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A Gap Analysis of Airport Safety Using ICAO SMS Perspectives: A Field Study of Taiwan

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Abstract

Safety is critical to the success of the aviation industry, and as it continues to develop worldwide and link more people and places, how aviation safety is standardized has been and will continue to be a global concern. The International Civil Aviation Organization (ICAO) has developed a comprehensive framework for safety management at airlines and airports, known as *Doc. 9859 Safety Management Manual* (SMM). Safety Management Systems (SMS) have since been required to be implemented by all ICAO member states beginning January 2010. Taiwan, administered by the Republic of China (ROC), is in a unique position as a non-member state of ICAO that is strongly connected to the world's aviation system. Using the Delphi Technique and convenient sampling, this research is a case study of how aviation safety is managed at a major international airport in Taiwan with respect to ICAO's SMS standards. Interviews and focus groups were conducted with participants from three major organizations operating at the surveyed airport: air traffic controllers, the airport management company, and a ground services provider. Results found that despite Taiwan's non-member status with ICAO, safety management was very consistent with ICAO SMS standards, especially in the areas this study focused on: safety policy and objectives, safety risk management, safety assurance, and safety promotion.

Keywords: SMS, Taiwan, safety management, aviation safety, safety management system

Introduction

In July 2011, a woman slipped under a barbed wired fence in the middle of the night, drove a truck in which staff had apparently left keys, and entered an airplane cockpit. Early in 2010, a terminal jet bridge collapsed and, in early 2011, a luggage truck driven by ground crews struck the engine cowlings of an airline's cargo plane. As airport operations are

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complex, and high-profile incidents receive intense scrutiny from the public and media, airport employees indeed play a critical role in upholding operational safety. To actively engage every airport worker in managing safety, the International Civil Aviation Organization (ICAO), an aviation-specialized agency of United Nations (UN), has started to promote Safety Management Systems (SMS) to its members by introducing a guidebook in 2006, *Doc. 9859: Safety Management Manual* (SMM). All ICAO members are required to implement Doc. 9859 at airlines and airports after January 2010 and a periodic report is mandatory and enforced by ICAO. While Taiwan is not a member of UN, how Taiwan's airports comply with ICAO rules is an important issue due to Taiwan's strong accommodation of international flights and international economic ties. This research is a case study of how airport safety is managed in Taiwan.

The Research Airport

The research airport is a large international airport in Taiwan. Airline services are provided by more than 30 carriers, and four airlines have significant operations at the research airport: China Airlines, EVA Airways, Transasia Airways, and Far Eastern Airlines. The former two airlines provide long-haul international service to North America, Europe, and Australia, and all four provide strong regional service within Southeast Asia. Recently, due to the improving relationship with mainland China, all air carriers have increased direct cross-strait flights to more than 15 cities in China. Nearly all flag carriers (airlines representing the states they serve) within Asia fly directly to this research airport. In addition, the research airport has seen an increase of service from low-cost carriers (LCCs), providing service primarily to Southeast Asia and Japan. Four United States carriers also provide service to this airport, as well as several European air carriers (Civil Aeronautics Administration of Taiwan, n.d.).

The research airport has a variety of other aviation-related businesses, organizations, and stakeholders. This airport has two large-scale ground service providers that provide support service for airlines. These include catering, aircraft marshalling, and baggage handling. Air traffic control (ATC) services, administered by Taiwan's Civil Aeronautics Administration (CAA), are also a significant part of this airport's operation. ATC is comprised of four services: tower (local) control, approach control, clearance delivery (providing route clearances to departing aircraft), and ground control (overseeing aircraft movement on the ground). Approach control is the only ATC service not directly connected to the research airport. It is located off-site, and provides control services to airplanes in the general metropolitan area (including those going to/coming from another major airport) as well as transiting aircraft that traverse its airspace.

Other businesses and organizations related to the research airport include customs and immigration authorities, vendors, ground transportation services providers, and security staff.

Purpose of the Study

The purpose of this study was to understand safety management at a major airport in Taiwan. ICAO has provided clear and specific guidelines for the establishment, management, and continuous improvement of Safety Management Systems, and this study aimed to determine the research airport's level of compliance with those standards (despite Taiwan's non-obligation to follow them). As this airport is among the busiest commercial airports in Taiwan, understanding how its safety program is managed and operated at this airport will provide significant insight as to Taiwan's attention and dedication to safety and safety management, which is critical to the success of a high-risk, high-consequence industry such as aviation.

Literature Review

In the aviation industry, the ICAO Safety Management Manual (SMM) is the global guide to designing and implementing SMS by aviation organizations worldwide. The ICAO SMM covers a wide variety of topics, including, but not limited to, basic safety theories, system safety concepts, and a process for SMS implementation. The ultimate aims of the ICAO SMM are an integration of safety management systems and a positive working safety culture within an organization (ICAO, 2009). More specifically, the content of the SMM includes the definition of risk, safety performance, acceptable levels of risk, individuals' responsibilities, regulatory compliance requirements, safety education, risk management and hazard reporting system, audits and monitoring, and risk analysis and investigation.

The idea behind SMS is to use a transparent system of policies and procedures to combat threats to safety and mismanagement of safety-related issues. This is one of the first attempts at a global aviation safety management standard. There are two different areas of SMS: a structural component and an operational component. The structural component outlines the physical composition of the system, including policies and guidelines, while the operational component refers to the day-to-day activities and actual functions of the SMS (Lowe, 2008). Overall, Safety Management Systems can be described in four major areas: Safety policy and objectives, safety risk management, safety assurance, and safety promotion. These categories are explored further and will be discussed in the methodology of this study.

A critical factor that ties the entire safety management system together is how to challenge the current safety

culture in a way that inspires all members of the organization to redefine their behaviors reflecting the importance of safety. This will ultimately put pressure on employees to constantly improve safety and benefit the organization as a whole. Along these lines, ICAO (2010) defines culture as “collective programming of the mind” (p. 2–23). There are three organizational structures: national, organizational and professional, all of which are influenced by culture, on the organizational and local levels. Upper management has the power to develop an organization’s culture, especially relating to safety, through its actions and adherence to its own practices and beliefs (ICAO, 2010).

In 2007, ICAO amended Annex 14 to require airports with international operations to incorporate safety management systems into their normal practices (Federal Aviation Administration, 2007). In 2007, the Federal Aviation Administration (FAA) published an advisory circular regarding the introduction of safety management systems at airports. Although SMS is not currently required by law

in the United States, the FAA (2007) does believe SMS has the potential to significantly reduce the likelihood of a serious accident or incident at airports. In Advisory Circular AC 150/5200-37, the FAA focuses specifically on the importance of safety culture. It states, “The attitudes, decisions and methods of operation at the policy-making level, demonstrate the priority given to safety” (FAA, 2007, p. 2). It is essential for top-level management to be heavily invested in safety for both policy and attitude. Management’s written policies do not influence the culture of the organization if employees do not believe they are met with equivalent action. It takes a proactive stance throughout the entire company to change or create a safety culture. Safety culture “concerns the requirement to not only perceive safety issues but also match them with appropriate action” (FAA, 2007, p. 2).

Advisory Circular (AC) 150/5200-37 also provides a recommended flow of information pattern, shown below (See figure 1). This image shows a visual display of the recommended structure of an SMS for an airport, and

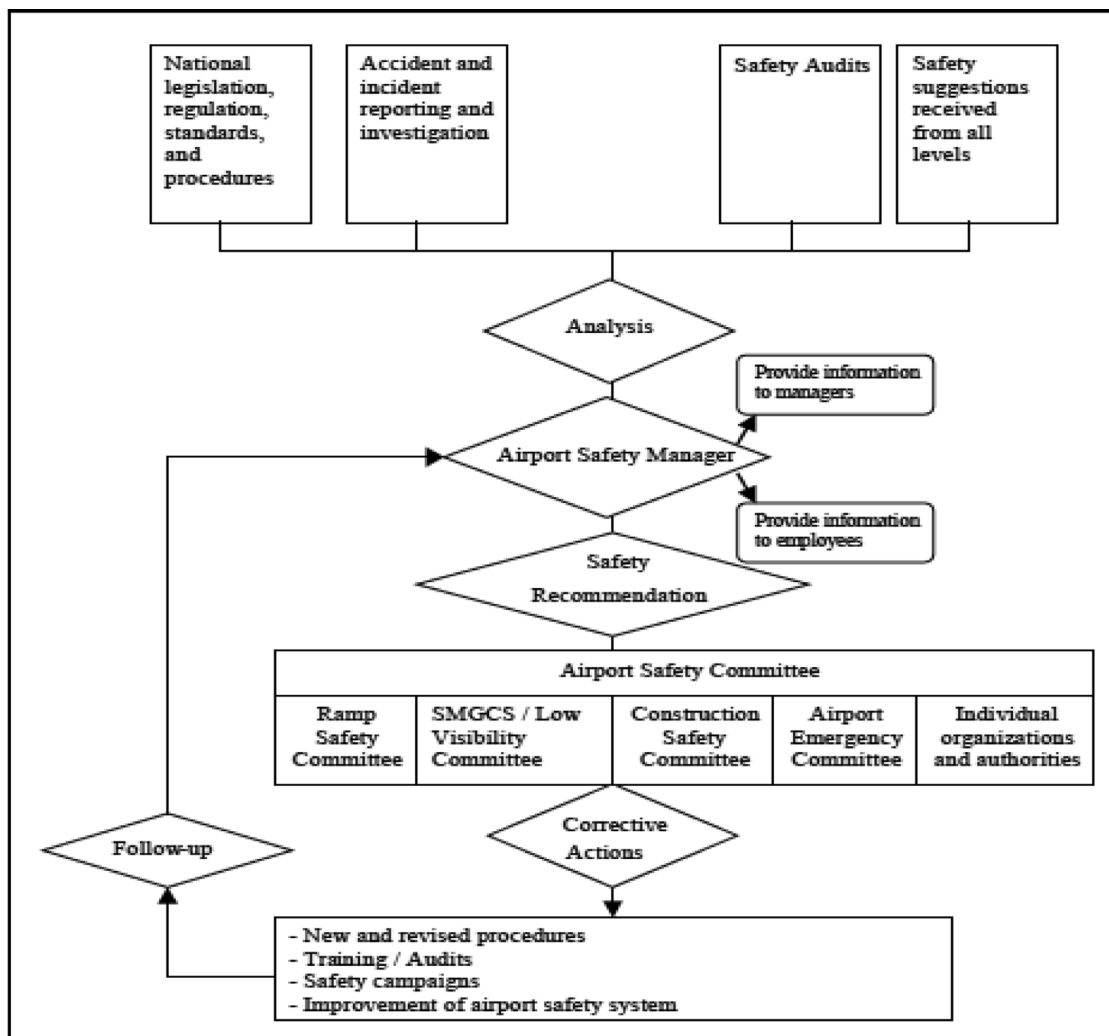


Figure 1. SMS Lifecycle Overview (FAA, 2007).

exhibits the recursive review of information by combining a hazard reporting system with safety risk monitoring.

It is important that the SMS addresses hazards as well as risks, and individuals implementing SMS should work with those who will be involved with hazard identification and risk assessment. As the process is developed, it is extremely important that feedback is received. Continuous monitoring and improvement are the only ways to ensure the system develops and resolves issues. An important element that improves the system is a voluntary hazard reporting system, which includes several key aspects of employee participation in a successful safety management system. A reporting system should be non-punitive in nature because fear of repercussions from reporting can discourage employees from utilizing the system. In the advisory circular, the FAA explains, "Through regular review and evaluation, management can pursue continuous improvements in safety management and may revise safety objectives to ensure that the SMS remains effective and relevant to the organization's operation" (FAA, 2007, p. 7).

Safety promotion is, as defined by the advisory circular, "a combination of safety culture, training, and data sharing activities that supports the implementation and operation of an SMS in an organization" (FAA, 2007, p. 1). For example, it is fundamentally important to ensure the training and education of all the employees to the specific conditions and environment in which they will be working. Communication must be accomplished from an organizational standpoint as well, through official communication channels so all employees receive clear and consistent information. This should be established through the use of seminars, bulletins, websites and any other means to constantly convey information (FAA, 2007). As previously discussed, so much of a successful SMS is grounded in the fact that people participate actively in it; therefore, effective communication and the alignment of upper management and lower level employees on safety values are critical.

Previous studies have looked at how safety is managed in the airport environment. Some examples of safety management at airports before the development of Safety Management Systems even include elements that were later incorporated in the SMS model. Hale (2001) examined how Schiphol Airport serving Amsterdam redesigned its approach to safety management after a fatal accident. The process included the development of an "Advisory Committee" which functioned essentially as a predecessor for the safety committee outlined by the ICAO SMM. It was ". . . designed to be independent, so as to reassure the public about the openness and transparency of the airport regulatory and control system" (Hale, 2001, p. 130). The committee handled basic safety review and risk assessment and was a worthy addition to the airport's safety management program.

Furthermore, the airport incorporated a sophisticated risk assessment modeling system. Using somewhat of a risk

assessment matrix, it incorporated accident and incident rates from North America and Europe, which were controlled for geographical conditions, weather, and airport layout factors that are inapplicable to Schiphol Airport, to determine "risk contours" for decision making.

Incorporating these elements of safety management proved to be a good improvement for Schiphol airport, and other studies have found safety management principles later included as part of SMS to be valuable. Remawi, Bates, and Dix (2011) found that implementing a Safety Management System in the Sharjah Airport in the United Arab Emirates was valuable not only for safety management, but the development of a positive safety culture. They concluded "the introduction of an SMS will influence the attitude of employees" (p. 632) and that safety culture improved at the airport.

There are, nonetheless, challenges in the implementation of SMS in aviation organizations. Leib, Lu, Sun, and Spence (2012) found challenges to SMS implementation and development in Mainland China, especially in regards to safety culture. They concluded, "Chinese aviation organizations appear to have solid procedures and policies consistent with international SMS standards as outlined by ICAO, but may not be fully utilized due to reduced employee involvement in the SMS" (Leib et al., 2012, p. 36). Given the cultural similarity of Mainland China and Taiwan, the potential challenges of safety culture development further justify the need to investigate Safety Management System implementation level at airports and other aviation organizations in Taiwan.

Research Questions

Clearly SMS is a developed framework for assessing, mitigating, and review hazards, and despite being a requirement only for ICAO member states, is a valuable addition to all aviation safety programs. Therefore, this study poses the following research questions in relation to SMS development for the safety program at the research airport:

- To what extent does the research airport implement ICAO SMM standards?
- What safety policies does the research airport management say they have in place?
- How do stakeholders in aviation safety at the research airport say they participate with safety management?
- How are risks identified and managed at the research airport?
- How is safety promoted at the research airport?

Because all of ICAO's members must review Taiwan's airport standards in order to sign the treaty of freedoms for foreign airlines to operate to and from Taiwan, how Taiwan maintains and meets the international standards is a highly researchable issue. While human operators are the most

important variable in an organizational management equation, how Taiwan's airport workers adequately perform under an international standard should be revealed. In particular, after the privatization of the research airport, strategic plans used by the management group to maintain the international standard should be discussed.

Methodology and Research Framework

This study was qualitative in nature and utilized interviews with participants to answer the research questions. In addition to interviews, researchers conducted on-site visits and focus group discussions. Interview and focus group questions were developed to determine how the airport's safety program(s) compared to ICAO SMS and specifically were aiming at the four major areas of SMS development. These include safety policy and objectives, safety risk management, safety assurance, and safety promotion. These questions were based on the ICAO Gap Analysis Survey, a checklist for determining compliance with ICAO SMS regulations for aviation service providers.

Sample

The sample for this study was a group of aviation safety stakeholders (participants) representing three major areas of direct aviation safety involvement: ground services providers, the airport management company, and air traffic controllers. Participants have a working knowledge of safety management at the research airport and have leadership roles in their safety programs. All participants were aviation safety managers in various aspects of operations in and around the research airport. Participants were identified through contacting major aviation organizations at the research airport and contacting safety managers who volunteered to participate in the study. Some participants were interviewed on multiple occasions due to time constraints, but ultimately followed the same interview questions and subsequent follow-up questions.

Data Collection

Interview questions were intentionally open and semi-structured to provide participants the opportunity to elaborate on the safety program at the airport without restricting their responses to detailed specifics of SMS. In this way, questions assessed their safety program without the presumption that it was an ICAO SMS. Examples of questions included:

What kinds of reporting systems are there and how are they accessed?

Possible follow up questions:

- What information is required for a hazard report?
- What are some statistics on the hazard reports?

- What is the flow of information?
- Describe anonymity and related issues.

What forms of risk analysis are at the airport/in your company?

Possible follow up questions:

- How are risks identified?
- Is there a safety committee?
- Please describe its composition and frequency of meetings.

These semi-structured interviews provided an opportunity for participants to describe the airport safety program without forcing them to discuss areas that may not be relevant. The interviews were all conducted face to face, and were designed to take approximately 30 minutes, although time was allowed for further discussion if necessary.

Results and Analysis

Researchers were able to conduct interviews with 12 participants (some individuals were interviewed regarding different topics on multiple occasions) from three different aviation organizations at the research airport representing a total of 20 interview hours. These organizations include air traffic control, ground services, and airport management. The interviews and group discussions took place over more than 10 on-site visits to the research airport. Interviews were semi-structured to the previously determined list of questions but allowed for follow up sub-questions. Responses were coded according to how the answer addressed various SMS categories based on the research questions: safety policy and objectives, safety risk management, safety assurance, and safety promotion. The analysis section looks at each of these areas separately and explains how the research airport was meeting the demands of those areas according to the ICAO SMM.

Safety Policy and Objectives

Because the research airport is privately owned, it would be the airport management company's responsibility to administer the Safety Management System. At the research airport, the management company places the responsibility of the SMS in its Flight Operations Department. Within this department, the SMS coordinator is a vice president level employee whose SMS leadership duties are part time. This department also maintains the SMS manual, which provides the goals of the safety program and outlines the process for safety review, auditing, and the structure of the SMS. This information is also publicly available on the website of the airport management company.

Other organizations have their own in-house safety programs as well. Air traffic controllers maintain a safety manual that outlines policies and procedures that they

follow as well as abnormal/emergency procedures. Air traffic controllers are a small, close-knit group who are required to make safety decisions quickly, and even the most junior-level controllers have a high level of authority and responsibility. Air traffic controllers do not have a dedicated safety manager, but each air traffic controller is expected to show safety leadership proactively.

The ground services organization used in this study also maintains extensive documentation regarding its safety policy and objectives, including support statements from upper management describing the importance of safety and commitment the company has to providing a safe environment. The safety manager of this organization is a full-time vice president level position. Both the airport services company and the airport management company have designed their safety management systems around ICAO's SMM. The ground services manager described the company's adherence to ICAO standards as ". . . very strong. We use SMM completely [sic]."

Safety Risk Management

The heart of safety risk management is identifying hazards, considering risk as a part of decision making, determining levels of risk for various threats, and mitigating risks.

For hazard identification, the research airport has a digital hazard reporting system available to anyone through its website. The report is very detailed and includes information about who was involved, where the issue/incident took place, and the prevailing weather conditions, among other things. Individuals may choose to leave certain fields blank (either for inapplicability or to remain anonymous) and the reports will still be accepted by the system.

The ground service provider and air traffic controllers also have hazard reporting systems. For air traffic controllers, when an issue arises they can summon a supervisor who will log the event in a daily log that is maintained for each shift. This is necessary because while a controller is on the job he/she is unable to take time away from duties to make a report. The daily log includes items such as foreign objects being found on taxiways, birds in the area, or runway or taxiway closures (which can be initiated by the controllers themselves or by order from the airport company). At the end of each shift, the supervisor will approve the daily log and forward it to the ATC chief. ATC uses a different reporting form for serious incidents. If there is an aircraft accident or incident involving damage to humans or equipment, a special report will be filed to CAA to proceed with an investigation.

The ground services operator has a robust reporting system that allows employees to submit reports directly to the safety office of the company. This in-house SMS reporting system is different from the airport management's

reporting system. In cases where a reporter wishes to file a report concerning a risk or hazard, he/she will file a report either with their own company or to the airport reporting system, depending on which organization has the capacity to apply corrective action.

The next step in safety risk management process is reviewing reports and making decisions. The airport accomplishes this through the use of committees. There are two types of committees administered by the airport company's SMS. First, there is an overall SMS committee which meets on a biannual basis. Members of the committee include representatives from every airline, the airport company, all ground services providers, cargo operators, maintenance facilities, and air traffic control. This committee has more than 50 members and this is the opportunity where the multiple safety programs in and around the research airport can merge for discussion and review. This committee also publishes periodic reports and safety data, and all of their reports and statistics tracking are published on their website. In addition, it makes use of specific safety risk analysis tools, such as a risk assessment matrix whose threshold levels for severity are determined by the safety committee.

The overall SMS committee also has several subcommittees (the second type committee). These are known as professional groups, and there are currently six at the research airport. The purpose of these subcommittees is to meet more regularly, once every three months, receive reports from the hazard reporting system related to their area of operation, and can further safety discussion in their specific area of operation.

Safety Assurance

Safety assurance is provided in a variety of ways at the research airport. For the ground services provider, the strongest area of safety assurance is the "closed-loop" nature of the hazard reporting system and safety committee. Any time inputs are received and corrective actions are applied, the result of such actions is evaluated by the safety committee to determine if the action was appropriate and successfully mitigated the issue. If not, a new correction can be applied. This kind of cycle of review prevents actions from being applied and ignored with no follow up.

The air traffic controllers have a much more responsive system of safety assurance in that they will know very quickly if an applied action is not working or has not mitigated the hazard.

It is important to note that because the nature of the hazards seen by ATC are very different from those seen by the airport company or ground services provider, their corrective actions must conform to a very high level of accuracy and their detection for whether an action is unsuccessful must be extremely fast. Therefore, safety assurance for ATC is very time sensitive and usually comes

from only the active controllers themselves, or, in some cases, the supervisor on duty. As one air traffic controller said, "We have to make decisions right away. Not a lot of time for thinking about it."

The airport company has a slightly different method of safety assurance from the other two organizations in this study. For one, they make use of professional groups to review actions taken by the full airport-wide SMS committee to ensure that the individuals most impacted by a given decision or action support it as well as help to implement it. According to one safety manager, "Because the airport SMS is so big, professional groups help look at issues faster." Professional groups include air traffic services, fueling, maintenance, cargo, flight operations, and security.

The airport company also utilizes another means of safety assurance: transparency with the general public. The company, through its website, provides the results of safety audits and reviews at the airport. It also maintains a list of received hazards reports (de-identified) and publishes safety data so people can see the improvements it has made or needs to make. As an airport safety manager described, "You can actually find all the safety data on our web site. We show everything."

Safety Promotion

Safety is promoted in a wide variety of ways at the research airport. Once again, each type of organization represented in this study had various methods of promoting safety to its stakeholders, participants, and employees. As building a positive safety culture is critical, organizations have put heavy effort into making sure everyone is not only aware of the SMS programs in place, but to help instill the values of SMS in the whole organization so that everyone is individually empowered to be a contributor to the overall safety of the research airport.

The ground services provider imposes several promotional advertisements to employees, via e-mails and flyers on company bulletin boards, to encourage its employees to participate in its hazard reporting system. It also releases periodic safety newsletters so that employees can be up-to-date on various safety issues. One safety manager from the ground services company said, "Nobody at our company doubts our commitment to safety. We are very clear about that and they all know it." Air traffic controllers have a similar method of promotion, but in addition to textual promotions, utilize their daily briefing to help share safety issues.

The airport company itself takes a very aggressive approach to safety promotion. The airport company's stakeholders include local people living in suburbs around the research airport, so their safety promotion strategy includes them as well. For example, the airport company sponsors an annual "Safety Week". During this time, safety

managers visit local schools and do presentations for students regarding aviation safety and news about the airport. In addition, they sponsor various promotions throughout the week, including e-mails, flyers, and displays.

The airport company also provides briefings for new contractors, such as airlines, cargo companies, and terminal vendors. This briefing provides information about the SMS at the airport and how they can participate if they observe any safety related issues. It provides details about the reporting system, professional groups, and invites the new organization to participate.

Conclusions

This study sought to answer several research questions, and through observation of three large organizations at the research airport, some conclusions can be made regarding the airport's compliance with ICAO standards of safety management.

The first research question was: "To what extent does the research airport implement ICAO standards?" Based on the areas of safety policy and organization, safety risk management, and safety promotion, the airport appears to exhibit a high level of ICAO SMM compliance based on the observed elements. All organizations claim they base their SMS on that document specifically, and all appear to engage in SMS implementation in the same manner as if Taiwan was a member of ICAO itself.

The second research question was: "What safety policies does the research airport's management have in place?" The research airport's management company utilizes a hazard reporting system for its safety program, as well as an SMS committee and respective sub-committees (professional groups). In addition, it employs various methods of safety assurance and safety promotion in the forms of transparency, publishing of safety data, and an aggressive safety promotion campaign.

Next, the study posed: "How do stakeholders in aviation safety at the research airport participate with safety management?" As it turns out, there are a wide variety of stakeholders in the research airport's safety management. These include air traffic controllers, commercial carriers, ground service organizations, passengers, terminal vendors, and local people. The research airport has an aggressive and creative safety campaign to involve as many of them as possible. As part of the importance of SMS lies in how it mobilizes participants, airport organizations are going to great lengths to involve everyone in safety, through proactive briefings about safety, to community outreach. This study found strong evidence indicating stakeholder involvement with the SMS at the research airport, which is very important to successful safety management.

The fourth research question was: "How are risks identified and managed at the research airport?" While

the three organizations in this study had various methods of measuring and evaluating risks, the airport company itself administered the overall safety committee, and did so in a way that is compliant with current ICAO standards. The safety committee meets regularly and includes members from all organizations at the airport. As a matter of practicality and efficiency for receiving and reviewing safety reports, those organizations have been divided into professional sub-groups to handle issues related to their aspect of operations. The airport hazard reporting system itself is also consistent with ICAO SMM standards. It has multiple formats, can be anonymous as the reporter chooses, and its reports are addressed at safety meetings of the full SMS committee. While there are several sub-SMS programs in various organizations, data from those programs is able to rise to the SMS committee level so it can be addressed by the airport has a whole if necessary.

Lastly, the final research question was: "How is safety promoted at the research airport?" Through investigation into these three major organizations, it is clear that the research airport aggressively pursues safety promotion, to a level that even exceeds ICAO SMS requirements. The amount of genuine safety promotion, through "Safety Week," new organization briefings, and publications indicates an enormous emphasis on safety discussion and support. Proper safety promotion is critical to ensuring the success of the system, and the research airport makes a large effort to inform everyone about safety values, best practices, hazard reporting, and proactive safety strategies.

ICAO Safety Management Compliance

Overall, the evidence collected in this study has indicated that safety management at the research airport is mostly consistent with aviation safety management standards set by ICAO through its Safety Management Manual. Using the SMM as a standard, organizations at the research airport have created several, but not necessarily redundant, Safety Management Systems which all support the airport management company's SMS.

It is important to note that there are a few deviations from ICAO SMM policies and procedures. For one, the SMM prescribes a full-time safety manager, and while several sub-organizations at the research airport have dedicated safety managers, the airport company only utilizes a part-time safety manager from within the flight operations department. In addition, the full safety committee could be more responsive if it met more frequently, even though the professional groups do meet more often to provide more specified safety guidance. While there isn't a specific frequency specified by the ICAO SMM, the number of meetings should be a function of the complexity of the airport operations and necessity of addressing safety issues.

As Taiwan is not a member of ICAO, its largest airport's level of compliance with the SMM is impressive. Overall, the airport addresses key components of safety hazard reporting, safety risk management, safety assurance, and safety promotion in ways that are consistent with the ICAO SMM. This helps ensure a near-seamless travel experience to and from Taipei from a safety standpoint, and as safety management at the research airport continues to improve, it will certainly be a good example of a healthy SMS in the airport environment.

While all of the evidence collected was in line with these conclusions, more extensive interviews with front-line employees would have uncovered a greater depth of information that might have shown other areas for improvement. Because of the limited nature of the study, the conclusions presented are surface-level only. Future studies within the research airport should focus on interviewing front-line employees under the condition of anonymity, and collecting non-interview data to verify the findings.

Further Study

As SMS continues to be implemented worldwide, further study is critical for both determining the challenges associated with establishing SMS in multicultural settings as well as how non-ICAO members manage safety in aviation. SMS is a relatively young managerial concept, and as it develops, it is important to understand how it unfolds across various cultures, countries, legal environments, and financial environments. Understanding the ways in which SMS is effective and successful, as well as those in which it could improve or be enhanced will ultimately help ensure the aviation industry is as safe as possible.

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