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Safety Management Systems: Management’s Role at Part 135 Carriers

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This paper is dedicated to my wife, Lindsay, and grandparents, Henry and Aliceanne Wallace. To Lindsay, who pulled more than her fair share of weight during our engagement and first year and a half of marriage allowing me to focus on my studies, and to my grandparents who both inspired my love of aviation and supported my pursuit of higher education.

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Abstract

Safety Management Systems (SMS) have become an area of focus in recent years for both aircraft operators and regulators. Part 121 air carriers already face regulatory requirements regarding the implementation of SMS. Part 135 air carriers are not yet required by regulators to adopt and implement SMS. However, there are many operators that have implemented SMS ahead of a regulatory requirement. Additionally, several third party auditing agencies such as the International Business Aviation Council’s (IBAC) International Standard for Business Aircraft Operations (IS-BAO), International Civil Aviation Organization (ICAO), and ARGUS International (ARG/US) encourage the development and implementation of SMS and provide their customers with SMS implementation services. Safety culture and the role of upper level management has also become a focal point surrounding the implementation of SMS and is especially critical for Part 135 carriers as management’s decision regarding SMS implementation exists outside of regulator requirement.

Keywords: safety management systems, safety culture, air charter, Part 135 air carriers
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Since the Wright Brothers first took to the skies in 1903, the aviation industry has constantly pushed the boundaries of speed, range, capacity, and complexity. In a constant pursuit of reaching, expanding, and at times exceeding limits imposed by the prevailing technology of the day, the history of air travel is filled with contrasting moments of human triumph and tragedy.

After the conclusion of World War II, civilian air travel featured robust growth, replacing travel by sea and rail to become the preferred venue for long-distance travel. With ever-increasing public use came a sharp focus on aviation safety. Air crashes were exhaustively investigated in an effort to discover root causes of specific failures in an attempt to rectify problems and mitigate the chance of such repeat disasters. The National Transportation Safety Board (NTSB) handles air crash investigations in the United States, often producing exhaustive reports detailing every possible aspect of the flight being investigated.

Years of in-depth analysis of aircraft accidents of all kinds brought to light the fact that accidents typically feature a cascade of events that eventually lead to one final failure or error that may doom a flight. With growing knowledge of “accident chains”, the aviation industry set forth to create systems that can effectively scrutinize every aspect of an air carrier’s organization in an attempt to identify, track, and mitigate risks that threaten to lead to an accident. These systems are referred to as Safety Management Systems (SMS). SMS have become a focal point in the world of aviation safety and
receive firm support from the Federal Aviation Administration (FAA), the International Civil Aviation Organization (ICAO), and other regulatory bodies throughout the world.

While air carriers operating under Federal Aviation Regulation Part 121, airport operators operating under Part 139, and maintenance facilities operating under Part 145 feature varying degrees of regulatory support for the implementation of SMS, Part 135 and especially Part 91 aircraft operators lack such encouragement from regulators to implement SMS.

**Literature Review**

When discussing the topic of SMS, research revolving around accident chains that result from latent conditions within an organization proves to be an effective starting point. As the twentieth century drew to a close, accident investigators shifted their focus from pilot error (operator error) to that of management’s role in the creation of latent conditions that may precipitate pilot error. Safety culture and safety leadership have come to the forefront of accident analysis and a positive correlation between safety culture and observed safety related results has been established (Remawi et al., 2011). The development of a positive safety culture lies firmly in the hands of organizational leaders and upper level management. Without management’s commitment to a positive safety culture there are dozens of unfavorable conditions that may arise. Reason (1997) notes,

…reveal themselves as factors likely to promote unsafe acts. These include undue time pressure, inadequate tools and equipment, poor human-machine interfaces, insufficient training, under-manning, poor supervisor-worker ratios, low pay, low status, macho culture, unworkable or ambiguous procedures, poor communications and the like. (p. 16)

With the realization that policies and procedures put in place by an organization’s management may have an effect on organizational safety, a new view of operational error
emerged. Policies that may have negative impacts on safety became viewed as holes in a wall of defense. An increase in holes in a defense system will, in turn, increase the likelihood of an organizational accident or incident (Strauch, 2009, Figure A).

The shift in a singular focus of accident investigators led to the need for a more holistic approach to accident prevention and risk mitigation and gave rise to SMS. The FAA proves to be an effective starting point when discussing SMS. With current or predicted mandated implementation in place for air carriers, maintenance facilities, and airport operators, the FAA has taken the lead by providing a basic framework organizations should utilize to implement SMS:

SMS requires the organization itself to examine its operations and the decisions around those operations. SMS allows an organization to adapt to change, increasing complexity, and limited resources. SMS will also promote the continuous improvement of safety through specific methods to predict hazards from employee reports and data collection. Organizations will then use this information to analyze, assess, and control risk. Part of the process will also include the monitoring of controls and of the system itself for effectiveness. SMS will help organizations comply with existing regulations while predicting the need for future action by sharing knowledge and information. Finally, SMS includes requirements that will enhance the safety attitudes of an organization by changing the safety culture of leadership, management, and employees. All these changes are designed to move the organization from reactive thinking to predictive thinking. (FAA, 2012)

The FAA (2006) took a major step in the pursuit of universal integration of SMS with the release of Advisory Circular 120-92. This advisory circular was refined and updated with the release of AC120-92a. The purpose of these advisory circulars is to “provide a framework for Safety Management System (SMS) development by aviation service providers” (FAA, 2010, p. 1). While advisory circulars are not regulatory in nature, the release of such advisory circulars is a clear indicator to air carriers that the FAA holds a keen interest in the topic of SMS and has a vision on how such a system
should be developed and implemented. Should SMS become a regulatory requirement for Part 135 air carriers in the future, it is likely that the elements presented in AC120-92 and AC120-92a will closely resemble that of any regulatory guidance that may be published.

SMS are also garnering attention and support outside of the FAA. Wang, Liu, and Lu (2012) observe, “ICAO requests that the Operation of Aircraft (Annex 6), Air Traffic Services (Annex 11), and Aerodrome (Annex 14) should implement SMS before 2011/1/1” (p. 1). While FAA rules govern flights in the United States, many operators operate internationally, therefore making many of them subject to rules and regulations established and promoted by ICAO.

Broderick (2007) points out, “The message is clear: SMS is coming to the U.S. aviation industry. The FAA seems to be charting the preferable course on the way to SMS mandates – working with stakeholders and others in the industry in the U.S. and abroad, and developing meaningful guidance in advance of rulemaking” (p. 20). With other advisory circulars covering airport operations and strong support from ICAO for both flight operations and maintenance operations, there is growing worldwide support for SMS.

With airline operators being the first group required to adopt SMS, the small body of research covering SMS implementation is sharply focused on Part 121 airlines. Researchers have found that of all aspects of SMS, the most crucial factor stems from management. The notion of an organization’s leadership being the most crucial factor to SMS may be difficult for some to embrace. After all, for years investigators and safety professionals alike have focused on pilot error, human factors, and an almost wholly-focused attempt at mitigation through pilot training. However, Hsu, Li, and Chen (2010)
conclude, “…research concludes with that compared to dimensions of Risk Management, Safety Promotion, and Documentation, Organization is the most important dimension and has the largest effect on other dimensions in an airline SMS, which begins with Policies that convey top managers’ viewpoint and vision on safety” (p. 235).

The focus on an organization’s culture and management with regard to the implementation of SMS presents a unique challenge for regulators attempting to provide universal guidance on SMS. As Chen and Chen (2012) point out, “Since the execution of SMS is regarded as essential to upgrading the air safety performance, it is vital to have an effective tool to evaluate its implementation” (p. 181). However, a standardized approach to measuring the effectiveness of the implementation of SMS will be compounded by the fact that organizations may feature drastically different cultures. Additionally, firms have varying relationships between management and employees. Finally, there will always be an economic angle to the development and implementation of SMS. Zimmermann, Paries, and Amalberti (2011) observe, “nearly all interviewees described a conflict between financial and safety objectives. As one pilot explains ‘there is always a balance between safety and economics…’” (p. 6).

While it is clear that various organizations may have different cultures that may necessitate different implementation techniques, the overall objective of SMS is consistent. Ott (2007) describes the purpose of SMS, “the objective is to ingrain a safety culture in a company, set up lines of responsibility and accountability, and reduce the accident and incident rates” (p. 56).

**Part 135 Operators**
While airline operators operating under FAR Part 121 face regulatory requirements that mandate SMS, Part 135 operators currently exist outside of such requirements. While there seems to be no body of evidence calling into question the benefits of SMS, there are many Part 135 operators that have yet to consider SMS implementation. Presently, very little published research has been conducted covering Part 135 operators and their business practices. A body of work must be set forth to discuss the benefits of SMS for Part 135 charter operators. This proposed research should cover current perceptions held by flight department managers and a thorough discussion of the tangible benefits realized by charter operators that have already successfully implemented SMS.

Finally, research must also cover safety culture and error management. Special attention should be placed on management’s impact on safety culture as safety culture is now viewed as a primary tool for the implementation of error management practices (Dyck et al., 2005). Does top management’s decision to forgo SMS implementation prior to regulatory requirement have a negative impact on the firm’s safety culture? Conversely, do firms that implement SMS ahead of such requirements achieve a more effective safety culture? While a review of current literature may lead to obvious conclusions to these questions, a formal study utilizing current data from the industry is needed to validate these conclusions.

**Method**

Over the past decade a significant body of work has been established regarding SMS. This body of work covers a wide array of topics including the regulatory role of SMS implementation, trends regarding SMS implementation, as well as the cultural
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(organizational safety culture) effects brought about by the implementation of SMS. With Part 121 operators already facing regulatory requirements regarding the implementation and utilization of SMS, Part 135 operators have begun implementing SMS ahead of what will likely be future regulatory requirements to do so. The null hypothesis of this case is: The implementation of SMS by Part 135 Air Carriers is an indication of a positive organizational safety culture.

**Apparatus**

The scope and breadth of published work available regarding SMS implementation makes meta-analysis an appropriate methodology for the study of SMS implementation and safety cultures of Part 135 air carriers. This case study is created around an explanatory design as previously reported literature will be used in conjunction with meta-analysis to “establish cause-and-effect relationships” (Hancock & Algozzine, 2006, p. 33) surrounding SMS implementation.

**Procedure**

A thorough review of the current literature base will be utilized to analyze SMS, safety culture, and management’s role in the Part 135 air charter industry. Through a discussion of literature covering the development and implementation of SMS as well as safety cultures in organizations, the null hypothesis will be tested. These results will be reported and discussed.

**Case Overview**

**Results**

Publications concerning the theory of SMS are plentiful. Both regulatory bodies and academic sources have produced a significant amount of information regarding SMS trends, effectiveness, implementation practices, and the likelihood of future regulatory
requirement. Less information exists with regard to the present status of Part 135 air carriers. This is to be expected because most charter operators exist outside the mainstream interest received by Part 121 air carriers (most 121 carriers are publically traded and attract interest from investors which leads to in-depth analysis of their business practices).

With overwhelming evidence supported by the current literature base, one must conclude that SMS is viewed as an initiative that will result in a positive impact on safety. It is widely accepted that an organization’s safety culture is created primarily by upper level management. Additionally, upper level management is responsible for electing to develop and implement SMS. As a result, the null hypothesis is accepted.

Discussion

A regulatory requirement for Part 135 operators to implement SMS is inevitable. In order for a SMS to be effective, it must be implemented with the full support of management as well as lower level members of an organization. The requirement of universal organizational support, however, places the majority of the burden on management.

Management sets the tone with regard to an organization’s safety culture. Hsu, Li, and Chen (2010) state, “…Organization is the most important dimension in SMS, which begins with policies that convey to all staff the top managers’ vision on safety” (p. 222). Companies operating as Part 135 carriers are frequently highly segmented, with various groups within the organization responsible for specific functions. Mechanics, charter sales personnel and customer service representatives, pilots, and cabin crewmembers may rarely interact directly with one another. Each department, in effect, takes its lead from management. This fact means safety culture, in most scenarios, must start from the top.
The FAA outlines four major aspects of an effective SMS program: a) safety policy, b) safety assurance, c) safety risk management, and d) safety promotion. Perhaps the two most critical of these four pillars, from a managerial perspective, are safety policy and safety promotion. Without a clear safety policy and a dedication to safety promotion, both safety assurance and safety risk management cannot exist.

First, managers must develop and implement a clear safety policy. This policy must be broad enough to apply to the different departments within an organization, yet specific enough to clearly define the organization’s goals and how it plans to achieve these goals. Perhaps the most crucial safety policy should be one assuring that management will not take punitive action against employees that report safety concerns or safety violations. However, such a policy must be worded so as not to give immunity to employees that intentionally violate rules, laws, or regulations. A policy of no-reprisals will likely encourage cooperation from employees within the organization.

Safety policies must then be supported by consistent and effective safety promotion. Safety promotion may be accomplished in a variety of forms. Frequent company-wide safety memos, safety meetings, or company supplied or supported continuing education are all effective methods of safety promotion. Once safety policies and safety promotion are in place, an organization may then focus on safety assurance and safety risk management.

Part 135 air carriers operate in a dynamic marketplace. The dynamic nature of the air charter business makes safety assurance revolve primarily around continuous auditing and documentation. Latent conditions may exist at any level in an air carrier’s organization from dispatchers to mechanics or pilots. As a result, it is essential for
management to conduct frequent and ongoing audits of various departments and functions within an organization and document the results. Documentation allows managers to identify deficiencies or discover trends, which facilitates early detection of possible latent conditions. The completion and documentation of ongoing audits naturally leads to the final major aspect of SMS, safety risk management.

Several risk factors might be identified by utilizing information gathered from audits during the safety assurance process. These risk factors must then be analyzed as to their probability of occurrence and the expected severity of such an occurrence both in terms of economic costs and human costs. Oftentimes, firms will implement a preliminary hazard analysis (PHA) to determine these factors. After a PHA is completed, mitigation plans should be considered along with a cost-benefit analysis measuring the cost of mitigation against the likelihood of economic damages if a negative event occurs.

While the FAA describes only four main aspects of effective SMS programs, each process has significant and far-reaching implications associated with it. Third party auditing agencies, such as ARG/US and IS-BAO, are recommending air carriers create a position within management whose sole job is to implement and oversee these four primary functions. This position should be autonomous and exist outside the influence of a chief pilot or director of operations position in order to avoid any influences that may be exerted on the safety manager to ignore or minimize perceived safety threats. Finally, a safety manager, with proper support from other upper-level managers in an organization, will likely set the tone of an organization’s safety culture. As numerous studies point out, an organization’s safety culture is an excellent predictor of safety performance.
Conclusion

Part 135 operators exist in an environment similar to that of Part 121 airlines. Both serve the public and, as a result, both are highly regulated by the FAA to ensure the public is protected. However, regulations for Part 135 operators often lag behind that of Part 121 carriers. Additionally, the nature of on-demand air charter leaves many unknowns. Without the guarantee of regular routes, operators must be prepared to dispatch aircraft and their crews to both familiar and unfamiliar airports. The uncertain nature of the Part 135 business coupled with lagging regulation necessitates a proactive management team with a focus on safety culture.

In recent years, SMS has become a prominent safety tool utilized by all Part 121 carriers and the majority of safety-minded Part 135 operators. By design, SMS can effectively identify latent conditions in an organization’s system, mitigate these identified risks, and track results. Operators with management electing to implement SMS prior to a regulatory requirement send a signal to employees that safety is an organizational priority. By fostering a positive safety culture, employees are likely to adopt a personal focus toward safety in an attempt to achieve the organization’s safety goals. Conversely, if management is reluctant to implement SMS, either through vocal opposition or by inaction, employees may be led to believe that safety concerns are not an organizational priority.

There is overwhelming support of SMS provided through academic studies, operational experience, and regulatory bodies. This consensus implies a positive correlation between SMS implementation and an organization’s safety culture. When
analyzing Part 135 operators, those that have already implemented SMS will likely have a more effective safety culture, and should achieve higher levels of safety as a result.
References


Figure A: Reason’s Model of Error. This paper presents SMS as a way to identify ‘holes in a system’s defenses’ primarily on the latent side of a system. Adapted from Investigating Human Error: Incidents, Accidents, and Complex Systems, 2009, by Strauch, B. Copyright 2009 by Ashgate Publishing Limited.