of potential/actual events to the whole number of cases). Probability can be defined as how likely an event is to occur, expressed as a number between 0 and 1. A probability of 0 means the event will never occur whereas a probability of 1 means that the event will always occur.

Qualitative assessment: A form of assessment that analyzes the general structures and systems currently in place. A descriptive methodology, which typically involves risk mapping and risk matrices. These assessments do not involve detailed measurements.

Quantitative assessment: A form of assessment that analyzes the actual numbers and values involved. This type of methodology typically applies mathematical and statistical techniques and modeling.

Residual risk: The amount of risk or level of risk impact after the existing control environment has been taken into account. Also referred to as net risk.

Risk: Risks are uncertain future events that may influence an organization's ability to achieve its objectives. The term "risk" can be used in three distinct applications:

- *Risk as exposure:* The most common definition of the term. Most people refer to potential negative events such as financial loss, fraud, lawsuits, or threats to meeting objectives as "risks." In this context, risk management means reducing the probability of a negative event without incurring excessive costs.
- *Risk as uncertainty:* The distribution of all possible outcomes, both positive and negative. In this context, risk management seeks to reduce the variance between anticipated outcomes and actual results.
- *Risk as opportunity:* This is implicit in the concept that a relationship exists between risk and return. The greater the risk, the greater the potential return, and, necessarily, the greater the potential for loss. In this context, managing risk means using techniques to maximize the upside of uncertainty within the constraints of a current operating environment.

Risk appetite: The amount of risk, on a broad level, an entity is willing to accept in pursuit of value. Risk appetite reflects the enterprise's risk management philosophy and, in turn, influences the entity's culture and operating style.

Risk causes: A factor that makes it more probable that a risk event or opportunity may occur and/or can increase the severity of a risk impact.

Risk identification: The process of identifying what events, losses, and opportunities can happen; why they might happen; and how.

Risk impact: The effect(s) of a risk event, for example financial loss, service failure, reputational damage, people/staff dissatisfaction, regulatory/legal non-compliance, and client relationship damage. For opportunities, the effect(s) of the event could include financial gain, service enhancement, and competitive advantage.

Risk perception: An individual's subjective view of risks and opportunities. This view can vary significantly due to differences in assumptions and concepts and the needs, issues, and concerns of stakeholders as they relate to the risks or issues under discussion. People tend to naturally lean toward being risk takers or being risk averse.

Risk prioritization: The ordering of risks and opportunities into priority order.

Risk register: A basic, ongoing working document that captures and describes risks and opportunities as they are identified together with risk accountabilities, actions where required, and review and completion dates.

Risk reporting: The provision of relevant, accurate, and timely risk/opportunity information to an organization's decision makers to provide a picture of the current state/potential future state of the enterprise.

Risk tolerance: Risk tolerance is a calculation based on the financial strength of the organization that indicates how much money the organization can lose before its key performance indicators are affected. While financial measures are quite common, risk tolerance can also be articulated in non-financial measures such as media exposure, downtime, and compliance levels.

Risk transfer: A series of techniques describing the various means of addressing risk through insurance and similar products. This includes recent developments such as the securitization of risk and creation of, for example, catastrophe bonds.

Risk treatment: The selection and implementation of relevant options for managing risk. There are five key treatments; accept, exploit, avoid, mitigate, and transfer.

Stakeholder: An individual, group, or organization that can affect, be affected by, or perceive itself to be affected by a risk. Stakeholders can include customers, shareholders, employees, suppliers, bankers, community groups, unions, etc.

Acronyms

AIRMIC	Association of Insurance and Risk Managers in Commerce
ALARM	The Public Risk Management Association
BCM	Business Continuity Management
CEO	Chief Executive Officer
CFO	Chief Financial Officer
COSO	Committee of Sponsoring Organizations of the Treadway Commission
ERM	Enterprise Risk Management

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FERMA	Federation of European Risk Management Associations
IEC	International Electrotechnical Commission
IRM	Institute of Risk Management
ISO	International Organization for Standardization
KCI	Key Control Indicator
KPI	Key Performance Indicator
KRI	Key Risk Indicator
PDCA	Plan-Do-Check-Act
RIMS	Risk and Insurance Management Society
RMIS	Risk Management Information System
SMS	Safety Management System
SOX	Sarbanes-Oxley
SRM	Safety Risk Management

APPENDIX B

Example Maturity Model

	Level 1 Undeveloped	Level 2 Formalized	Level 3 Established	Level 4 Embedded	Level 5 Optimized
Governance and Infrastructure	▪ An ERM plan does not exist for the airport ▪ Responsibility for ERM has not been established ▪ No provision for ERM activity in the budget ▪ No review of the effectiveness of any ERM activity ▪ No improvement process for ERM	▪ ERM policy and procedures in place and signed off on by senior management ▪ Risk reviews are scheduled for each main department ▪ Risk coordinators are formally identified ▪ Irregular updates on effectiveness of ERM (response optional) ▪ Accountability and authority for ERM is formalized ▪ Benefits of ERM have been communicated	▪ The airport has documented the methodology for ERM within departmental plans and activity ▪ The benefits of ERM have been communicated ▪ A risk committee has been established ▪ Risk coordinators have the skills, training, and resources to deliver on ERM expectation ▪ Board formally receives updates on the effectiveness of ERM ▪ ERM aligned and coordinated across all risk activities (e.g., SMS, insurance, crisis management, key projects) ▪ BCM program in place that works in conjunction with ERM policy and department ▪ Airport risk register is in place and signed off on by board	▪ ERM policy and procedures conform with and are referenced by other local management processes (e.g., a Project Management Plan) ▪ A formal ERM analysis is required on all airport projects as part of the initial estimation/ approval process ▪ The ERM process is fully integrated with all business processes (e.g., strategic planning [business plan], and budgeting) ▪ The board and the risk committee receive formal annual reports on the effectiveness of the ERM framework, usually delivered by Internal Audit or a 3rd party (based on set review criteria aligned to the ERM policy and ERM plan)	▪ An effective "three lines of defense" model is in place and fully integrated with all business processes. This is a best-practice approach to ensuring that those responsible for taking risk are supported and enabled to manage risk (1st line) through collation and analytics (2nd line) and independent assurance (3rd line)

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	Level 1 Undeveloped	Level 2 Formalized	Level 3 Established	Level 4 Embedded	Level 5 Optimized
Identification and Prioritization	▪ Risks are not formally captured ▪ Assessment (if performed) may not use a scoring scheme or may use inconsistent variables ▪ No defined measure of risk appetite	▪ Risk registers conform to an agreed format ▪ Alternative methods for risk identification are considered when planning risk identification sessions ▪ The sources of knowledge to be used during risk identification are clearly identified (i.e., lessons learned logs, keywords, Hazard Identification Prompt Lists, and external functions/ experts) ▪ A qualitative assessment is carried out using a consistent, defined, scoring scheme ▪ Risk appetite is defined	▪ Risks are categorized ▪ Risk owners are allocated for each risk ▪ The ERM policy and procedures document multiple risk scoring criteria and describe how risks will be assessed in terms of probability and the multiple impact(s) ▪ Risk maps are used to illustrate assessment results ▪ Risks are centrally consolidated/ aggregated and challenge provided where appropriate ▪ Emerging risks are formally considered and evaluated	▪ A team-based approach is used to identify risks ▪ Risk identification exercises conducted outside regular schedule (in event of major changes) ▪ All employees know who to report an emerging risk to should one become apparent ▪ Risk quantification takes into effect the impact on other parts of the airport	▪ The risks of not pursuing opportunities are captured during the risk identification exercise. A risk assessment process is in place (developed and documented) that informs senior decision making (e.g., investments) ▪ The assessment process includes advanced procedures for quantifying risks (methodologies such as range predictions, simulation tools, and decision trees)
Risk Treatment	▪ Any risks identified are unlikely to have treatment specified, funded, or tracked to completion	▪ Risk owners clearly defined and supported ▪ All key risks have associated response plans ▪ Control effectiveness is formally assessed	▪ Risk treatment is planned and monitored ▪ Assessment of effectiveness of proposed treatment is performed (e.g., cost-benefit analysis, Delphi style workshop)	▪ The airport has specific financial provisions to cover contingency (fallback) plans and risk treatment strategies ▪ The board understands contingency (fallback) actions for key risks ▪ The allocation of funds for risk treatment is aligned with management priorities and decisions	▪ The risk treatment process is fully integrated with cost management, finance/ accounting, and strategic planning processes ▪ Cross airport treatment plans are developed and coordinated

	Level 1 Undeveloped	Level 2 Formalized	Level 3 Established	Level 4 Embedded	Level 5 Optimized
Reporting	▪ There is no formal process for key risk reviews ▪ Management reports are sporadic and/or ad hoc and are often incomplete or inaccurate ▪ There are no formal risk escalation procedures/ processes in place ▪ There is no airport-wide communication on ERM	▪ Departmental risk reporting and dashboards ▪ The risk register is reviewed and updated in accordance with the ERM policy and procedures ▪ There is a formal mechanism for escalating and aggregating risks ▪ Each risk response has a target completion date that is actively and routinely tracked ▪ Those individuals with ERM responsibilities are regularly provided with ERM communications	▪ There is a defined process to review and report risk status and key risk indicators (KRIs), using standard reports to key stakeholders up and down the airport hierarchy ▪ Creation of risk dashboard ▪ Regular communication on "risk status" is distributed to key stakeholders and interested parties as defined in the ERM policy and procedures ▪ Alignment between ERM and internal audit process ▪ Risk Management Information System (RMIS) that allows consolidation	▪ ERM is a standing agenda item in senior management meetings and discussion is documented ▪ Risks and risk treatment actions are actively and routinely tracked and financial provisioning is adjusted as risks expire ▪ There is a formal ERM communication plan that addresses both internal and external communication requirements, ERM process and output inform annual internal audit plan (risk-based audit) ▪ Regular testing and documentation of crisis management plans aligned to key risks	▪ Leading KRIs are developed for each key risk ▪ The risk control system is fully integrated with the airport's control systems, monitoring programs, and management processes ▪ Where losses occur or there are audit findings, associated risk assessments and KRIs are adjusted and publishing "lessons learned"
Risk Culture	▪ ERM training has not been provided to any employee	▪ ERM training is provided to those with responsibility for ERM ▪ ERM policy and procedures are formally documented ▪ ERM is owned at department	▪ Tailored ERM training is proactively provided to all individuals ▪ ERM guidance (manuals, policies/ procedures) readily available to all employees	▪ ERM training, relevant to their role, is embedded in the personal development plans of relevant individuals ▪ ERM performance	▪ Systematic feedback on ERM effectiveness including metrics, behavioral attributes, and overall process

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	Level 1 Undeveloped	Level 2 Formalized	Level 3 Established	Level 4 Embedded	Level 5 Optimized
		level	(e.g., on intranet)	indicators are included in personal goals ▪ Development of open, challenging, and learning-based risk culture	
Managing Partnerships	▪ The airport's ERM does not extend to working with other external airports	▪ Definition of partnership agreed on and risk register in place	▪ Airport partners are required to provide evidence of health and safety, environmental, and corporate ERM prior to contract (part of standard procurement process) ▪ Risks arising out of working with specific partners are identified and managed	▪ ERM is undertaken by all stakeholders in all partnerships ▪ Joined up treatment plans are developed and coordinated with key external organizations where appropriate	▪ All major contracts, joint ventures, and partnerships are risk profiled, based upon a standard process, prior to contract to ensure that responsibility for key risks is apportioned properly

APPENDIX C

Electronic Tool: User Instructions

Please ensure macros are enabled every time you use the risk register. The process for this varies depending on the version of Excel you use. You need to select the "Enable Macros" button that pops up when you first open the risk register.

While the information within this electronic tool can be altered, amended, and added to, the structure should not be changed as this will disrupt the functionality of the tool. Please do not alter sheet names, rows, and columns.

The front "Title Page" sheet provides contents buttons for easy navigation throughout the tool. Click on the contents buttons to access the appropriate sheet. To go back to the front "Title Page" sheet, click on the "Back to Title Page" link at the top of each sheet.

Three separate electronic tools are provided. The differences are based on the risk assessment criteria that your organization decides to apply:

- If you decide to use a 4 × 4 risk assessment scale, use the 4 × 4 electronic tool
- If you decide to use a 5 × 5 risk assessment scale, use the 5 × 5 electronic tool
- If you decide to use a 6 × 6 risk assessment scale, use the 6 × 6 electronic tool

Please note that using a 4 × 4 risk assessment scale means that you have decided to assess the impact of the risk using a 1–4 numbered scale and the likelihood using a 1–4 numbered scale. A 5 × 5 risk assessment scale means a 1–5 numbered scale for both impact and likelihood has been applied, and a 6 × 6 risk assessment scale indicates that a 1–6 numbered scale has been applied.

Initial Set Up

If you are using this tool in Excel 2007 or higher, then please do not change the file type when saving—make sure the file is saved as an "Excel 97–2003 Workbook (xls)." A message may appear highlighting differences between the two versions of Excel; you can safely ignore this error. Click "Continue" at this point.

There are a couple of steps to complete the first time you open the risk register:

- Insert the name of your Airport/Department where you see [Insert Airport]
- Titles
  - When the risk register is opened, if the name of the Airport/Department is blank, you will be prompted to enter the name
  - To change the name, click on the "Set Register Title" button on the "Title Page" sheet
- Assessment Criteria
  - Use the guidance in Section 4.2.1 to develop your assessment criteria and enter it in the assessment criteria section of the electronic tool

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– Depending on what electronic tool you have used (4 × 4, 5 × 5, or 6 × 6) the assessment criteria sheet will provide you with the relevant template to enter your assessment criteria. Add where indicated with [Insert].

Using the Tool

1. Risk Register

Entering Information

The risk register is where you enter most of the information obtained through the ERM process. (Scale references below apply to the 5 × 5 tool.)

- **Risk Number:** This is a numerical ID allocated for each risk. Every risk should be given a unique *number* and *not a letter or symbol*.
- **Risk ID:** This is an alphabetical reference that will be used to illustrate risks on the risk map. Every risk should be given a unique Risk ID. Once all letters have been used, start a second set of the alphabet, e.g. A2, B2, C2. Please note: only each risk, not every cause and consequence, should be allocated a Risk Number and Risk ID.
- **Risk:** Record the risk in this column.
- **Causes:** Record the risk causes in this column; record all causes in the same cell.
- **Consequences:** Record the risk consequences in this column; record all consequences in the same cell.
- **Risk Owner:** Record the name of the risk owner in this column.
- **Risk Category:** Record the risk category in this column.
- **Inherent Impact:** Record the inherent risk impact score in this column, using the Impact Assessment Criteria. You will only be able to record a number between 1 and 5.
- **Inherent Likelihood:** Record the inherent risk likelihood score in this column, using the Likelihood Assessment Criteria. You will only be able to record a number between 1 and 5.
- **Inherent Risk Score:** This will be automatically calculated. Do not enter any data in this column.
- **Current Controls:** Record the controls that are in place to mitigate the risk.
- **Control Assessment:** Use the drop-down menu to assess whether the effectiveness of the current controls is considered poor, average, or good. Use the Control Assessment Criteria to guide this.
- **Residual Impact:** Record the residual risk impact score in this column, using the Impact Assessment Criteria. You will only be able to record a number between 1 and 5.
- **Residual Likelihood:** Record the residual risk likelihood score in this column, using the Likelihood Assessment Criteria. You will only be able to record a number between 1 and 5.
- **Residual Risk Score:** This will be automatically calculated. Do not enter any data in this column.

Sorting Data

Buttons are provided at the top of certain columns to sort the data. The headers of these columns are in blue. If you click on a header, it will sort the risk register by that column.

Colors are assigned to the risk score columns. If you would like to change the range of numbers that each color is aligned to:

- Go to "Tools" in the toolbar, "Protection" in the list, and click "Unprotect Sheet" (In Excel 2007 and 2010, go to "Review" in the toolbar and click on "Unprotect Sheet")
- Enter the word "fred" when prompted for a password
- Go to the conditional formatting section (usually found under "Format" in the toolbar) (In Excel 2007 and 2010, found under "Home" in the toolbar)
- Change the numbers/format as required

Creating/Deleting Risk Response Plans

The tool can automatically create risk response plans for each recorded risk. Every time risks are added/deleted click on the "Create/Delete Risk Response Plans" button. Please note that the button will not work if there are no risks in the system.

If you would like to access one of the risk response plans, click on "Go to Risk Response Plan" button and enter the number of the risk that you wish to view the plan for. You will be taken to the Risk Response Plan (see Section 4.6) for an explanation of how to complete this. Once created, you can also access risk response plans via the "Risk Response Plans" button on the "Title Page" sheet.

2. Risk Map

There are two risk maps in the electronic tool: one to illustrate the inherent risk profile and one to illustrate the residual risk profile. These will automatically populate when the risk score is calculated in the "Risk Register" sheet.

3. Risk Response Plan

You should create risk response plans for all recorded risks. Much of the information in the "Risk Response Plans" is automatically populated from the information recorded in the "Risk Register" sheet. Additional information required is highlighted by a red border and includes the following:

- **Review Period:** Select how often the Risk Response Plan should be reviewed.
- **Additional Response Required:** Record additional responses that are required.
- **Priority:** Use the drop-down menu to select whether the priority of this additional response is high, medium, or low.
- **Person Responsible:** Insert the name of the individual responsible for completing the additional response.
- **Target Completion:** Enter the date that the additional response should be completed.
- **Last Review Date:** Insert the date that the Risk Response Plan was last reviewed.

If you would like to delete a response plan, delete the risk itself (on the Risk Register) and then press the button "create/delete risk response plans." A pop-up box will appear saying "do you want to delete the response plan?"

Saving Data

Please note that while the information within the electronic tool can be altered, amended, and added to, the structure should not be changed as this will disrupt the functionality of the tool. Please do not alter sheet names, rows, and columns.

Saving data as you continue through the process is critical to ensure that they are not lost. To ensure version control, please use the "save as" function to save the document to the appropriate date each time changes are made. Original tools were developed in Excel 2003 format; the option to save as an "Excel 97–2003 Workbook" will retain the original formatting. For users of Excel 2007 or Excel 2010, the option to save as "Excel Macro-Enabled Workbook (*.xlsm)" should be selected. Saving as a macro-free workbook will permanently disable some of the functionality of the tool.

Abbreviations and acronyms used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation