The Status of Safety Management Systems at FAR Part 139 Airports

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Abstract

The purpose of this study was to determine the current status of SMS development and implementation at FAR Part 139 airports across the United States. Research questions addressed the following: How many FAR Part 139 airports are engaged in SMS development and implementation? What progress is being made toward SMS development or implementation, as reported by FAR Part 139 airports? What reasons do FAR Part 139 airports identify for not developing or implementing SMS? The researchers utilized a ten question survey questionnaire to address these questions. Descriptive methods of analysis were used. Seventy-four percent of the respondents reported that they currently maintain an aviation safety program, but are not engaged in SMS development or implementation. It appears that many survey respondents are not willing to engage in the development and implementation of SMS until the FAA provides further guidance and resources, or mandates SMS adoption.

Introduction

In 2005, the International Civil Aviation Organization (ICAO) required member states to develop and implement Safety Management Systems (SMS) (ACRP, 2012, p. 5). The ICAO standard applies to international airports and includes certificated airports. ICAO defines SMS as "A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures" (ICAO, 2013, xii).

Between 2007 and 2009 the Federal Aviation Administration (FAA) funded 4 pilot projects that involved the development and implementation of SMS components at selected Federal Aviation Regulation (FAR) Part 139 airports of various sizes (ACRP, 2012, pp. 6-7). The majority of previous research has examined the perceptions of pilot project airport participants; this study seeks to determine the current status of SMS development and implementation at FAR Part 139 airports across the U.S. This was accomplished through a comprehensive review of current literature related to FAR Part 139 airport SMS, including a description of SMS, a review of the four SMS FAR Part 139 pilot projects, and current SMS guidance available to FAR Part 139 airports. The research study also reports the findings of a ten-question online survey questionnaire.

Research Questions

This study reports the development and implementation status of SMS at FAR Part 139 certificated airports. Research questions include the following:
1. How many FAR Part 139 airports are engaged in SMS development and implementation?
2. What progress is being made toward SMS development or implementation, as reported by FAR Part 139 airports?
3. What reasons do FAR Part 139 airports identify for not developing or implementing SMS?

Literature Review

Aviation Safety Management has significantly evolved in the last fifty years. Historically, safety management and safety improvement involved a "fly-crash-fix-fly" approach (Stolzer, Halford, & Goglia, 2008). Safety Management Systems (SMS) is a recent approach to aviation safety management that attempts to utilize a more proactive and predictive approach to reducing aviation accidents. SMS can be thought of as a tool to translate an organization's concerns about safety into effective actions to mitigate hazards.   The FAA provides a framework for SMS in Advisory Circular (AC) 120-92A (2010), *Safety management systems for aviation service providers*. This Advisory Circular provides a uniform set of expectations for the aviation industry to follow during the adoption of SMS that is aligned with the format and structure set by the ICAO.

A brief overview of the four components of SMS and their elements needs to be discussed to understand the basic structure. The four components of SMS are policy and objectives, safety risk management, safety assurance, and safety promotion (ACRP, 2009). These components work together and contribute to the development of a positive safety culture within an organization.

The first component of SMS is policy and objectives. The management of an organization supports SMS by establishing policies and safety standards for the organization. The policy developed by management should establish the direction and guiding safety principles of the organization. The policy should improve communication to staff regarding the management's commitment to enhance safety (ACRP, 2009). Simply stated, a safety policy should describe the organization's overall approach to safety, while objectives should specify the desired outcomes the SMS is trying to achieve. Advisory Circular 120-92A defines an objective as "the desired state or performance target of a process. Usually it is the final state of a process and contains the results and outputs used to obtain the desired state or performance target" (p. 7).   Objectives give the organization measurable targets that can be achieved within a specified period of time.

The second component of SMS is safety risk management (SRM). A key philosophy within SMS is to manage risk proactively. Safety risk management seeks to identify hazards and systematically assess the risk associated with those hazards. Risk is considered to have two components; likelihood of an occurrence and severity of the occurrence as it relates to a hazard (AC 120-92A, 2010). Controls are then put into place to lower the risk to an acceptable level. After risk is mitigated, it is important to monitor the mitigation of the risk through its entire life cycle (ACRP, 2009). The five steps in the safety management process include a description of the system, an identification of the hazards, a determination of the risk, a risk analysis and assessment, as well as, the treatment and monitoring of the risk.

The third component of SMS is safety assurance. The AC 120-92A (2010) defines safety assurance as "a formal management process within the SMS that systematically provides confidence that an organization's products/services meet or exceed safety requirements" (p. 8). The component includes self-auditing, external auditing and safety oversight. The goal of safety assurance is to ensure the policies, procedures and activities implemented by management to improve safety are effective (ACRP, 2009). Data collection and analysis facilitate continuous improvement, which is a core concept of SMS, and safety assurance provides the tools necessary to accomplish this core concept.

The fourth and final component of SMS is safety promotion. The purpose of safety promotion is intended to support the development of a strong safety culture. Tools should be in place to help facilitate the transferring of important information to individuals within the organization regarding hazards and their associated risks. Training, education, and other means of communication are key elements of safety promotion (ACRP, 2009).

All four of these components must exist and be executed for an effective SMS to exist within an organization. All four components rely on the existence and effectiveness of the other components. A strong safety culture is an integral part of SMS. An organization cannot have a successful SMS without the existence of a strong safety culture; invariably a strong safety culture helps in the development of SMS (Stolzer et al., 2008).

The FAA is now following ICAO's lead and is encouraging the aviation industry in the United States to adopt SMS. The FAA has sponsored four pilot studies involving the development and implementation of SMS at FAR Part 139 airports. Thirty-one FAR Part 139 airports throughout the U.S. participated in these pilot studies. "Beginning in April 2007 and concluding in early 2012, FAA provided opportunities for U.S. airports to gain knowledge and provide information and feedback to FAA by conducting SMS airport pilot studies" (ACRP, 2012, p. 2).

The first and second pilot studies were conducted in 2007, 20 airports received Airport Improvement Program (AIP) grants to fund the conduct of a program gap analysis and develop their SMS Manual (ACRP, 2012). The third study initiated on July 2008, was designed to gather information on scalability and how smaller airports could implement

SMS. The fourth study conducted in 2009, was an implementation study where 11 of the original 20 airports from the first and second study participated. This study investigated how airports implement the elements of Safety Assurance and Safety Risk Management at their respective airport environments (FAA, 2014).

In 2012, the Airport Cooperative Research Program (ACRP) sponsored a study titled ACRP Synthesis 37: Lessons Learned from Airport Safety Management Systems Pilot Studies, to provide FAR Part 139 airports with data and experiences from the four FAR Part 139 pilot studies previously mentioned. The Synthesis researchers surveyed the 31 airports to organize lessons learned, general findings, and trends. The researchers developed and conducted a 36-question survey that included such topics as including program logistics, planning, staffing, and SMS integration and implementation (ACRP, 2012).

Airport Cooperative Research Program Synthesis 37 identified many lessons learned. Airports participating in the study found that SMS development and implementation had many benefits, as well as challenges. Twenty-four of the 26 airports that participated in the study said they would continue to pursue the adoption of SMS. Some airports reported that SMS improved communication and increased safety awareness through data collection and trend analysis. In spite of these benefits, other airports indicated they were waiting for a final mandate from the FAA to officially assign staff and budgets to SMS development and implementation. "Airports are awaiting additional resources and forthcoming SMS guidance from FAA" (ACRP, 2012, p. 12).

Methodology

This exploratory study utilized a thorough literature review combined with a ten question survey questionnaire developed by the authors. Descriptive methods of analysis were used. Gliner, Morgan, and Leech (2009) define the descriptive approach to research as an approach "that answers descriptive questions using only descriptive, not inferential, statistics; summarizes data from the current sample of participants without making inferences about the larger population of interest; no comparisons or associations are made; does not have an independent variable" (p. 430). The study population consisted of 468 of the 542 FAR Part 139 airports in the U.S. Currently there is no comprehensive email list for all FAR Part 139 airports. The researchers were able to compile an email list of 468 of the 542 Part 139 airports. Four e-mail addresses were identified and returned as invalid. Of the 464 airports that were emailed a survey, 174 responded for a response rate of 37.5%.

All of the airports on the list were provided a cover letter and granted access to an online survey via survey monkey. The survey questionnaire was reviewed and approved by the Southern Illinois University (SIU) Human Subjects Committee. The airports were given an option to remove themselves from the email list and to receive no further communication from the researchers. The cover letter asked that the individual responsible for safety complete the survey. Survey participants were notified that their participation

was voluntary. The survey was emailed to participants on two separate occasions spaced three weeks apart. The survey questionnaire can be found in Appendix A.

Findings

The findings section will address survey questionnaire responses. The first question sought to determine where the airport was located. The 169 survey respondents who answered this question represented 44 U.S. states. The states with 10 or more respondents were Texas 14 (8.28%), Florida 12 (7.1%), California 12 (7.1%), and Michigan 10 (5.92%).

The second question asked the participants to identify the classification of their airport. Thirteen respondents did not answer this question. Of the 161 that responded 97 (60.25%), were identified as Class 1 airports, 20 (12.42%) were Class 2 airports, 14 (8.70%) were Class 3 airports, and 30 (18.63%) were Class 4 airports. These results were close to the proportion of the classes of airports in the U.S., Class 1 (64%), Class 2 (15%), Class 3 (6%) and Class 4 (15%).

Question three asked respondents to rate their knowledge of SMS. The rankings included No Knowledge, Some Knowledge, Knowledgeable, Very Knowledgeable, and SMS Expert. One hundred sixty-six (166) of the 174 respondents answered this question. Ninety-four (56.63%) of respondents reported that they possessed "Some Knowledge." Fifty (30.12%) reported that they were "Knowledgeable." Fifteen (9.04%) reported that they were "Very Knowledgeable." Two (1.2%) reported that they were an "SMS Expert," while 5 (3.01%) reported that they had "No Knowledge" of SMS.

Question four asked respondents to rate their organization's willingness to pursue SMS. Nine (9) respondents elected not to answer this question. Figure 1 shows the response distribution of question 4.
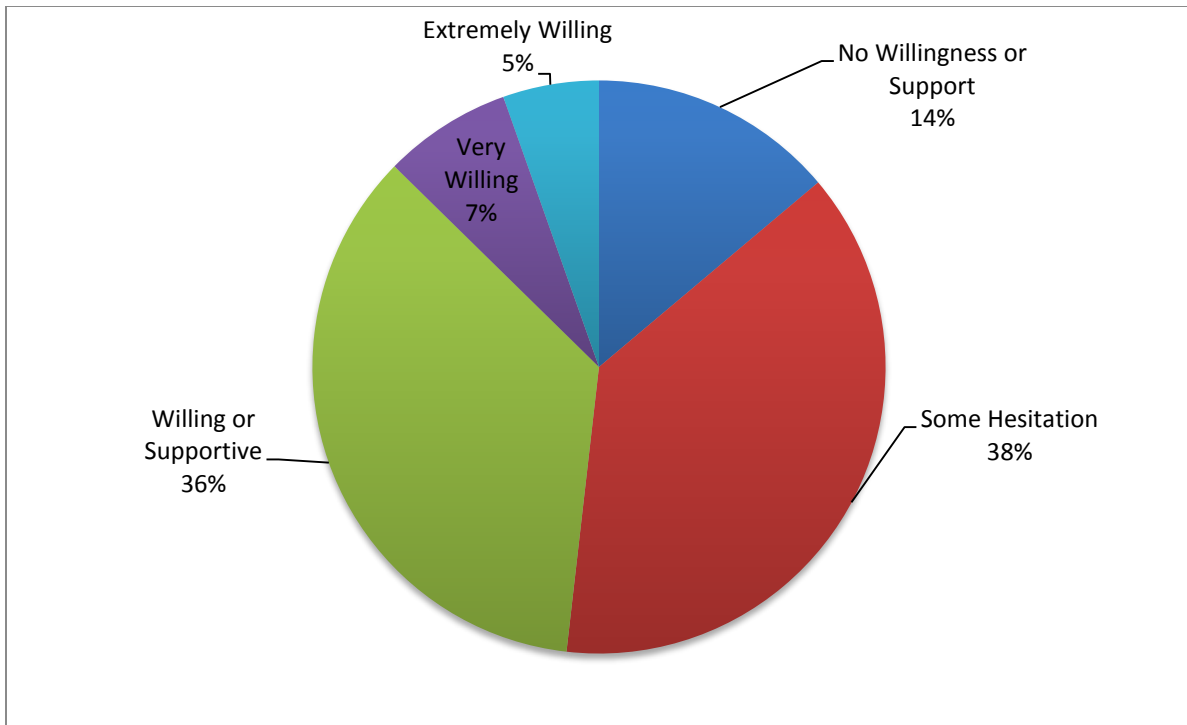
Figure 1. How would you rate your organization's willingness to pursue SMS?

Question five asked respondents how familiar they were with documents that applied to SMS for airports. One hundred thirty-two (75.86%) of the 174 participants answered this question. The documents listed were Advisory Circular AC 120-92A; AC 150/5200-37; ACRP Report 1: Safety Management Systems for Airports, Volume 1: Overview; ACRP Report 1: Safety Management Systems for Airports, Volume 2: Guidebook; and ACRP Synthesis 37: Lessons Learned from Airport Safety Management Systems Pilot Studies. Table 1 shows the response distribution for this question.

Table 1

Are you familiar with any of the following documents that apply to Airport SMS?

Documents	Responses
AC 150/5200-37	113 (85.6%)
ACRP Report 1: Volume 1: Overview	77 (58.3%)
ACRP Report 1: Volume 2: Guidebook	60 (45.5%)
AC 120-92A	54 (40.9%)
ACRP Synthesis 37	44 (33.3%)

Question six asked what type of safety program was in place at their respective airport. Thirteen (13) of the 174 respondents elected to not answer this question. Figure 2 shows the response distribution to this question.
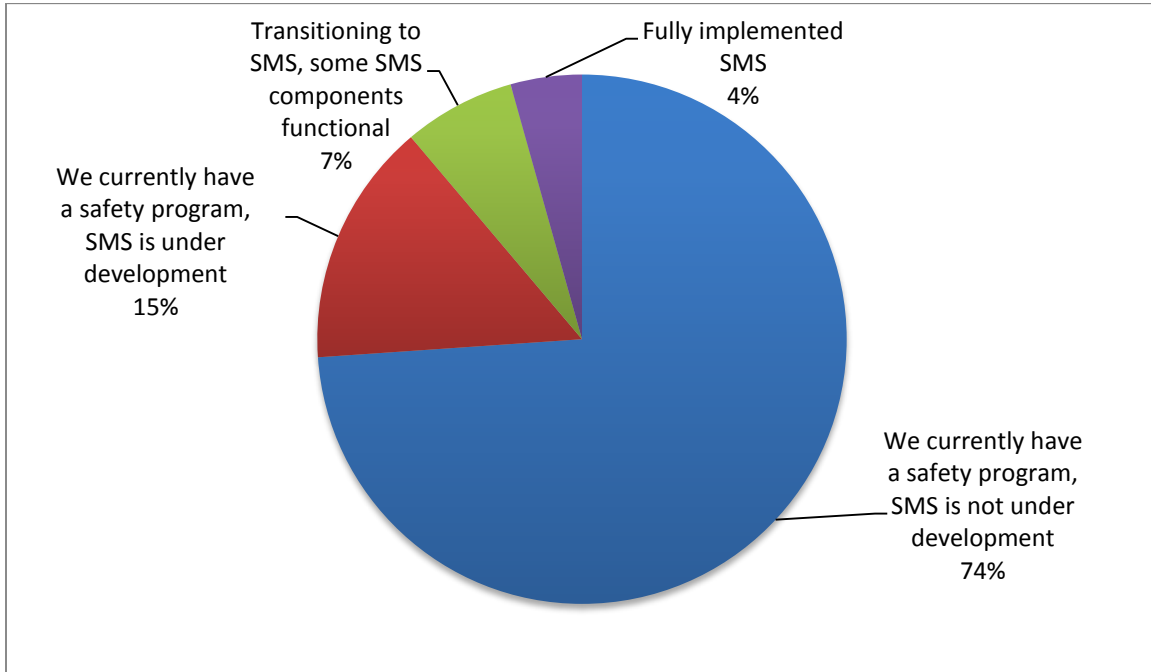

Figure 2. How would you describe your airport's current safety program?

Question seven asked respondents that if SMS was to be implemented in the future, at what point would they expect to have SMS fully in place. One-hundred forty-nine respondents (149) answered this question (86%). The choices ranged from within a year, 2-3 years, more than 3 years, and no idea. Ten (6.71%) said they would have SMS fully implemented within a year, 48 (32.21%) said 2-3 years, 29 (19.46%) said more than 3 years and 62 (41.61%) had no idea.

Question eight focused on those airports that said SMS was not under development. The question specifically attempted to identify what safety components the airport presently had in-place. One hundred thirty-seven (137) respondents (79%) answered this question. Table 2 shows the response distribution to question 8.

Table 2

Answer this question if SMS is not under development. Examining your current overall safety program, which of the following safety components are in place at your airport? (Check all that apply).

Components	Responses
Emergency Planning and Response	135 (98.6%)
Safety Training	120 (87.6%)
Safety Documentation	96 (70.0%)
Safety Promotion	82 (59.9%)
Safety Policy and Objectives	80 (58.4%)
Safety Committee	67 (48.9%)
Paper Reporting	64 (46.7%)
Regular Safety Audits	53 (38.7%)
Confidential Hazard Reporting and Tracking	34 (24.8%)
Web Based Reporting	18 (13.1%)

Question nine asked respondents that are in the process of developing or have implemented SMS specifically what SMS elements are in-place or have been completed? Thirty-two (32) of 174 respondents answered this question. Table 3 shows the response distribution for this question.

Table 3

Answer this question if SMS is under development. If you are developing or have implemented SMS at your airport which of the following components are in place or have been completed? (Check all that apply)

Elements	Responses
Safety Risk Management Processes	21 (65.7%)
Preliminary Gap Analysis	16 (50.0%)
SMS Training	16 (50.0%)
SMS Manual	14 (43.8%)
Regularly Conduct Safety Risk Assessments (SRA)	14 (43.8%)
SMS Promotion	13 (40.6%)
Safety Assurance Processes	11 (34.4%)
Detailed Gap Analysis	10 (31.3%)
Confidential Hazard Report Tracking and Documentation	10 (31.3%)
SMS Implementation Plan	10 (31.3%)

Finally, question ten of the survey asked, "If your organization is not considering the adoption of SMS, please indicate why." Seventy-six (76) of 174 respondents answered this question. The options given were "Lack of Funding", "Lack of Sufficient Manpower", "Liability Issues", "SMS is a waste of time", and "Increased Government Intervention." Table 4 shows the response distribution for this question.

Table 4

If your organization is not considering the adoption of SMS, please indicate why. (Check all that apply)

Reasons	Responses
Lack of Sufficient Manpower	61 (80.3%)
Lack of Funding	52 (68.4%)
Increased Government Intervention	30 (39.5%)
Liability Issues	12 (15.8%)
"SMS is a Waste of Time"	11 (14.5%)

Discussion

The following observations address the three research questions associated with the study, and provide the basis for the study's conclusions.

Research Question One

"How many FAR Part 139 airports are engaged in SMS development and implementation?" Based on the survey responses to question six, 74% percent or 119 of the 161 respondents reported that they currently maintain an aviation safety program, but are not engaged in SMS development or implementation. Thirty-five (35) respondents (22%) reported that their SMS was either under development, or they were in the process of transitioning to SMS and several SMS components/activities were functional. Seven (7) respondents (4%) reported that their SMS was fully implemented. This finding indicates that while respondents place a significant value on the inherent benefits of an aviation safety program, they did not believe that SMS development and implementation were critical to the maintenance of aviation safety.

Research Question Two

"What progress is being made toward SMS development and implementation as reported by FAR Part 139 airports?" Thirty-five respondents (22%) reported that SMS development, or some transition to SMS was underway within their organization on survey

question six. An additional seven (7) respondents (4%) indicated that SMS had been fully implemented at their facility. On survey question eight, 137 of all survey respondents (79%) indicated that they already had at least one of the following SMS components and/or activities in-place: safety committee, confidential hazard reporting system, safety promotion, safety training, safety documentation, emergency planning, safety audits, safety policy, and objectives.

According to survey question three, 161 of all survey respondents (93%) reported possessing some level of knowledge regarding SMS. However on survey question seven, 29 respondents (17%) reported that SMS implementation would take more than three years to conduct. Sixty-two (62) respondents (36%) reported that they had "no idea" of when implementation would take place. While the majority of respondents (93%) report possessing some level of knowledge related to SMS, and on survey question nine, 79% of all survey respondents report currently being engaged in a large variety of required SMS functions and/or activities, they appear reluctant to fully adopt an SMS program. Why? The answers to our third research question respond to this issue.

Research Question Three

"What reasons do FAR Part 139 airports identify for not developing or implementing SMS?" On survey question ten, 76 respondents (44%) reported that their reasons for not developing and implementing SMS, which included: lack of funding, insufficient manpower, resistance to increased government intervention, liability issues, and the perception that "SMS is a waste of time." Additionally, ACRP Synthesis 37 (2012) reported several challenges experienced by SMS pilot project airports attempting SMS development including, lack of FAA support/resources, lack of management support and stakeholder "buy in" (p. 46). ACRP Report 1, Safety Management Systems for Airports (2009) lists several common challenges associated with SMS implementation including: management commitment, behavioral change, maintaining momentum, and cultural characteristics (pp. 59-60). It would appear that despite the documented benefits of SMS, survey respondents and SMS documents indicate that significant challenges exist with regard to developing and implementing SMS. For example, only half of the airports that responded that they were in process of SMS implementation said they had performed a preliminary gap analysis. This is an important step considered regulatory by ICAO.

Conclusions

Safety Management Systems are regarded as one of the aviation industry's most prevalent safety initiatives. Survey questionnaire data analysis indicates that FAR Part 139 certificated airports throughout the U.S. hold aviation safety in high regard. Many of the airports that participated in this study maintain safety components and perform safety activities in their existing safety programs that reflect many of the required components of SMS.   As such, they do not feel aviation safety hinges on the development and implementation of SMS. It appears that many survey respondents are not willing to engage

in the development and implementation of SMS until the FAA provides further guidance and resources or mandates SMS adoption. There are many reported challenges that are perceived to exist with the development and implementation of SMS. Having participated in the development of two airport SMS Manuals, and the implementation of one SMS, two of the researchers can attest to some of the challenges reported in this study. However, through this experience it was also discovered that several of these challenges could be overcome by developing creative solutions. The FAA has not mandated the development and implementation of SMS, but it does encourage the voluntary adoption of the safety initiative. The FAA believes that SMS provides airports with an added "layer of safety" (Safety Management System for Certificated Airports, 2010, p. 62,009). On the other hand, the results of this study indicate that airports are not wholly convinced that SMS is a significant improvement over their existing safety programs. As such, many survey respondents have adopted a "wait and see" approach to SMS development and implementation.

Recommendations

As this was an exploratory study, it was determined that descriptive methods of analysis were appropriate for reporting the data. The researchers believe that the survey data warrants additional analysis and the following research studies are recommended.

1. A research study that categorizes respondents by class of airport, and examines survey responses from different classes of airports using statistical analysis. How do the perceptions and attitudes of different classes of airports vary toward the development and implementation of SMS?

2. A research study that classifies respondents by geographic region, and compares survey responses from airports located in different regions of the U.S. How do the perceptions and attitudes of airports located in different regions of the U.S. vary toward the development and implementation of SMS?

3. A research study that examines the types of resources dedicated to SMS development and implementation by airports of varying size and complexity. A study of this nature would assist in addressing SMS scalability concerns based on specific airport characteristics.

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Appendix A

1. Please Classify for your Part 139 airport.
   - Class I
   - Class II
   - Class III
   - Class IV

2. In what state or U.S. territory does your airport reside?

3. How would you rate your knowledge of Safety Management Systems?
   1. No knowledge
   2. Some Knowledge
   3. Knowledgeable
   4. Very Knowledgeable
   5. SMS Expert

4. How would you rate your organization's willingness to pursue SMS?
   1. No willingness or support
   2. Some hesitation
   3. Willing or supportive
   4. Very willing
   5. Extremely willing

5. Are you familiar with any of the following documents that apply to Airport SMS? (Check all that apply)
   - AC 120-92A Introduction of Safety Management Systems for Air Operators
   - AC 150/5200-37 Introduction to Safety Management Systems for Airport Operators
   - ACRP Report 1: Safety Management Systems for Airports, Volume 1: Overview
   - ACRP Report 1: Safety Management Systems for Airports, Volume 2: Guidebook
   - ACRP Synthesis 37: Lessons Learned from Airport Safety Management Systems Pilot Studies

6. How would you describe your airport's current safety program?
   - We currently have a safety program, SMS is not under development
   - We currently have a safety program, SMS is under development
   - Transitioning to SMS, some SMS components functional
   - Fully implemented SMS

7. If your organization plans to implement an SMS, by when would you expect that your organization plans to have the SMS fully in place?
   - Within a year
   - Within 2-3 years
   - More than 3 years
   - No idea

Answer this question if SMS is not under development
8. Examining your current overall safety program, which of the following safety components are in place at your airport? (Check all that apply)
   - Safety Committee
   - Safety Policy and Objectives
   - Confidential Hazard Reporting and Tracking
     - Paper
     - Web Based
   - Safety Training
   - Safety Documentation
   - Emergency Planning and Response
   - Safety Promotion
   - Regular Safety Audits
   - Other_____

Answer this question if SMS is under development
9. If you are developing or have implemented SMS at your airport which of the following components are in place or have been completed? (Check all that apply)
   - Preliminary Gap Analysis
   - Detailed Gap Analysis
   - SMS Manual
   - SMS Training
   - SMS Promotion
   - Safety Risk Management Processes
   - Regularly Conduct Safety Risk Assessments (SRA)
   - Safety Assurance Processes
   - Confidential Hazard Report Tracking and Documentation
   - SMS Implementation Plan
   - Other_____

10. If your organization is not considering the adoption of SMS, please indicate why.
    (Check all that apply)
    - Lack of funding
    - Lack of sufficient manpower
    - Liability issues
    - "SMS is a waste of time"
    - Increased government intervention
    - Other_____