

Doc 9968



# Report on Environmental Management System (EMS) Practices in the Aviation Sector

---

Approved by the Secretary General  
and published under his authority

First Edition — 2012

International Civil Aviation Organization



**Doc 9968**



# **Report on Environmental Management System (EMS) Practices in the Aviation Sector**

---

**Approved by the Secretary General  
and published under his authority**

**First Edition — 2012**

**International Civil Aviation Organization**

Published in separate English, Arabic, Chinese, French, Russian  
and Spanish editions by the  
INTERNATIONAL CIVIL AVIATION ORGANIZATION  
999 University Street, Montréal, Quebec, Canada H3C 5H7

For ordering information and for a complete listing of sales agents  
and booksellers, please go to the ICAO website at [www.icao.int](http://www.icao.int)

**Doc 9968, *Report on Environmental Management System (EMS)  
Practices in the Aviation Sector***

Order Number: 9968

ISBN 978-92-9231-834-5

© ICAO 2012

All rights reserved. No part of this publication may be reproduced, stored in a  
retrieval system or transmitted in any form or by any means, without prior  
permission in writing from the International Civil Aviation Organization.





# TABLE OF CONTENTS

|  | <i>Page</i>  |
|--|--------------|
| <b>Executive summary</b> .....                                   | <b>(vii)</b> |
| <b>Acronyms</b> .....  | <b>(ix)</b>  |
| <b>Chapter 1. Introduction</b> .....                             | <b>1-1</b>   |
| 1.1. Background.....   | 1-1          |
| 1.2. Methodology.....  | 1-2          |
| 1.3. Questionnaire data.....                                     | 1-3          |
| 1.4. Introduction to EMS.....                                    | 1-4          |
| <b>Chapter 2. Questionnaire participation</b> .....              | <b>2-1</b>   |
| 2.1. Introduction.....   | 2-1          |
| 2.2. Sector characterization.....                                | 2-1          |
| <b>Chapter 3. Environmental management drivers</b> .....         | <b>3-1</b>   |
| 3.1. Introduction.....   | 3-1          |
| 3.2. Priority environmental issues or impacts.....               | 3-1          |
| <b>Chapter 4. Approaches to environmental management</b> .....   | <b>4-1</b>   |
| 4.1. Introduction.....   | 4-1          |
| 4.2. Application of EMS standards or guidelines.....             | 4-1          |
| 4.3. Scope of EMS.....   | 4-3          |
| 4.4. Other management systems in place.....                      | 4-4          |
| <b>Chapter 5. Performance monitoring and communication</b> ..... | <b>5-1</b>   |
| 5.1. Introduction.....   | 5-1          |
| 5.2. Performance monitoring.....                                 | 5-1          |
| 5.3. Communication methods.....                                  | 5-2          |

|   | <b>Page</b> |
|---|-------------|
| <b>Chapter 6. Implementation and maintenance .....</b>    | <b>6-1</b>  |
| 6.1. Introduction .....                                   | 6-1         |
| 6.2. EMS implementation .....                             | 6-1         |
| 6.3. EMS maintenance .....                                | 6-4         |
| <b>Chapter 7. Benefits and challenges .....</b>           | <b>7-1</b>  |
| 7.1. Introduction .....                                   | 7-1         |
| 7.2. Implementation challenges .....                      | 7-1         |
| 7.3. Benefits of EMS implementation .....                 | 7-1         |
| 7.4. Trade-off analysis .....                             | 7-1         |
| <b>Chapter 8. Organizations without an EMS.....</b>       | <b>8-1</b>  |
| 8.1. Introduction .....                                   | 8-1         |
| 8.2. Environmental programme elements or principles ..... | 8-1         |
| 8.3. Performance monitoring.....                          | 8-4         |
| 8.4. Communication methods .....                          | 8-9         |
| 8.5. EMS application and development issues .....         | 8-10        |
| <b>Chapter 9. Recommendations .....</b>                   | <b>9-1</b>  |
| <b>Chapter 10. Conclusion .....</b>                       | <b>10-1</b> |
| <b>Appendix. References .....</b>                         | <b>A-1</b>  |

---

## EXECUTIVE SUMMARY

Pressure on the aviation industry to balance increasing global demands in air travel with environmental protection is at an all time high. Therefore, an effective approach to sustain operations and meet future environmental requirements is critical. The International Civil Aviation Organization's (ICAO's) Committee on Aviation Environmental Protection (CAEP) is the international forum of expertise for the study and development of proposals to minimize the impact of aviation on the environment.

At the seventh meeting of CAEP (CAEP/7) in February 2007, the Land Use Planning and Noise Management Task Group (TG) was asked to deliver a report at the eighth meeting of CAEP (CAEP/8) in February 2010 on the use of environmental management systems (EMSs) and, as appropriate, make recommendations on how the committee could promote the use of EMS within the aviation system. In response, the TG developed an industry questionnaire to learn more about the application and potential value of EMS to aviation organizations. The questionnaire and accompanying State letter were distributed worldwide by Member States and international representative organizations in May 2008. Approximately 326 organizations responded to the questionnaire and were categorized into five different sectors, including air navigation services providers (ANSPs), airlines, airports, manufacturers and other aviation organizations. After validating the data, information from 233 responses formed the basis of this report to CAEP/8 and supported the development of recommendations.

Approximately 50 per cent of questionnaire respondents (117) applied EMS standards or guidelines, with the majority having an ISO 14001:2004 certified EMS in place. The remaining 116 respondents had other environmental programmes with many of the same principles and practices that are required as part of a formal EMS. For those organizations with an EMS, 82 per cent had additional management systems—approximately 51 per cent of these additional systems were integrated or coordinated with the organization's EMS. Over the past ten years, EMS implementation has been relatively consistent in the aviation industry. Respondents indicated that 6 to 12 months on average were needed to successfully develop and implement an EMS. Approximately 71 per cent had assistance with EMS implementation from a consulting or contracting firm.

Regardless of whether the respondent organization had an EMS, measuring environmental performance was important for ensuring compliance. On average, the majority of respondents communicated environmental performance through a corporate social responsibility (CSR) report or through their organization's website. Seventy-nine respondent organizations without an EMS plan to implement one in the future. Their most common reason for not implementing an EMS was unfamiliarity with EMS approaches, and as a result, they requested aviation industry specific EMS implementation guidance.

The information provided by respondents formed the basis of two recommendations which focused on increasing awareness of EMS principles and best practices in the aviation sector and establishing practical guidance to assist those organizations that choose to use EMS to enhance their management of environmental issues. Awareness and guidance materials should integrate existing ICAO environmental tools, guidelines and manuals. Where possible, they should encourage organizations to support higher-level ICAO environmental objectives, consider the collaborative nature of the aviation industry, and account for variance in operation type (i.e. sector type) and the level of EMS maturity at the organization.

**Recommendations**

**Disseminate report information.** Within the first year of the CAEP/9 cycle, ICAO should make the information contained in this report publicly available. A report should be distributed specifically to CAEP States and observers and to all survey respondents.

**Develop EMS guidance.** Stand-alone EMS guidance should be developed for the end of the CAEP/9 cycle to assist organizations to determine how EMS elements and principles can be used to enhance the way they manage environmental issues, and provide practical guidance on how these EMS elements and principles can be implemented/integrated into existing management systems and business processes.

---

## ACRONYMS

|        |   |
|--------|---|
| ACI    | Airports Council International  |
| ANSP   | Air navigation services provider  |
| CAEP   | Committee on Aviation Environmental Protection                          |
| CSR    | Corporate social responsibility   |
| CANSO  | Civil Air Navigation Services Organisation                              |
| EMAS   | Eco-management audit scheme   |
| EMS    | Environmental management system   |
| FAA    | Federal Aviation Administration   |
| IATA   | International Air Transport Association                                 |
| ICCAIA | International Coordinating Council of Aerospace Industries Associations |
| ISO    | International Organization for Standardization                          |
| O&M    | Operation and maintenance   |
| SMS    | Safety management system  |
| TG     | Task group  |
| QMS    | Quality management system   |

### Abbreviation

|     |                      |
|-----|----------------------|
| USD | United States dollar |
|-----|----------------------|

---



# Chapter 1

## INTRODUCTION

### 1.1 BACKGROUND

1.1.1 Global demand for air travel is estimated to increase significantly in the future. While the benefits of this growth will be substantial, it is likely to be accompanied by an increase in aviation-related environmental impacts. Local air quality, ambient noise levels, water quality, energy use and climate change are some of the most prominent impacts of concern. Pressure on the aviation industry to balance increasing demand with environmental protection is at an all-time high. Therefore, an effective approach to sustain operations and meet future environmental requirements is critical. Identifying the significant environmental impacts of aviation and effectively managing these impacts efficiently through the use of technology, procedures and policy is likely to play an important role in the sustainable growth of the aviation industry.

#### ICAO and the environment

1.1.2 ICAO is a specialized agency of the United Nations created in 1944 to promote the safe and orderly development of global air transport. ICAO's work on the environment focuses primarily on those problems that benefit most from a common and coordinated approach on a worldwide basis, namely, aircraft noise and engine emissions. The following environmental goals have been established by ICAO:

- a) limit or reduce the number of people affected by significant aircraft noise;
- b) limit or reduce the adverse impact of aviation emissions on local air quality; and
- c) limit or reduce the impact of aviation greenhouse gas emissions on the global climate.

1.1.3 ICAO's Committee on Aviation Environmental Protection (CAEP) is the international forum of expertise for the study and development of proposals to minimize the impact of aviation on the environment. Its membership consists of experts from ICAO Member States and observer organizations, including intergovernmental and non-governmental organizations representing the aviation industry and environmental interests. CAEP is responsible for conducting studies and recommending measures to minimize and reduce aviation's impact on the environment, and for maintaining certification Standards for aircraft noise and aircraft engine emissions. Recommendations made by CAEP are reviewed and adopted by the ICAO Council. The Council reports to the ICAO Assembly where the main policies on aviation environmental protection are defined and translated into Assembly Resolutions.

1.1.4 Since its creation in 1983, the role of CAEP has progressively expanded from one of setting basic standards to the development of broad policy measures, such as the balanced approach to limit or reduce the impact of aircraft noise, and the creation of market-based measures to handle noise and emissions charges and emissions trading. In order to achieve a greater understanding of the environmental impacts of aviation, CAEP encourages research through the collection, generation, analysis, harmonization, exchange, and dissemination of information related to aviation environmental issues. CAEP's work often results in published reports, guidance material, and/or specific studies.

### **CAEP/8 EMS task**

1.1.5 An environmental management system (EMS) provides a methodology and framework to systemically identify and cost-effectively manage significant environmental aspects of aviation organizations' operations and have proven effective across a wide range of organizations, including airports, air carriers, manufacturers and government agencies. As a result, international recognition of the potential value of EMS as a tool to help aviation organizations manage their environmental issues is increasing. ICAO wanted to further understand the application of EMS by aviation organizations, encourage implementation to help them overcome environmental challenges and better use environmental opportunities.

1.1.6 At the seventh meeting of CAEP (CAEP/7) in February 2007, the Land Use Planning and Noise Management Task Group (TG) was asked to deliver a report to the eighth meeting of CAEP (CAEP/8) in February 2010 providing information on the use of EMS and, as appropriate, make recommendations on how the committee could promote the use of EMS within the aviation system. In response, the TG formed an ad hoc working group to perform the task and proposed a questionnaire to gather information for the report. The United States Federal Aviation Administration (FAA) agreed to lead the effort, and an ad hoc working group was formed with representatives from Transport Canada, Italy, International Coordinating Council of Aerospace Industries Associations (ICCAIA), International Air Transport Association (IATA) and Airports Council International (ACI).

1.1.7 The CAEP/8 EMS task was to:

- a) deliver a report providing information on the use of EMS among airports, airlines and air navigation providers in order to give a base of understanding in the aviation sector; and
- b) based on the report, as appropriate, make recommendations on how the committee could promote the use of EMS within the aviation sector.

## **1.2 METHODOLOGY**

1.2.1 The TG developed an industry questionnaire based widely on input from members of the working group to gain an understanding of environmental management practices in the aviation sector. This questionnaire was divided into eight sections that sought understand the responding organizations and their environmental management practices by inquiring about the following:

- a) environmental management drivers;
- b) approach to environmental management;
- c) performance monitoring and communication methods;
- d) resources required for implementation and maintenance; and
- e) lessons learned.

1.2.2 The questionnaire and accompanying State letter were approved by the ICAO Secretary General on 16 May 2008 and distributed worldwide by Member States and \*international representative organizations. Approximately 326 organizations responded to the questionnaire over a six-month period.

1.2.3 Following validation, individual sector data were forwarded to the appropriate international representative organization so a summary analysis could be conducted to characterize the respondents in a given sector. After the response data were validated and characterized, data from the remaining 233 responses were analysed and formed the basis of the report to CAEP/8.

### 1.3 QUESTIONNAIRE DATA

1.3.1 As a result of the number and range of organizations from different States that responded to the questionnaire, variation in the data exists. Common inconsistencies included the submission of partially completed surveys; multiple different responses from the same organization; and responses to both question sets, i.e. those for organizations with an EMS and those for organizations without an EMS. It was critical that the data be as consistent as possible for a strong informative analysis. Therefore, the TG developed resolutions on how common inconsistencies should be addressed prior to analysis as follows:

- a) delete those responses from the data set that provided no information on the organization's environmental management practices;
- b) delete those responses from the data set that were duplicate;
- c) request clarification from international representative organizations for responses that were from the same organization but not duplicate;
- d) review data specifically by sector to see what can be done about inconsistent financial figures;
- e) request clarification from the international representative organizations or respondents for those responses that claimed they do not apply EMS standards/guidelines, but completed both sets of questionnaires, i.e. those for organizations with an EMS and those without one;
- f) delete the completed data set from organizations without an EMS that claimed to have one and who completed the question set for organizations with an EMS;
- g) change the organization's response to the question regarding whether or not they had an EMS to reflect the question set that they answered; and
- h) delete those responses from the data set that did not provide sufficient information on the organization to validate an accurate response.

1.3.2 Of the 326 responses received, approximately 93 were not considered for analysis as a result of the agreed upon resolutions. The remaining 233 responses formed the basis of the report to CAEP/8 and supported the development of recommendations.

---

\* Four sectors, namely, air navigation services providers (ANSPs), airports, airlines and manufacturers, participated in the survey through their relevant representative associations, e.g. Civil Air Navigation Services Organisation (CANSO), ACI, IATA and ICCAIA. Throughout the document, "international representative organizations" will be used to refer to the group.

1.3.3 In addition to variation in the data, it should be noted that the questionnaire respondents did not make up a random sample. The questionnaire and State letter that was distributed to international representative organizations and States encouraged the participation of all organizations in the aviation sector. However, since participation was voluntary, those organizations who responded were more likely to have an environmental programme in place. As a result, the sample of respondents is not representative of the aviation industry as a whole.

## 1.4 INTRODUCTION TO EMS

1.4.1 As one of the most environmentally friendly forms of transportation, aviation organizations are increasingly using an EMS among other approaches to meet their environmental challenges. A formal definition of EMS, developed by Transport Canada, is as follows:

*... A systematic approach for organizations to bring environmental considerations into decision-making and day-to-day operations. It also establishes a system for tracking, evaluating and communicating environmental performance. An EMS helps ensure that major environmental risks and liabilities are identified, minimized and managed. ...*

1.4.2 Formal EMSs emerged in the early 1990s to provide organizations with a proactive, systematic approach for managing the potential environmental consequences of their operations. Such systems have been widely adopted by industry and government and have been effective at improving an organization's regulatory compliance and environmental performance. Although several recognized EMS frameworks exist, most are based on the International Organization for Standardization's (ISO's) ISO 14001:2004 EMS standard, illustrated in Figure 1-1. The elements contained in this figure are described as follows:

- a) **Environmental policy.** The organization establishes an environmental policy which provides an overarching vision and framework for environmental management at the organization;
- b) **Planning.** The organization identifies how its operations might harm the environment and develops objectives, targets and programmes to reduce this harm;
- c) **Implementation and operation.** The organization implements the systemic measures to control operations and reduce environmental impacts across all levels and functions of its operations;
- d) **Checking.** The organization assesses its environmental performance and the effectiveness of its management system elements;
- e) **Management review.** Based on its assessment of the implemented systemic measures, the organization undertakes actions to make system adjustments and promote continual improvement. EMS continually moves through this cycle, fine-tuning the management of those operations that harm the environment. This "continual improvement cycle" is a fundamental characteristic of EMS; it allows the system to adapt to the dynamic nature of the organization's operations and external conditions; and
- f) **Continual improvement.** It is the process by which the organization refines its EMS and improves its environmental performance based on feedback that is received through monitoring and assessment processes.

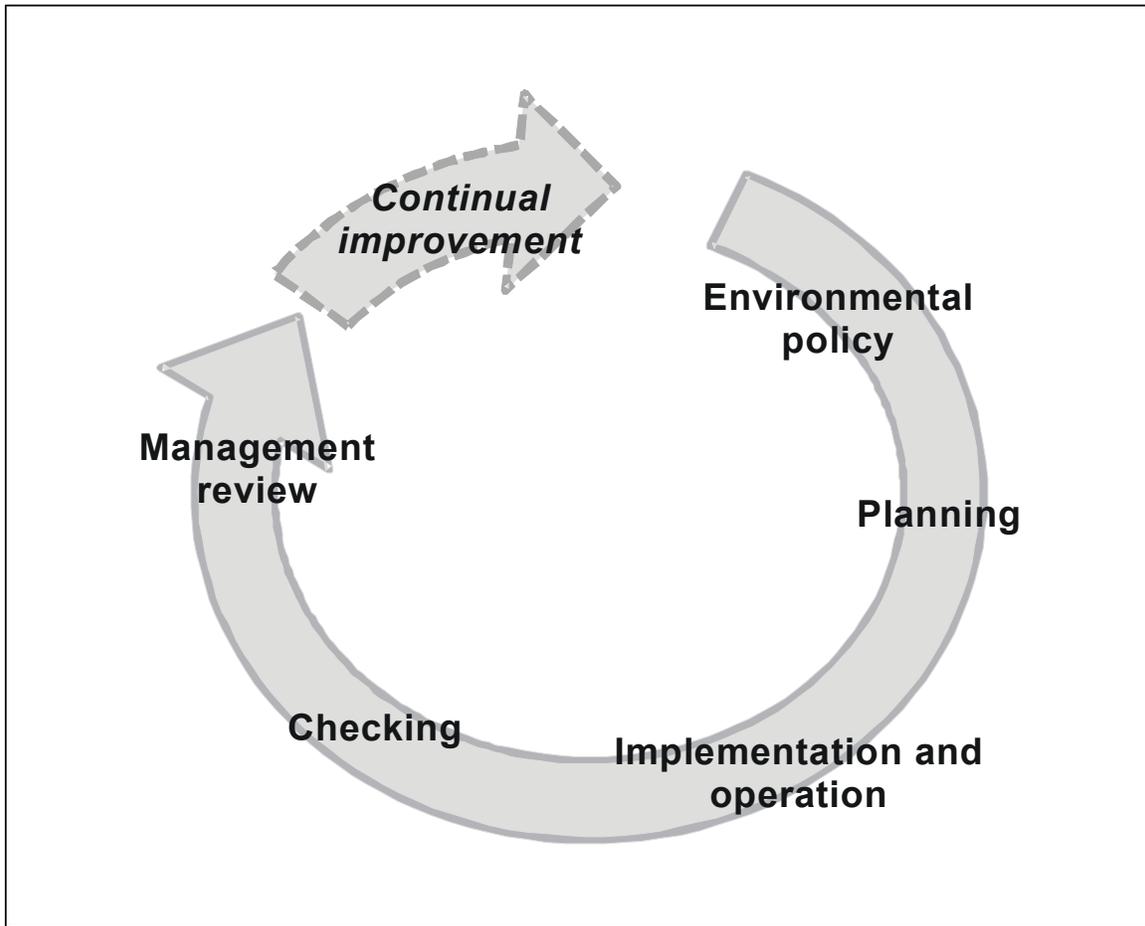


Figure 1-1. ISO 14001:2004 Framework



## Chapter 2

# QUESTIONNAIRE PARTICIPATION

### 2.1 INTRODUCTION

As mentioned in Chapter 1, questionnaires were disseminated worldwide to Member States and a wide range of stakeholders within the aviation industry. A total of 326 responses were received over a six-month period, and following validation, 233 of these formed the basis of this report. This chapter discusses and analyses the breakdown of these responses by industry sector and geographic location (see Table 2-1 and Figure 2-1).

### 2.2 SECTOR CHARACTERIZATION

2.2.1 Individual sector response data were forwarded to international representative organizations for completion of a summary analysis for that sector. These analyses contained statistical data specific to the respondents and offered insight into the industry as a whole, and illustrated their geographic location by sector.

*Note.— The total number of respondents for each sector was out of 233.*

#### Airlines

2.2.2 Eighty respondents were from passenger, cargo or passenger and cargo airlines. These “airline” respondents transported an estimated 1.1 billion passengers and 55 billion ton kilometers of cargo in 2008, representing approximately 67 per cent of total system-wide scheduled passengers and 33 per cent of total system-wide scheduled cargo carried by IATA member airlines in that year. Of the 80 airline respondents, 57 (or 71 per cent) were IATA members.

#### ANSPs

2.2.3 Twenty-four respondents were from air navigation and air traffic services providers. Eighteen of the 24 “ANSP” respondents were members of CANSO. Together, CANSO respondents moved an estimated 57 370 000 aircraft per year.

#### Airports

2.2.4 Ninety-six respondents were from airport companies, airport authorities, and government and city departments that operated one or more airports. These “airport” respondents operated 231 airports that had an annual passenger throughput of approximately 1.15 billion.

2.2.5 The 96 airport respondents represented approximately 17 per cent of ACI’s 597 member organizations, and 5.7 per cent of the 1 680 airports in ACI. In terms of passenger numbers, the 96 responses covered almost a quarter of the 4.8 billion passengers handled at ACI member airports annually.

### Manufacturers

2.2.6 Ten respondents were from aircraft and engine manufacturers. These “manufacturer” respondents represented approximately 50 per cent of the ICCAIA membership.

### Other

2.2.7 Forty-four respondents were from a variety of “other” organizations, including fixed-base operations, corporate aviation flight departments, aviation academies and flight schools, and aircraft and engine maintenance organizations. Respondents identified themselves as belonging to multiple sectors, and as a result, approximately 83 per cent of those in the other sector also identified with one or more alternative sector.

**Table 2-1. Number of valid survey respondents within each aviation industry sector**

| <i>Sector characterization</i> |            |
|--------------------------------|------------|
| Airlines                       | 80         |
| ANSPs                          | 24         |
| Airports                       | 96         |
| Manufacturers                  | 10         |
| Other                          | 44         |
| <b>Total</b>                   | <b>254</b> |

*Note.— CAEP received 233 unique responses to the survey. When selecting a sector, respondents were able to choose multiple options.*

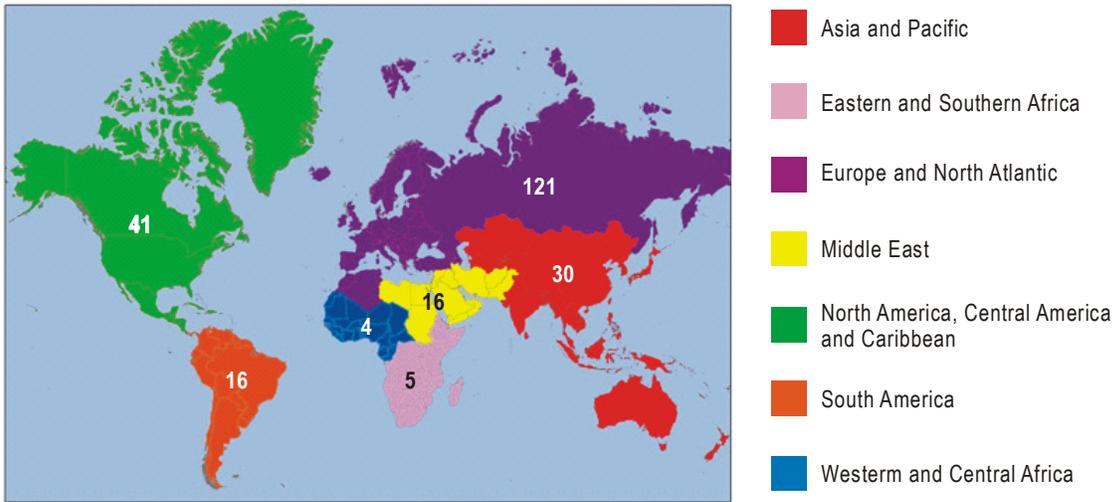


Figure 2-1. Number of CAEP survey respondents within each ICAO region



## Chapter 3

# ENVIRONMENTAL MANAGEMENT DRIVERS

### 3.1 INTRODUCTION

The projected growth of aviation and accompanying environmental effects has changed the priority of traditional aviation-related environmental issues and resulted in the emergence of some new concerns. This chapter discusses and analyses the priority of environmental issues and impacts on aviation organizations including those that are currently most important, and where applicable, investigates trends by industry sector.

### 3.2 PRIORITY ENVIRONMENTAL ISSUES OR IMPACTS

3.2.1 Respondents rated the importance of various environmental issues or impact on their organization. Ratings were tallied, and the level of importance with the highest percentage of votes for each issue or impact was identified. Table 3-1 lists those environmental issues that were in agreement across each of the five sectors (see 2.1) as to their level of importance, i.e. high and medium, to the aviation industry today. There was no consensus across industry sectors as to the issues or impacts that might be of importance in five or ten years or those that will never be important.

**Table 3-1. Areas of environmental concern across all aviation industry sectors**

| <i>Environmental issue or impact</i> | <i>Important today</i> |               |
|--------------------------------------|------------------------|---------------|
|                                      | <i>High</i>            | <i>Medium</i> |
| Aircraft noise                       | ✓                      |               |
| Noise from ground activities         |                        | ✓             |
| Fuel efficiency                      | ✓                      |               |
| Financial                            | ✓                      |               |
| Compliance with laws and regulations | ✓                      |               |
| State policies                       | ✓                      |               |
| Company core values and ethics       | ✓                      |               |
| Global climate change                | ✓                      |               |
| Non-governmental organizations       |                        | ✓             |

| <i>Environmental issue or impact</i>        | <i>Important today</i> |               |
|---|------------------------|---------------|
|   | <i>High</i>            | <i>Medium</i> |
| Corporate commitment and vision             | ✓                      |               |
| Capacity and growth constraints             | ✓                      |               |
| Soil and water protection                   | ✓                      |               |
| Energy management                           | ✓                      |               |
| Materials and chemicals management          | ✓                      |               |
| Operational efficiency                      | ✓                      |               |
| Customers' and other stakeholders' concerns | ✓                      |               |

*Note.— Agreement was identified through comparison of categories with the highest respondent percentage across all five sectors.*

3.2.2 Respondents rated each environmental issue against the following six levels of importance: very important now, medium important now, likely to be important in five years, likely to be important in ten years, will never be very important and not applicable. Only one level of importance could be assigned to each environmental issue or impact.

## Chapter 4

# APPROACHES TO ENVIRONMENTAL MANAGEMENT

### 4.1 INTRODUCTION

Aviation organizations are increasingly challenged to meet new market demands in a manner that is environmentally sustainable. In response to this challenge, organizations are using EMS approaches to manage environmental issues. This chapter discusses and analyses these approaches and, where applicable, investigates industry trends.

### 4.2 APPLICATION OF EMS STANDARDS OR GUIDELINES

4.2.1 EMS standards or guidelines were employed by 117 or approximately 50 per cent of respondents across all five sectors. The number of organizations within each sector that applied EMS standards or guidelines is illustrated in Table 4.1.

**Table 4-1. Organizations that use EMS standards or guidelines within each aviation industry sector**

| <i>Aviation industry sector use of EMS</i> |            |
|--|------------|
| ANSPs                                      | 6          |
| Airlines                                   | 42         |
| Airports                                   | 54         |
| Manufacturers                              | 8          |
| Other                                      | 19         |
|  | <b>129</b> |

*Note.— Of 129 organizations that used EMS standards or guidelines, 117 responded only once and 12 were included in multiple sectors.*

4.2.2 The types of EMS standards or guidelines used by respondents in each sector are shown in Figure 4-1. The majority of respondents (57) in four of the five sectors had implemented an ISO 14001:2004 certified EMS. Other commonly used EMS standards included the application of organization-appropriate EMS elements (27) and the implementation of a formal EMS based on ISO 14001 or the eco-management audit scheme (EMAS), but without third-party certification (24). Across all five sectors, eight organizations were registered to EMAS.

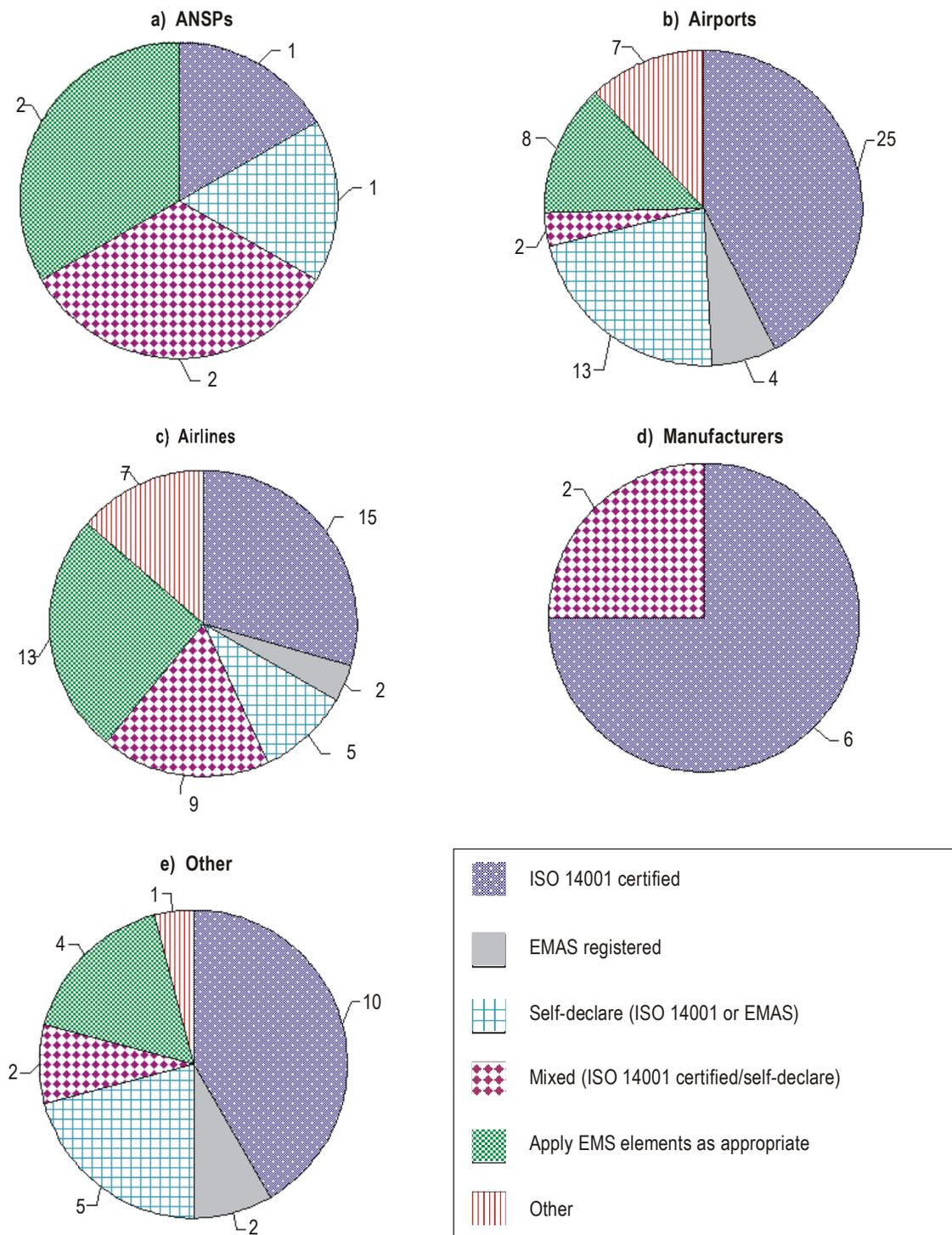


Figure 4-1. EMS approaches to managing environmental issues by aviation industry sector

### 4.3 SCOPE OF EMS

4.3.1 In order to understand the extent of EMS implementation within respondent organizations, survey participants were asked to identify the elements of their organization currently within the scope of their EMS. Table 4-2 illustrates the percentage included (e.g. the entire organization and all its operations were included within the EMS scope or were only select facilities or operations covered by EMS). Most respondents indicated that 100 per cent (i.e. all facilities and operations) was covered by the scope of their EMS.

**Table 4-2. The percentage of the organization included in the scope of EMS**

| Sector        | Percentage of the organization included in the scope of EMS |        |        |         |      |
|---------------|---|--------|--------|---------|------|
|               | <30%  | 30–60% | 60–90% | 90–100% | 100% |
| ANSPs         | 1   | 0      | 0      | 0       | 3    |
| Airports      | 4   | 3      | 1      | 5       | 37   |
| Airlines      | 2   | 6      | 4      | 5       | 8    |
| Manufacturers | 0   | 0      | 1      | 0       | 4    |
| Other         | 1   | 0      | 0      | 3       | 10   |

4.3.2 Respondents were also asked to identify the activities or operations that they currently include in their organization's EMS. Table 4-3 lists functions that were included or excluded from EMS scopes across each of the five sectors. Of the 28 activities and operations included in the questionnaire, "catering centres" is the only item typically excluded from an EMS's scope.

**Table 4-3. Activities and operations concurrently included or excluded from the EMS scope across all aviation industry sectors**

| Organization's activity or operation                 | EMS scope |          |
|--|-----------|----------|
|  | Included  | Excluded |
| Engineering/maintenance operations                   | ✓         |          |
| Catering centres                                     |           | ✓        |
| Facility management                                  | ✓         |          |
| Staff environmental training                         | ✓         |          |
| Organization's organizational structure and policies | ✓         |          |
| Environmental accounting                             | ✓         |          |

| Organization's activity or operation       | EMS scope |          |
|--|-----------|----------|
|  | Included  | Excluded |
| Environmental performance criteria         | ✓         |          |
| Environmental auditing                     | ✓         |          |
| Energy management                          | ✓         |          |
| Soil and water protection                  | ✓         |          |
| Waste management                           | ✓         |          |
| Materials and chemicals management         | ✓         |          |
| Air quality monitoring                     | ✓         |          |
| Noise exposure monitoring                  | ✓         |          |
| Ground transportation                      | ✓         |          |
| Procurement policies/supplier requirements | ✓         |          |
| Ecology conservation                       | ✓         |          |

*Note 1.— Agreement was identified through comparison of categories with the highest respondent percentage across all five sectors.*

*Note 2.— An activity or operation was listed as "excluded" if the highest respondent percentage across all five sectors was "Don't know/not applicable".*

4.3.3 Respondents categorized each function based on the following scope options, with only one scope option assigned to each activity or operation: included in EMS, likely to be included within five years, likely to be included within ten years, and don't know/not applicable.

#### 4.4 OTHER MANAGEMENT SYSTEMS IN PLACE

4.4.1 Of 117 respondents with an EMS, 82 per cent had one or more additional management systems. The percentage of respondents with either a safety management system (SMS) or a quality management system (QMS) was high for all sectors (see Table 4-4). However, in four of the sectors (airports, airlines, manufacturers and other) the most common addition to an EMS was a QMS.

4.4.2 Approximately 51 per cent of respondents with additional management systems had integrated or coordinated it with their EMS. Most respondents with integrated systems suggested that the greatest benefits are:

- a) the sharing of system procedures and processes, which helps avoid duplication of effort and increased efficiency; and
- b) the ability to manage diverse operations in a more integrated manner.

**Table 4-4. Management system types in addition to EMS within each aviation industry sector**

| <b>a) ANSPs</b>  |     | <b>b) Airports</b>   |      |
|--|-----|--|------|
| <i>Additional management system in place</i>                 |     | <i>Additional management system in place</i>                     |      |
| SMS  | 67% | SMS  | 48%  |
| QMS  | 50% | QMS  | 52%  |
| Other management system                                      | 17% | Other management system  | 13%  |
| No additional management system                              | 17% | No additional management system                                  | 26%  |
| <i>Note.— Percentages are based on 6 ANSP responses.</i>     |     | <i>Note.— Percentages are based on 54 airport responses.</i>     |      |
| <b>c) Airlines</b>   |     | <b>d) Manufacturers</b>  |      |
| <i>Additional management system in place</i>                 |     | <i>Additional management system in place</i>                     |      |
| SMS  | 64% | SMS  | 75%  |
| QMS  | 95% | QMS  | 100% |
| Other management system                                      | 19% | Other management system  | 13%  |
| No additional management system                              | 5%  | No additional management system                                  | 0%   |
| <i>Note.— Percentages are based on 42 airline responses.</i> |     | <i>Note.— Percentages are based on 8 manufacturer responses.</i> |      |

---

**e) Other**

---

| <i>Additional management system in place</i> |     |
|--|-----|
| SMS  | 37% |
| QMS  | 74% |
| Other management system                      | 11% |
| No additional management system              | 21% |

---

*Note.— Percentages are based on 19 other responses.*

---

## Chapter 5

# PERFORMANCE MONITORING AND COMMUNICATION

### 5.1 INTRODUCTION

As aviation organizations adapt to meet industry demands in an environmentally sustainable way, demonstrating and communicating environmental performance to stakeholders is becoming increasingly important. This chapter discusses and analyses the value of EMS in assisting aviation organizations to manage a broad range of environmental issues, impacts, and regulations. It also describes the types of environmental targets that aviation organizations set, the approaches used to measure performance, and the methods that are employed to communicate their EMS. Where applicable, analysis and discussion investigate trends by the industry sector.

### 5.2 PERFORMANCE MONITORING

5.2.1 Respondents that had an EMS were asked to rate how helpful it was in managing and controlling their organization's various environmental issues. Table 5-1 lists those issues with consensus across all sectors as to their level of helpfulness today. There was no consensus across industry sectors as to the helpfulness of EMS in managing environmental issues of medium importance today, those that might be of importance in five or ten years, or those areas in which EMS will never be helpful.

**Table 5-1. Consensus areas of EMS helpfulness towards managing and controlling environmental concerns across all aviation industry sectors**

| <i>Environmental issue or impact</i> | <i>Very helpful today</i> |
|--------------------------------------|---------------------------|
| Compliance with laws and regulations | ✓                         |
| State policies                       | ✓                         |
| Company core values and ethics       | ✓                         |
| Corporate image                      | ✓                         |
| Soil and water protection            | ✓                         |
| Waste management                     | ✓                         |
| Energy management                    | ✓                         |

*Note.— Agreement was identified through comparison of categories with the highest respondent percentage across all five sectors.*

5.2.2 Respondents rated each environmental issue against the following six levels of EMS helpfulness: very helpful now, medium helpful now, likely to be helpful in five years, likely to be helpful in ten years, will never be very helpful, and not applicable. Only one level of helpfulness could be assigned to each environmental issue or impact.

5.2.3 Respondents indicated that one of the most important reasons why environmental performance is measured is to ensure compliance. The questionnaire asked participants to list the five most important environmental regulations in which their organization's EMS ensures compliance. As a result of global participation in the questionnaire, various environmental regulations were identified as important, and there was no clear consensus on which laws were the most significant. The results were therefore categorized into areas of environmental concern, which were then tallied and ranked to identify the top five areas in which the respondents ensured compliance (see Table 5-2).

**Table 5-2. Top five areas of environmental regulatory concern**

| <i>Important environmental regulation areas</i> |     |
|---|-----|
| Hazardous/solid waste                           | 54% |
| Water   | 40% |
| National environmental regulations              | 38% |
| Air   | 34% |
| Noise   | 26% |

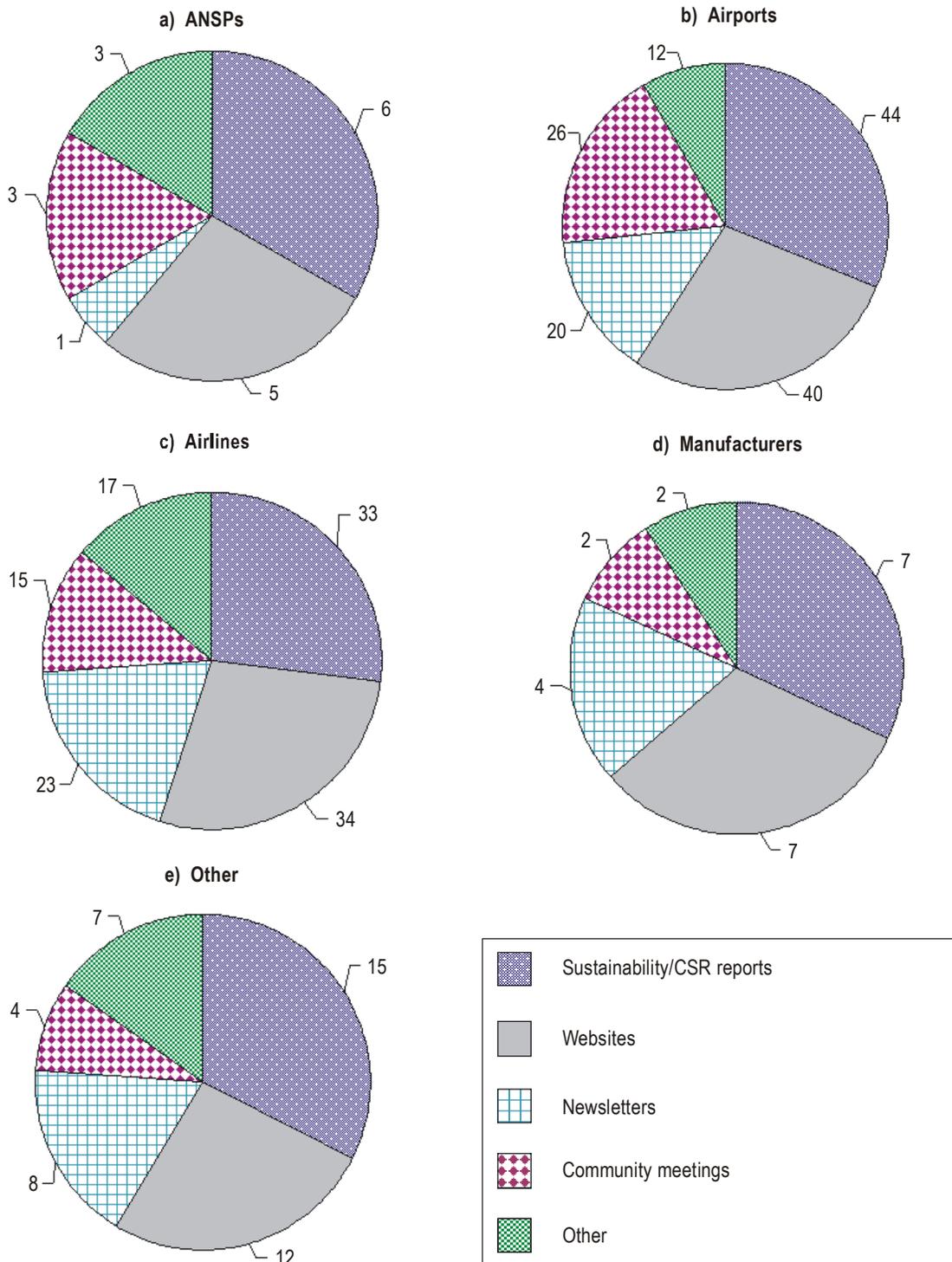
*Note.— Percentages are based on 115 respondents.*

5.2.4 First, the management and disposal of hazardous and solid waste was the most important environmental area in which 54 per cent respondent organizations ensured compliance. Second, legislation that regulates the quality, management and use of storm water, waste water and drinking water was important to 40 per cent. Thirty-eight per cent indicated that they ensured compliance with the national environmental regulations of each State in which their organization operated. The national environmental regulation that was identified by respondents typically controlled general environmental concerns such as environmental protection and conservation. The fourth, most important regulated environmental area was the quality and management of air emissions, in particular, carbon dioxide, and the last was noise.

5.2.5 In addition to compliance, respondents stated that other important reasons to measure environmental performance included the tracking and monitoring of progress towards achievement of environmental objectives and reporting performance to stakeholders and the public. Respondent organizations typically measured performance through environmental audits and the use of key performance indicators. The environmental targets set by respondents were directly aligned with the environmental areas in which organizations ensured compliance. In general, respondents were looking to reduce their consumption of energy, waste, water, emissions and noise, with environmental targets and objectives set on average at not more than five years ahead.

### 5.3 COMMUNICATION METHODS

As shown in Figure 5-1, the most common methods of communicating environmental performance across all five sectors are through the use of sustainability or corporate social responsibility (CSR) reports and through the organization's website. The third most common method of external communication employed by airport and ANSP respondents is to use community meetings as a forum for informing stakeholders and the public. In contrast, manufacturer, airline and other respondents prefer the use of newsletters over community meetings. In all sectors there were some organizations that listed other means of communicating environmental performance, including presentations at conferences, internal meetings, press releases, magazines and other publications.



**Figure 5-1. Methods for communicating environmental performance used by organizations within each aviation industry sector that have implemented an EMS**



## Chapter 6

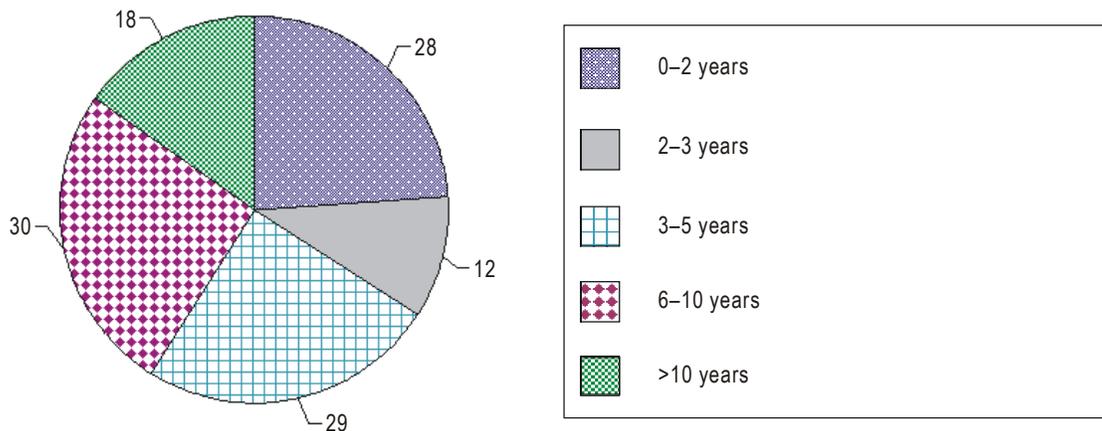
# IMPLEMENTATION AND MAINTENANCE

### 6.1 INTRODUCTION

A wide range of approaches can be used to implement an EMS depending on the nature of the organization's operations and future plans. This chapter discusses and analyses the resources and time needed for EMS implementation, including training. It also discusses the resources needed to operate and maintain an EMS, as well as how long the organization has operated their EMS. Where applicable, the analysis and discussion investigate trends by industry sector.

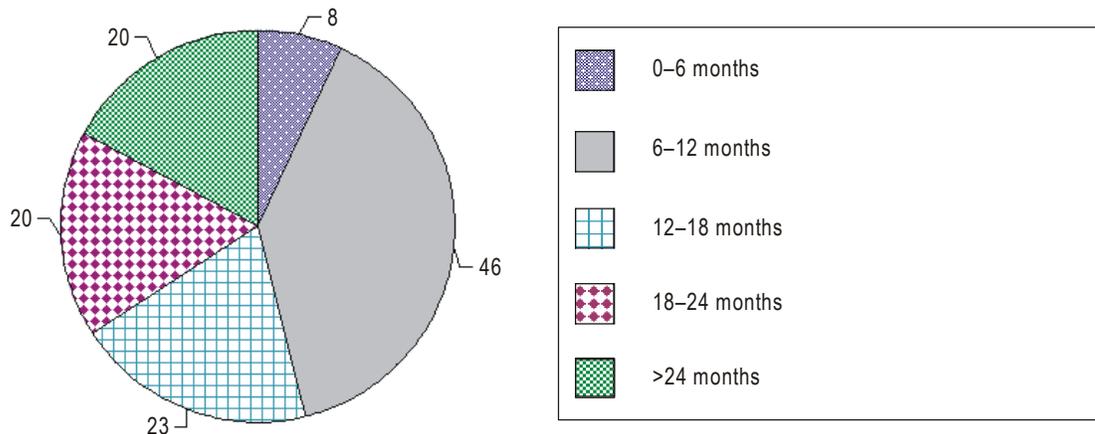
### 6.2 EMS IMPLEMENTATION

6.2.1 Respondents were asked to indicate when their EMS was implemented as well as how long it took to successfully implement the system within their organization. The same trends were found among all five sectors; and therefore responses were aggregated at the industry level. Figure 6-1 shows that EMS implementation has been relatively consistent within the industry for the past ten years.



**Figure 6-1. Average time EMS has been in place across all aviation industry sectors**

6.2.2 Figure 6-2 indicates that most organizations (46) required 6 to 12 months to fully develop and implement their EMS. Very few organizations (8) were able to accomplish this task in less than six months, and many (63) needed one to two years to fully deploy their systems. EMS implementation typically takes longer in large organizations and in complicated operations. Approximately 71 per cent of the 117 respondents with an EMS sought outside assistance from a consulting or contracting firm in order to implement the system.



**Figure 6-2. Average time to implement EMS across all aviation industry sectors**

6.2.3 Table 6-1 provides an estimate of the average level of resources necessary for EMS implementation within each of the five sectors. The averages for each sector are based on the total number of respondents and do not necessarily reflect all respondents for each sector. The estimates provided by respondents on the required implementation time are higher than those identified in Figure 6-2. The airline, airport and other sector results indicate that implementation takes approximately 14 to 15 months. Manufacturers and ANSPs estimated longer implementation times, with ANSPs estimating about 3.5 years.

**Table 6-1. Average resource use for EMS implementation within each aviation industry sector**

| a) ANSPs  |             | b) Airports   |             |
|---|-------------|---|-------------|
| <i>Implementation resource average</i>                |             | <i>Implementation resource average</i>                    |             |
| Implementation time (months)                          | 410         | Implementation time (months)                              | 15.3        |
| Employees used  | 5.7         | Employees used  | 26.3        |
| Employees hired for implementation                    | 4.3         | Employees hired for implementation                        | 2.3         |
| Contractor support costs                              | US\$544 429 | Contractor support costs                                  | US\$62 950  |
| Equipment costs                                       | US\$10 000  | Equipment costs   | US\$209 114 |
| Certification/registration costs                      | US\$100 000 | Certification/registration costs                          | US\$9 966   |
| <i>Note.— Averages are based on 6 ANSP responses.</i> |             | <i>Note.— Averages are based on 54 airport responses.</i> |             |

| <b>c) Airlines</b>  |            | <b>d) Manufacturers</b>                                       |             |
|---|------------|---|-------------|
| <i>Implementation resource average</i>                    |            | <i>Implementation resource average</i>                        |             |
| Implementation time (months)                              | 13.9       | Implementation time (months)                                  | 21.4        |
| Employees used  | 9.5        | Employees used  | 33.5        |
| Employees hired for implementation                        | 2.9        | Employees hired for implementation                            | 19.6        |
| Contractor support costs                                  | US\$51 542 | Contractor support costs                                      | US\$42 500  |
| Equipment costs   | US\$19 699 | Equipment costs   | US\$0       |
| Certification/registration costs                          | US\$12 976 | Certification/registration costs                              | US\$120 000 |
| <i>Note.— Averages are based on 42 airline responses.</i> |            | <i>Note.— Averages are based on 8 manufacturer responses.</i> |             |

| <b>e) Other</b>   |            |
|---|------------|
| <i>Implementation resource average</i>                  |            |
| Implementation time (months)                            | 15.2       |
| Employees used  | 11.2       |
| Employees hired for implementation                      | 5.8        |
| Contractor support costs                                | US\$89 591 |
| Equipment costs   | US\$33 344 |
| Certification/registration costs                        | US\$9 778  |
| <i>Note.— Averages are based on 19 other responses.</i> |            |

6.2.4 The results indicated that, on average, a minimum of five employees were required during EMS implementation. Both airports and manufacturers provided larger estimates of 26 and 34 employees, respectively. All five sectors estimated the need for at least two additional employees, with the manufacturer sector respondents estimating an average need for 20 additional staff. The estimates for the number of employees required within each sector varied by organization size.

6.2.5 Contract support costs ranged from USD 42 000 to USD 90 000 for four of the five sectors (airports, airlines, manufacturers and other). ANSP respondents indicated an average cost for contractor support of over USD 500 000. Estimates for the average cost of equipment ranged from USD 10 000 to USD 34 000 for three of the five sectors (ANSPs, airlines and others). Manufacturer sector respondents did not estimate their equipment costs, and the airport sector respondents estimated an average equipment cost of USD 209 114. EMS certification and registration costs for three of the five sectors (airports, airlines and other) ranged from USD 9 700 to USD 13 000. ANSP and manufacturer sector respondents estimated average EMS certification and registration costs to be much higher at USD 100 000 and USD 120 000, respectively.

*Note.— The monetary figures provided as part of the survey responses were rough estimates and caution should therefore be taken when using them to represent industry or sector trends.*

### 6.3 EMS MAINTENANCE

6.3.1 Table 6-2 provides a rough average estimate of the level of resources necessary for EMS operation and maintenance (O&M) for each of the five sectors. Note that the averages for each sector were based on the total number of respondents and did not necessarily reflect all respondents for each sector. For three of the five sectors (airports, airlines and other), time necessary for O&M ranged from one to two years. Estimates provided by ANSP and manufacturer sector respondents were on both sides of this range with manufacturers on average spending less than six months on O&M and ANSPs needing three years. As for the number of employees needed for EMS O&M, the estimates varied by sector and were as follows: 5 for ANSPs, 28 for airports, 15 for airlines, 30 for manufacturers and 16 for other.

**Table 6-2. Average resource use for EMS O&M within each aviation industry sector**

| <b>a) ANSPs</b>   |             | <b>b) Airports</b>  |            |
|---|-------------|---|------------|
| <i>O&amp;M resource average</i>                           |             | <i>O&amp;M resource average</i>                               |            |
| O&M time (months)   | 36.0        | O&M time (months)   | 22.2       |
| Employees used  | 5.0         | Employees used  | 27.7       |
| Contractor support costs                                  | US\$275 000 | Contractor support costs                                      | US\$22 577 |
| Equipment costs   | US\$10 000  | Equipment costs   | US\$21 554 |
| Certification/registration costs                          | US\$36 653  | Certification/registration costs                              | US\$5 020  |
| <i>Note.— Averages are based on 6 ANSP responses.</i>     |             | <i>Note.— Averages are based on 54 airport responses.</i>     |            |
| <b>c) Airlines</b>  |             | <b>d) Manufacturers</b>                                       |            |
| <i>O&amp;M resource average</i>                           |             | <i>O&amp;M resource average</i>                               |            |
| O&M time (months)   | 17.0        | O&M time (months)   | 3.8        |
| Employees used  | 14.8        | Employees used  | 29.5       |
| Contractor support costs                                  | US\$14 500  | Contractor support costs                                      | US\$5 000  |
| Equipment costs   | US\$36 407  | Equipment costs   | US\$25 000 |
| Certification/registration costs                          | US\$7 704   | Certification/registration costs                              | US\$77 000 |
| <i>Note.— Averages are based on 42 airline responses.</i> |             | <i>Note.— Averages are based on 8 manufacturer responses.</i> |            |

| <b>e) Other</b>                    |            |
|------------------------------------|------------|
| <i>O&amp;M resource average</i>    |            |
| O&M time (months)                  | 14.3       |
| Employees used                     | 16.0       |
| Contractor support costs           | US\$63 511 |
| Equipment costs                    | US\$30 000 |
| Certification / registration costs | US\$6 636  |

*Note.— Averages are based on 19 other responses.*

6.3.2 The range of contract support costs was estimated to be from USD 5 000 to USD 22 577 for three out of five sectors (airports, airlines and manufacturers). Other sector and ANSP respondents estimated an average cost of USD 63 500 and USD 275 000, respectively. The cost of equipment for four out of five sectors (airports, airlines, manufacturers and other) was estimated to be between USD 21 000 and USD 36 407; for ANSPs the estimated average was USD 10 000. Lastly, three out of five sectors (airports, airlines and other) estimated average EMS certification and registration costs to be from USD 5 000 to USD 7 704. Manufacturers and ANSPs were higher at USD 77 000 and USD 36 653, respectively.

*Note.— The monetary figures provided were rough estimates, and caution should be taken in using the data as representative of industry or sector trends.*

6.3.3 Staff training was necessary for both EMS implementation and maintenance. Respondents were asked to indicate the types of staff training required for their EMS. The training of management and office personnel, and engineering and maintenance staff had the highest respondent percentages across all five sectors. Sector differences were apparent in the additional types of training that were required for EMS implementation and maintenance (see Table 6-3). For example, airlines required both ground operations and cabin crew staff training; airports required ground operations staff training; and manufacturers required manufacturing staff training.

**Table 6-3. Staff training required as a result of EMS within each aviation industry sector**

| <b>a) ANSPs</b>                     |     | <b>b) Airports</b>                  |     |
|-------------------------------------|-----|-------------------------------------|-----|
| <i>Staff requiring EMS training</i> |     | <i>Staff requiring EMS training</i> |     |
| Management and office staff         | 80% | Management and office staff         | 91% |
| Engineering and maintenance staff   | 80% | Engineering and maintenance staff   | 83% |
| Manufacturing staff                 | 0%  | Manufacturing staff                 | 11% |
| Ground operations staff             | 20% | Ground operations staff             | 39% |

| <i>Staff requiring EMS training</i> |     |
|-------------------------------------|-----|
| Air traffic controller staff        | 40% |
| Cabin crew staff                    | 0%  |
| Other staff                         | 40% |

*Note.— Percentages are based on 5 ANSP responses.*

| <i>Staff requiring EMS training</i> |     |
|-------------------------------------|-----|
| Air traffic controller staff        | 9%  |
| Cabin crew staff                    | 0%  |
| Other staff                         | 17% |

*Note.— Percentages are based on 46 airport responses.*

**c) Airlines**

| <i>Staff requiring EMS training</i> |     |
|-------------------------------------|-----|
| Management and office staff         | 84% |
| Engineering and maintenance staff   | 76% |
| Manufacturing staff                 | 8%  |
| Ground operations staff             | 63% |
| Air traffic controller staff        | 8%  |
| Cabin crew staff                    | 45% |
| Other staff                         | 47% |

*Note.— Percentages are based on 38 airline responses.*

**d) Manufacturers**

| <i>Staff requiring EMS training</i> |     |
|-------------------------------------|-----|
| Management and office staff         | 88% |
| Engineering and maintenance staff   | 88% |
| Manufacturing staff                 | 88% |
| Ground operations staff             | 38% |
| Air traffic controller staff        | 0%  |
| Cabin crew staff                    | 0%  |
| Other staff                         | 25% |

*Note.— Percentages are based on 8 manufacturer responses.*

**e) Other**

| <i>Staff requiring EMS training</i> |     |
|-------------------------------------|-----|
| Management and office staff         | 29% |
| Engineering and maintenance staff   | 24% |
| Manufacturing staff                 | 12% |
| Ground operations staff             | 24% |
| Air traffic controller staff        | 0%  |
| Cabin crew staff                    | 6%  |
| Other staff                         | 12% |

*Note.— Averages are based on 17 other responses.*

## Chapter 7

### BENEFITS AND CHALLENGES

#### 7.1 INTRODUCTION

While organizations differ, there are lessons learned from every EMS implementation. This chapter discusses and analyses the benefits and challenges perceived by respondents in implementing EMS. Analysis and discussion of trends have been aggregated for all sectors.

#### 7.2 IMPLEMENTATION CHALLENGES

7.2.1 Respondents, regardless of sector, identified many of the same challenges with EMS implementation. Table 7-1 outlines the top three most common challenges, with the greatest challenges being resources and the degree of culture change necessary for successful EMS implementation. Respondents stated that it was difficult to alter employee behavior towards incorporating environmental considerations and responsibilities into decision-making and day-to-day operations.

7.2.2 Another common challenge that respondents faced was adequately training employees to be aware of EMS and their responsibilities with regard to system maintenance. Lack of management commitment was cited as the third, most common challenge. Other challenges included EMS alignment within the larger organization and record keeping requirements during EMS implementation.

**Table 7-1. Top three EMS implementation challenges**

| <i>EMS implementation challenges</i> |     |
|--------------------------------------|-----|
| Resources (time, finances)           | 26% |
| Culture change                       | 26% |
| Employee awareness/training          | 23% |
| Management commitment                | 16% |

*Note.— Percentages are based on 110 respondents.*

### 7.3 BENEFITS OF EMS IMPLEMENTATION

The three most common benefits of EMS implementation are illustrated in Table 7-2, with the greatest benefit being that it enhanced the reputation and image of the organization and improved their relationship with stakeholders. Another benefit was improved compliance with environmental regulations. Also, since EMS is a proactive approach to environmental management, risk to the organization was mitigated. Lastly, respondents cited that improving the environment, or lessening their organization's impact on the environment, was another important benefit. Other benefits included the ability to track environmental performance—a cost reduction and increased awareness and efficiency.

**Table 7-2. Three most frequently cited benefits of EMS implementation**

| <i>EMS implementation benefits</i> |     |
|------------------------------------|-----|
| Enhance reputation/image           | 34% |
| Enhance compliance/mitigate risk   | 33% |
| Environmental improvements         | 25% |

*Note.— Percentages are based on 110 survey respondents.*

### 7.4 TRADE-OFF ANALYSIS

According to the sector respondents, the benefits of EMS implementation far outweigh the implementation and maintenance challenges. Approximately 96 per cent recommended that other organizations establish EMS. Many stated that they would be willing to share some of their EMS materials, including environmental policies, environmental/sustainability reports, performance metrics, and objectives and targets. However, organizations were not willing to share EMS documentation that may contain proprietary information such as audit reports and complete EMS manuals.

## Chapter 8

# ORGANIZATIONS WITHOUT AN EMS

### 8.1 INTRODUCTION

Some organizations have not implemented an EMS but have other environmental programmes to manage their environmental issues. This chapter discusses and analyses responses from those organizations. It reviews the approaches that they use to manage environmental issues and impacts, including those that are common to EMS, and it analyses those most important to them now. In addition, it investigates the metrics and targets that are established to measure performance and the types of guidance that would assist them in implementing an EMS. Where applicable, the analysis and discussion investigates trends by industry sector.

### 8.2 ENVIRONMENTAL PROGRAMME ELEMENTS OR PRINCIPLES

8.2.1 Replies indicated that 116 respondents did not apply EMS standards or guidelines; however, they had environmental programmes with many of the same elements or principles required for an EMS. These respondents were asked to identify whether or not EMS elements were included in their environmental programme. Table 8-1 illustrates the percentage of respondents, by sector, whose environmental programme included certain elements or principles consistent with EMS.

**Table 8-1. Environmental programme elements of organizations that do not apply EMS standards or guidelines**

| <b>a) ANSPs</b>                         |     | <b>b) Airports</b>                      |     |
|---|-----|---|-----|
| <i>Environmental programme elements</i> |     | <i>Environmental programme elements</i> |     |
| Environmental vision/policy             | 63% | Environmental vision/policy             | 68% |
| Goals, objectives or targets            | 44% | Goals, objectives or targets            | 66% |
| Management programmes                   | 19% | Management programmes                   | 58% |
| Operational controls                    | 75% | Operational controls                    | 84% |
| Environmental metrics                   | 19% | Environmental metrics                   | 53% |
| Performance reporting                   | 38% | Performance reporting                   | 63% |
| External communication programmes       | 25% | External communication programmes       | 39% |
| Employee awareness training programmes  | 38% | Employee awareness training programmes  | 61% |

| <i>Environmental programme elements</i> |     |
|---|-----|
| Compliance audits/inspections           | 31% |
| Systems/process audits                  | 31% |
| Emergency preparedness                  | 38% |
| Management structure or framework       | 13% |
| Top management performance reviews      | 13% |

*Note.— Percentages are based on 16 ANSP responses.*

| <i>Environmental programme elements</i> |     |
|---|-----|
| Compliance audits/inspections           | 61% |
| Systems/process audits                  | 39% |
| Emergency preparedness                  | 68% |
| Management structure or framework       | 50% |
| Top management performance reviews      | 34% |

*Note.— Percentages are based on 38 airport responses.*

### **c) Airlines**

| <i>Environmental programme elements</i> |     |
|---|-----|
| Environmental vision/policy             | 89% |
| Goals, objectives or targets            | 74% |
| Management programmes                   | 51% |
| Operational controls                    | 63% |
| Environmental metrics                   | 34% |
| Performance reporting                   | 49% |
| External communication programmes       | 37% |
| Employee awareness training programmes  | 57% |
| Compliance audits/inspections           | 60% |
| Systems/process audits                  | 37% |
| Emergency preparedness                  | 57% |
| Management structure or framework       | 34% |
| Top management performance reviews      | 26% |

*Note.— Percentages are based on 35 airline responses.*

### **d) Manufacturers**

| <i>Environmental programme elements</i> |      |
|---|------|
| Environmental vision/policy             | 100% |
| Goals, objectives or targets            | 100% |
| Management programmes                   | 50%  |
| Operational controls                    | 100% |
| Environmental metrics                   | 100% |
| Performance reporting                   | 100% |
| External communication programmes       | 100% |
| Employee awareness training programmes  | 100% |
| Compliance audits/inspections           | 100% |
| Systems/process audits                  | 50%  |
| Emergency preparedness                  | 100% |
| Management structure or framework       | 100% |
| Top management performance reviews      | 50%  |

*Note.— Percentages are based on 2 manufacturer responses.*

| <b>e) Other</b>                         |     |
|---|-----|
| <i>Environmental programme elements</i> |     |
| Environmental vision/policy             | 82% |
| Goals, objectives or targets            | 73% |
| Management programmes                   | 64% |
| Operational controls                    | 86% |
| Environmental metrics                   | 41% |
| Performance reporting                   | 64% |
| External communication programmes       | 50% |
| Employee awareness training programmes  | 77% |
| Compliance audits/inspections           | 77% |
| Systems/process audits                  | 55% |
| Emergency preparedness                  | 77% |
| Management structure or framework       | 64% |
| Top management performance reviews      | 50% |

*Note.— Percentages are based on 22 other responses.*

8.2.2 The data indicate that respondents across all five sectors had many elements of an EMS in place. Percentages were high across all sectors for the following:

- a) environmental vision/policy;
- b) goals, objectives or targets;
- c) operational controls;
- d) employee awareness training programmes;
- e) compliance audits/inspections; and
- f) emergency preparedness.

8.2.3 Although management commitment is imperative for organizations to effectively manage their environmental impacts, on average, top management performance reviews had the lowest percentage across all sectors. In addition, organizations with an EMS indicated that management commitment was one of the biggest challenges of EMS implementation.

### 8.3 PERFORMANCE MONITORING

8.3.1 Respondents who used an environmental programme rather than a formal EMS were asked to rate how helpful it was in managing and controlling 28 specific environmental issues or impacts. Table 8-2 lists those most commonly identified as helpful today in each sector. Generally, the level of agreement across all five industry sectors was not strong.

8.3.2 Although there was no agreement by the aviation industry, the ANSPs, airlines, manufacturers and other sectors agreed that their environmental programmes were helpful in managing and controlling compliance with laws and regulations today. The ANSPs, airports, airlines and other sectors agreed that their environmental programme was helpful in managing customer and other stakeholder concerns, fuel efficiency, finance, and company core values and ethics.

**Table 8-2. Areas of environmental concern in which use of an environmental programme is seen as helpful by organizations that do not apply EMS standards or guidelines for management**

| a) ANSPs                             |                      |               |                       |
|--------------------------------------|----------------------|---------------|-----------------------|
| <i>Environmental issue or impact</i> | <i>Helpful today</i> |               | <i>Not applicable</i> |
|                                      | <i>High</i>          | <i>Medium</i> |                       |
| Aircraft noise                       | ✓                    |               |                       |
| Emissions from ground activities     |                      |               | ✓                     |
| Noise from ground activities         |                      |               | ✓                     |
| Fuel efficiency                      | ✓                    |               |                       |
| Financial                            |                      | ✓             |                       |
| Compliance with laws and regulations | ✓                    |               |                       |
| State policies                       | ✓                    |               |                       |
| Competitive pressures                |                      |               | ✓                     |
| Company core values and ethics       |                      | ✓             |                       |
| Media pressure                       |                      |               | ✓                     |
| Corporate image                      |                      | ✓             |                       |
| Local community concerns             |                      |               | ✓                     |
| Non-governmental organizations       |                      |               | ✓                     |
| Capacity and growth constraints      |                      | ✓             |                       |
| Soil and water protection            |                      |               | ✓                     |

| <i>Environmental issue or impact</i>          | <i>Helpful today</i> |               | <i>Not applicable</i> |
|---|----------------------|---------------|-----------------------|
|   | <i>High</i>          | <i>Medium</i> |                       |
| International public perceptions              |                      | ✓             |                       |
| Waste management                              |                      | ✓             |                       |
| Material and chemical management              |                      |               | ✓                     |
| International policy                          |                      | ✓             |                       |
| Customers' and other stakeholders' concerns   | ✓                    |               |                       |
| Shareholders' appreciation or rating agencies |                      |               | ✓                     |

*Note.— Areas of helpfulness determined through identification of categories with the single highest respondent percentage within the ANSP sector.*

#### **b) Airports**

| <i>Environmental issue or impact</i>        | <i>Helpful today</i> |                           |
|---|----------------------|---------------------------|
|   | <i>Medium</i>        | <i>Helpful in 5 years</i> |
| Aircraft emissions                          | ✓                    |                           |
| Noise from ground activities                |                      | ✓                         |
| Fuel efficiency                             | ✓                    |                           |
| Financial                                   | ✓                    |                           |
| Competitive pressures                       | ✓                    |                           |
| Company core values and ethics              | ✓                    |                           |
| Media pressure                              | ✓                    |                           |
| Local air quality                           | ✓                    |                           |
| Energy management                           | ✓                    |                           |
| Operational efficiency                      | ✓                    |                           |
| Customers' and other stakeholders' concerns | ✓                    |                           |

*Note.— Areas of helpfulness determined through identification of categories with the single highest respondent percentage within the airport sector.*

## c) Airlines

| <i>Environmental issue or impact</i>        | <i>Helpful today</i> |               |
|---|----------------------|---------------|
|   | <i>High</i>          | <i>Medium</i> |
| Aircraft emissions                          | ✓                    |               |
| Aircraft noise                              |                      | ✓             |
| Emissions from ground activities            |                      | ✓             |
| Noise from ground activities                |                      | ✓             |
| Fuel efficiency                             | ✓                    |               |
| Financial                                   | ✓                    |               |
| Compliance with laws and regulations        | ✓                    |               |
| State policies                              | ✓                    |               |
| Competitive pressures                       |                      | ✓             |
| Company core values and ethics              | ✓                    |               |
| Media pressure                              |                      | ✓             |
| Corporate image                             | ✓                    |               |
| Ecological conservation                     | ✓                    |               |
| Local community concerns                    |                      | ✓             |
| Global climate change                       | ✓                    |               |
| Non-governmental organizations              |                      | ✓             |
| Corporate commitment and vision             | ✓                    |               |
| Capacity and growth constraints             |                      | ✓             |
| Soil and water protection                   |                      | ✓             |
| International public perceptions            |                      | ✓             |
| Waste management                            | ✓                    |               |
| Material and chemical management            |                      | ✓             |
| Operational efficiency                      | ✓                    |               |
| International policy                        | ✓                    |               |
| Customers' and other stakeholders' concerns | ✓                    |               |

---

*Note.— Areas of helpfulness determined through identification of categories with the single highest respondent percentage within the airline sector.*

---

**d) Manufacturers**

| <i>Environmental issue or impact</i> | <i>Helpful today</i> |                       |
|--------------------------------------|----------------------|-----------------------|
|                                      | <i>High</i>          | <i>Not applicable</i> |
| Compliance with laws and regulations | ✓                    |                       |
| Non-governmental organizations       |                      | ✓                     |

*Note 1.— Areas of helpfulness determined through identification of categories with the single highest respondent percentage within the manufacturer sector.*

*Note 2.— Only two of the responses were from organizations that identified themselves as manufacturers without an EMS currently in place.*

**e) Other**

| <i>Environmental issue or impact</i> | <i>Helpful today</i> |               |
|--------------------------------------|----------------------|---------------|
|                                      | <i>High</i>          | <i>Medium</i> |
| Aircraft emissions                   |                      | ✓             |
| Aircraft noise                       | ✓                    |               |
| Noise from ground activities         |                      | ✓             |
| Fuel efficiency                      | ✓                    |               |
| Financial                            | ✓                    |               |
| Compliance with laws and regulations | ✓                    |               |
| State policies                       | ✓                    |               |
| Competitive pressures                | ✓                    |               |
| Company core values and ethics       | ✓                    |               |
| Media pressure                       | ✓                    |               |
| Corporate image                      | ✓                    |               |
| Ecological conservation              | ✓                    |               |
| Local community concerns             | ✓                    |               |

| <i>Environmental issue or impact</i>          | <i>Helpful today</i> |               |
|---|----------------------|---------------|
|   | <i>High</i>          | <i>Medium</i> |
| Local air quality                             | ✓                    |               |
| Non-governmental organizations                |                      | ✓             |
| Capacity and growth constraints               |                      | ✓             |
| Soil and water protection                     | ✓                    |               |
| International public perceptions              | ✓                    |               |
| Waste management                              | ✓                    |               |
| Energy management                             | ✓                    |               |
| Material and chemical management              | ✓                    |               |
| Operational efficiency                        | ✓                    |               |
| Customers' and other stakeholders' concerns   | ✓                    |               |
| Shareholders' appreciation or rating agencies | ✓                    |               |

*Note.— Areas of helpfulness determined through identification of categories with the single highest respondent percentage within the Other sector.*

8.3.3 Respondents rated each environmental issue against the following six levels of environmental programme helpfulness: very helpful now, medium helpful now, likely to be helpful in five years, likely to be helpful in ten years, will never be very helpful, and not applicable. Only one level of helpfulness could be assigned to each environmental issue or impact.

8.3.4 Like organizations with an EMS, those without indicated that it is important to measure environmental performance to ensure compliance and to minimize the organization's impact on the environment. Environmental performance is typically measured through the continuous monitoring and measurement of specific elements important to the organization and through yearly reviews and inspections, as well as by the number of incidents that occur per year. The environmental targets set by respondents focused on the reduction of water, fuel, energy and waste consumption.

8.3.5 Respondents without a formal management system were asked to list the five most important environmental regulations with which their organization's environmental programme helped ensure compliance. Since respondents were worldwide, various environmental regulations were identified as important, but there was no clear consensus on specific legislation. As for those with an EMS in place (see 5.1), results were categorized into areas of environmental concern which were tallied and ranked to identify the top five areas that respondents without an EMS ensured compliance (Table 8-3).

**Table 8-3. Five most frequently cited areas of environmental regulatory concern**

| <i>Important environmental regulation areas</i> |     |
|---|-----|
| Hazardous/solid waste                           | 54% |
| Air   | 49% |
| Water   | 47% |
| Noise   | 39% |
| National environmental regulations              | 17% |

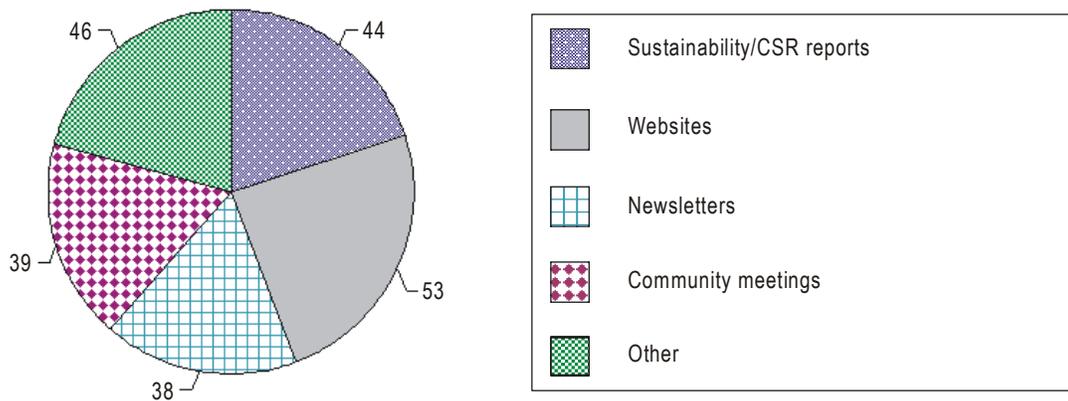
*Note.— Percentages are based on 87 respondents.*

8.3.6 The five environmental areas identified as important by respondents without an EMS were identical to those of organizations with an EMS, with the management and disposal of hazardous/solid waste as the greatest priority to both. Second, legislation that regulates the quality and management of air emissions, in particular, carbon dioxide, was important to 49 per cent. The area that concerns the quality, management and use of storm water, waste water and drinking water was third most important, and managing the level of noise was deemed important by all sectors. A few respondents indicated that they ensured compliance with other types of State-specific national environmental legislation.

#### 8.4 COMMUNICATION METHODS

8.4.1 Respondents were asked to identify the communication methods used by their organization regarding its environmental programme. As the same trends were found among all five sectors, the results were aggregated at the industry level. Figure 8-1 provides a breakdown of the communication methods used by respondents with an environmental programme in place but without a formal EMS framework.

8.4.2 It is evident that all the communication methods outlined in Figure 8-1 were applied fairly consistently, with the use of websites being the most common. Other methods identified included posters and brochures, internal meetings, presentations at seminars and e-mail.



**Figure 8-1. Methods used by organizations across the aviation industry that have not implemented an EMS for communicating the performance of their environmental programme**

## 8.5 EMS APPLICATION AND DEVELOPMENT ISSUES

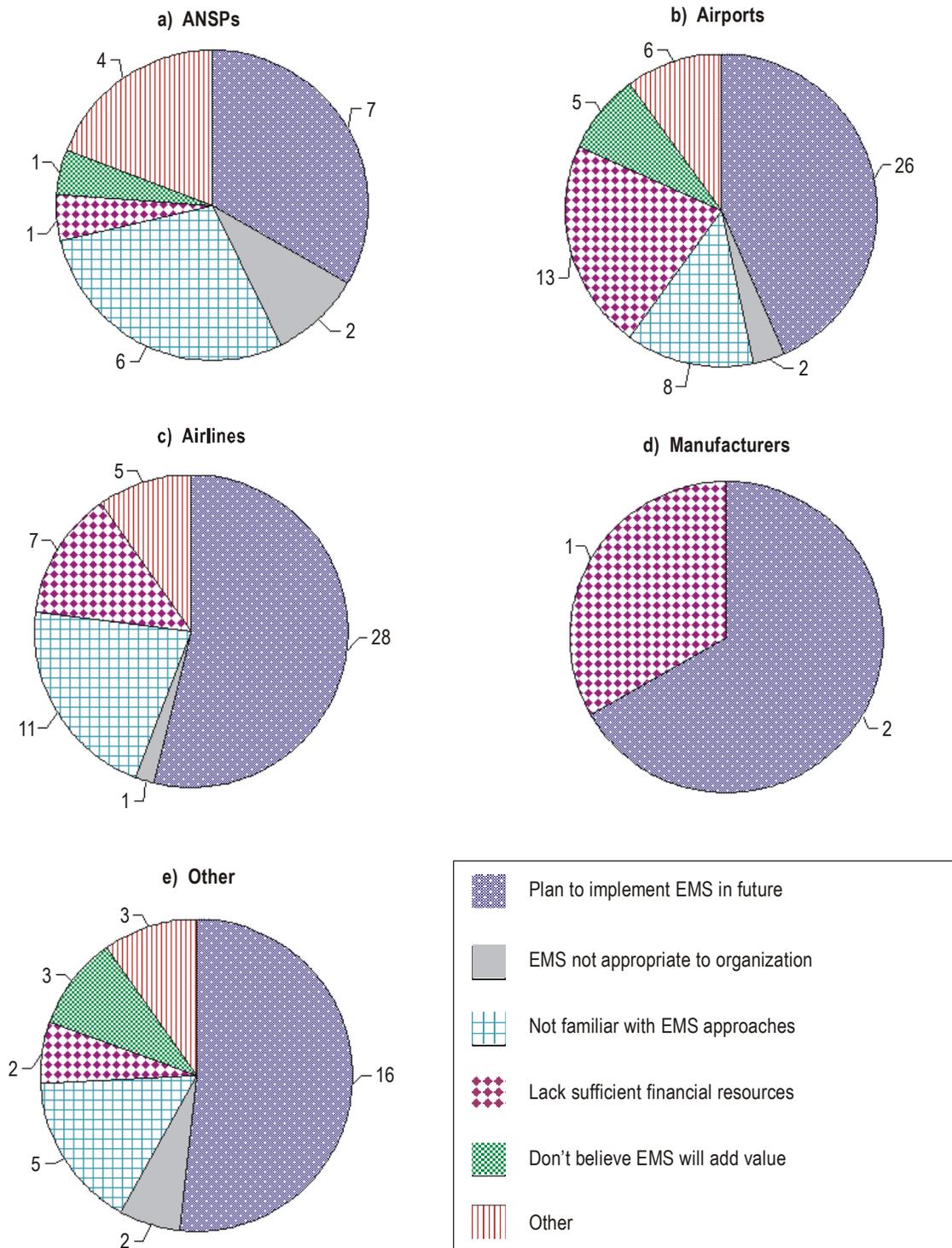
8.5.1 A variety of reasons exist as to why organizations do not apply EMS standards or guidelines. According to the respondents, most (79) plan to implement EMS in the future, with airlines (28) and airports (26) making up the majority.

8.5.2 The reasons why respondent organizations across the aviation industry do not apply EMS standards or guidelines are outlined in Figure 8-2, with the most frequent reason being that the organization is unfamiliar with the EMS approach. Of the five sectors, airlines (11) and airports (8) had the highest response rate.

8.5.3 Of the 116 respondent organizations that do not apply EMS standards or guidelines, 79 plan to implement them in the future. Table 8-4 outlines the top five environmental issues on which organizations would focus their EMS.

8.5.4 The environmental issues identified in Table 8-4 closely resemble the list of important regulated environmental areas in Table 8-3. According to respondents, air emissions was the most important issue, others included the consumption of fuel and energy.

8.5.5 In order to become more familiar with EMS, respondents requested guidance in EMS implementation. Figure 8-3 indicates that all the guidance materials suggested by the questionnaire could be useful in EMS implementation, with the most useful type that CAEP could provide being in the aviation industry.

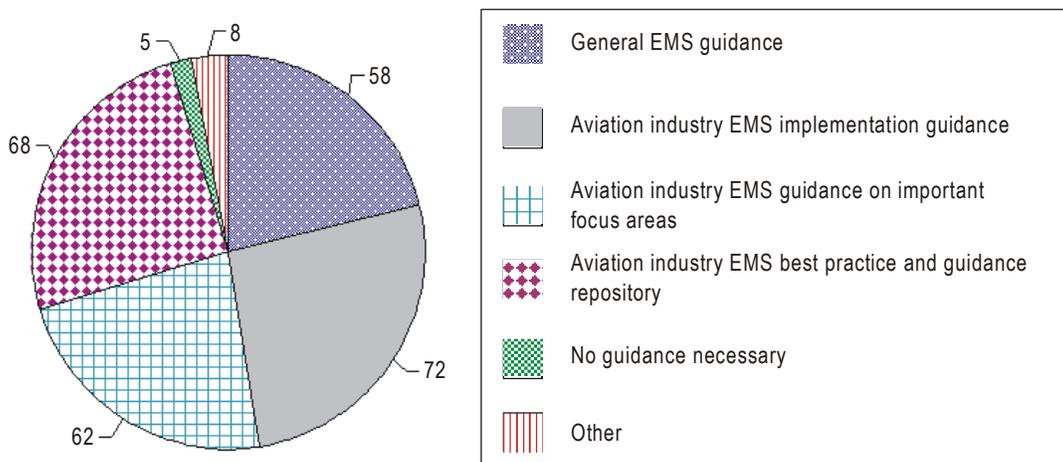


**Figure 8-2. Primary reasons for not applying EMS guidelines or standards cited by organizations within each aviation industry sector**

**Table 8-4. Top five environmental issues for inclusion in future EMS**

| <i>Important environmental issues</i> |     |
|---------------------------------------|-----|
| Air emissions                         | 73% |
| Hazardous/solid waste                 | 51% |
| Noise                                 | 50% |
| Fuel efficiency                       | 30% |
| Energy                                | 23% |

*Note.— Percentages are based on 86 respondents.*



**Figure 8-3. Usefulness of CAEP guidance types in assisting aviation industry organizations with EMS implementation.**

## Chapter 9

### RECOMMENDATIONS

The recommendations in a) and b) below are based on information summarized in the report and input from CAEP TG members. These recommendations focus on increasing awareness of EMS principles and best practices in the aviation sector, and establishing practical guidance to assist those States and organizations that chose to use EMS to enhance their management of environmental issues. Awareness and guidance materials should integrate existing ICAO environmental tools, guidelines and manuals. Where possible, they should encourage organizations to support higher-level ICAO environmental objectives, consider the collaborative nature of the aviation industry and account for variance in the types of organizations in the aviation sector and the level of the organization's EMS (or environmental programme) maturity.

- a) **Disseminate report information.** Within the first year of the CAEP/9 cycle, ICAO should make the information contained in this report publicly available. A report should be distributed specifically to CAEP States and observers and to all survey respondents.
- b) **Develop EMS guidance.** Stand-alone EMS guidance should be developed for the end of the CAEP/9 cycle to assist organizations to determine how EMS elements and principles can be used to enhance the way they manage environmental issues, and provide practical guidance on how these EMS elements and principles can be implemented/integrated into existing management systems and business processes.



## Chapter 10

### CONCLUSION

10.1 Over the past ten years, EMS implementation has been relatively consistent in the aviation industry. Approximately 50 per cent of respondents (117) applied EMS standards or guidelines, with the majority having an ISO 14001:2004 certified EMS in place. The remaining 116 respondents with other environmental programmes in place had many of the same principles and practices that are required for a formal EMS. For those organizations with an EMS, 82 per cent had additional management systems—approximately 51 per cent of these are integrated or coordinated with the organization's EMS.

10.2 Respondents indicated that it took 6 to 12 months on average to successfully develop and implement an EMS. Approximately 71 per cent of organizations had assistance with EMS implementation from a consulting or contracting firm. Respondents indicated that the three most common benefits of EMS implementation are enhanced reputation or image, enhanced compliance and mitigation of risk, and environmental improvements.

10.3 Regardless of whether the respondent had an EMS, measuring environmental performance was important for ensuring compliance. On average, the majority communicated environmental performance through a CSR report or their organization's website. Environmental areas of regulatory concern were primarily a focus of organizations regardless of whether or not they implemented an EMS. Seventy-nine respondent organizations without an EMS plan to implement one in the future and indicated that the most common reason for not implementing one was unfamiliarity with EMS approaches. As a result, they requested aviation industry specific EMS implementation guidance.

10.4 The recommendations were to disseminate the CAEP/8 EMS report to States, respondents and the public through various mechanisms, and consider development of EMS guidance, which should consider the collaborative nature of the aviation industry.



## Appendix

### REFERENCES

ICAO. *Assembly Resolutions in Force (as of 28 September 2007)* (Doc 9902). Montréal, September 2007. <[http://legacy.icao.net/icaone1t/dcs/9902/9902\\_en.pdf](http://legacy.icao.net/icaone1t/dcs/9902/9902_en.pdf)>

———. CAEP/7-WP/54, “Environmental Management Systems.” Montréal, February 2007.

———. CAEP8\_WG2\_LUPTG2\_WP03, “Update on Environmental Management System (EMS) Task.” October 2007.

———. CNS/MET-ATM-IP/33, “Environmental Issues Related to Implementation of CNS/ATM System.” Bangkok, July 2003. <<http://www.icao.int/icao/en/ro/apac/cnsmetsg7-cnsatmicsg10-2003/ip33.pdf>>

———. *ICAO Environmental Report 2007*. Montréal, 2007. <[http://www.icao.int/env/pubs/Env\\_Report\\_07.pdf](http://www.icao.int/env/pubs/Env_Report_07.pdf)>

International Organization for Standardization (ISO). ISO 14001:2004 — *Environmental management systems — Requirements with guidance for use*. November 2004.

— END —





ISBN 978-92-9231-834-5



9 7 8 9 2 9 2 3 1 8 3 4 5