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Safety Management Systems (SMS) implementation is currently a voluntary pursuit for collegiate aviation programs. Some programs have implemented SMS and others are beginning to consider it. An understanding of the impact of SMS on safety culture at institutions actively implementing SMS and the potential challenges posed can be useful to the entire collegiate aviation community. The safety culture perceptions across three collegiate aviation programs with varying levels and types of SMS implementation were explored through semi-structured interviews of students, certified flight instructors (CFI), and safety leaders. Emergent codes and subsequent themes derived from the semi-structured interviews suggest an apparent knowledge gap among respondents on the SMS implementation phases and some essential attributes of a fully-functional SMS program. Another significant finding was that CFI plays a critical role in developing students' perception of safety culture by setting the example for desired safety behavior and exposing students to the safety processes within programs. The findings suggest that using practical or scenario-based learning in SMS training can ensure understanding and enhance a sensed ownership of SMS processes in the various programs. The results also suggest that actively engaging CFI in SMS higher-level processes such as safety risk assessments and audits can improve their safety leadership and empower them as effective mentors for their students. Active participation in the SMS process by aviation students can significantly improve their perceptions of safety culture, enhance desired safety behaviors, and bridge the knowledge gap required for entry into the aviation industry.

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Collegiate aviation operations in the United States (U.S) have been characterized by training environment complexity due to stringent airman certification standards, high accident potential as compared to commercial airlines (NTSB, 2019), and low levels of experience among pilots, which has implications for operational safety in this sub-set of general aviation (G.A.) (Adjekum, 2014). To ensure a sustainable culture of safety, there has been advocacy for the adoption of Safety Management Systems (SMS) in collegiate aviation operations (Adjekum, 2014, 2017; Friewald et al., 2013). Safety Management Systems (SMS) is a systematic approach to managing safety, including the necessary organizational structures, accountability, responsibilities, policies, and procedures (ICAO, 2018), and its impact on safety culture within aviation organizations has been previously studied in commercial airlines, and airports (Chen & Chen, 2014; Gill & Shergill, 2004; McDonald et al., 2000; Remawi et al., 2011).

There seems to be a shift in research that focuses on safety culture and SMS in collegiate aviation programs and adding to the body of literature in that area (Adjekum, 2014, 2017; Adjekum et al., 2015, 2016; Adjekum & Fernandez-Tous, 2020; Canders, 2016; Freiwald et al., 2013; Robertson, 2016; Velazquez & Bier, 2015a; Velazquez & Bier, 2015b). It is imperative to build on prior research and continue the process of research updates. While SMS is not a requirement for collegiate aviation in the U.S, it can become a requirement at some point in the future, and some universities have already pursued SMS preemptively (Pinholster, 2019).

Safety culture is essential to an organization's safety performance and applies to those organizational aspects that relate to safety performance and is a product of the values and actions of organizational leadership and learning (FAA, 2015a). The Federal Aviation Administration (FAA) and International Civil Aviation Organization (ICAO) both consider a proactive safety culture to be an essential performance outcome of SMS, and periodic assessments of the relationships between these two concepts can provide valuable inputs for continuous improvements to safety policies and practices (FAA, 2015a; ICAO, 2018).

Adjekum (2014, 2017) utilized quantitative designs to research safety culture in collegiate aviation using the Collegiate Aviation Program Safety Culture Assessment Survey (CAPSCAS). The findings from Adjekum (2014, 2017) found that "years spent at the university" had a significant effect on the safety culture perceptions of respondents. However, this analysis was performed at one collegiate aviation institution, and there is a need to perform a similar analysis at other collegiate aviation institutions using either mixed or qualitative approaches.

Other research across multiple universities focused on how SMS affects safety reporting culture, but a quantitative approach was used (Adjekum et al., 2015, 2016; Robertson, 2016). The need to corroborate the findings of these extant research across multiple universities using other research approaches is warranted for generalizability purposes. This will provide universities with vital data-driven approaches when developing SMS in their aviation programs. Despite all these studies, specific inquiry into the relationships between SMS implementation

and safety culture perceptions in collegiate aviation using a purely qualitative approach seems novel, and there have been recommendations for more research (Adjekum, 2017).

Purpose of the Study

This study qualitatively explores the relationship between SMS implementation and the safety culture perceptions of a cross-section of flight students, certificated flight instructors (CFIs), and safety management leadership in multiple collegiate aviation programs in the U.S. Specifically, the safety culture perceptions of respondents from these programs with varying types and implementation levels of SMS were explored through semi-structured interviews.

Previous research findings have suggested a difference in safety culture perception based on the "year group" of aviation students (Adjekum, 2014). Therefore, another goal of this study was to explore some of the reasons for such differences when the nominal assumptions are that safety culture is pervasive and should be almost homogeneous in an organization with effective SMS (Chen & Chen, 2014; Stolzer & Goglia, 2016) and find ways to continuously improve the safety culture.

A detailed understanding of how research respondents perceive safety-risk factors in flight operations could provide relevant information needed for hazard identifications and effective safety risk management. These processes are vital for sustaining a proactive safety culture (ICAO, 2018; Reason, 2008). Finally, as part of SMS implementation, safety communication and promotional strategies are very important in framing the safety culture perceptions of respondents. The study aimed to get a better understanding of the effectiveness of these strategies using a semi-structured interview approach.

Research Question

The over-arching question and sub-questions were obtained from Adjekum (2016). The detailed questionnaire with demographic details was initially sent to three subject-matter experts (SMEs) who are faculty members with extensive research portfolios in safety culture and SMS research. These SMEs reviewed the questionnaire for comprehensibility and face validity and provided meaningful comments. An example of a suggestion provided by one SME was the need to probe deeper into the understanding of SMS types and implementation levels among respondents. The final over-arching research question was:

> What are research participants' perceptions of the relationship between safety culture in their collegiate aviation programs and SMS implementation?

The following sub-questions delved into specific aspects of the over-arching research question:

- What are the differences in perceptions of a safety culture based on years spent in the program?
- What are the differences in perceptions of SMS implementation?
- What are the perceptions of safety communication and promotion?

Details of the question guide used in the semi-structured interviews can be found in Appendix A.

Literature review

SMS in Aviation

Remawi et al. (2011) investigated the effects of SMS implementation on employee attitudes toward unsafe acts at two airports in the Middle East, and their findings suggested that SMS resulted in improved perceptions of safety rules, supportive environment, personal risk appreciation, work environment, and involvement. In terms of assessing the dimensionality of SMS, Chen and Chen (2012) developed a scale to evaluate an airline's SMS performance. Five factors were identified in their analysis: documentation and commands; safety promotion and training; executive management commitment; emergency preparedness and response plan; and safety management policy which can be used by management to determine how well SMS performs based on their employee perceptions.

Chen and Chen (2014) sought to analyze multiple antecedents that are suggested to influence pilot behavior in an SMS environment. Three factors were considered for the model: Perceived SMS Practices, Morality Leadership, and Self-Efficacy. Safety Motivation was also included to assess the mediating effect. The outcome variable was safety behavior, which is broken down into two constructs: Safety Compliance and Safety Participation. Perceived SMS Practices were shown to affect both safety behavior outcome variables directly and were further strengthened by the mediating role of safety motivation.

In a review of the conceptual similarities of crew resource management (CRM) and SMS in the collegiate aviation environment, Velazquez and Bier (2015a) suggested that continuous education and guidance to upper leadership will lead to a more SMS specific invested culture as it did for CRM and that some of the challenges to SMS implementation in collegiate aviation programs include lack of scientific validation, absence of clear guidance from regulatory oversight agencies, and shortage of data tracking, sharing, and monitoring for improved overall system safety.

In another review of SMS education in various Aviation Accreditation Board International (AABI) accredited collegiate undergraduate aviation programs, Velazquez and Bier (2015b) evaluated more than 70 AABI-accredited collegiate aviation programs (e.g., flight, aviation management, and air traffic control) in 30 institutions. The review consisted of aviation safety course descriptions found in university catalogs.

Velazquez and Bier (2015b) suggested that SMS is not generally included in undergraduate aviation-accredited programs. While many courses cover SMS-related concepts, only 13% of the evaluated programs have an SMS course or SMS as a topic in an aviation safety course description. This finding suggests a gap in the introduction of SMS concepts at the foundational levels in collegiate aviation programs in the U.S.

Brady and Stolzer (2016) evaluated the effectiveness of SMS utilizing the approach of Input-Output (I.O.) economics theory along with Data Envelope Analysis (DEA). The initial

findings supported the efficacy of such a method in evaluating SMS implementation in different organizations. In the sample, inefficiencies were able to be identified to give feedback and direction to the management on where these inefficiencies exist to improve the SMS.

Stolzer et al. (2018) continued to explore the use of DEA as a method to measure the effectiveness of SMS. Interviews were initially conducted on Subject Matter Experts (SMEs) in SMS. The findings from these interviews and relevant research literature were used to develop a survey instrument to collect the data necessary to utilize DEA as a tool for evaluating SMS effectiveness in organizations.

Safety Culture in Collegiate Aviation

Safety culture and safety climate have been actively studied for years (Gao et al., 2013; Liao, 2015; Taylor & Thomas III, 2003; Wang, 2018). There has also been extensive research performed on safety culture and safety climate in industries outside aviation (Barbaranelli et al., 2015; Brondino et al., 2012; Fugas et al., 2012; Groves et al., 2011; Kapp, 2012; Neal et al., 2000; Stemn et al., 2019; Wu et al., 2010). An area of research that is developing is safety culture in collegiate aviation and similar flight training organizations (Adjekum, 2014, 2017; Adjekum et al., 2016; Chiu et al., 2019; Dillman et al., 2010; Gao & Rajendran, 2017; Robertson, 2016). A behavioral component of safety culture that is relevant to this study is safety reporting behavior. Effective safety reporting is a critical component of an effective SMS (FAA, 2015a; ICAO, 2018).

Given the importance of participation in reporting systems and related safety behavior, Dillman et al. (2010) investigated perceptions surrounding reporting systems and why some students in collegiate training institutions fail to file a hazard report for actions or any other hazardous condition a safety department would need. Their findings suggested that a lack of time, ridicule from others, and embarrassment from peers were driving forces for students not participating in the provided reporting systems.

Freiwald et al. (2013) performed a safety culture assessment in collegiate aviation using a quantitative instrument called the Commercial Aviation Safety Survey (CASS), which was initially developed and validated in commercial aviation (Gibbons et al., 2006). Significant findings from this study were a lack of accountability for safety and a belief among respondents that safety reporting programs were critical, even though many had not participated in them.

Adjekum (2014) assessed the safety culture of a single collegiate aviation program using a new instrument developed from the CASS, referred to as the Collegiate Aviation Perception of Safety Culture Assessment (CAPSCAS), to determine if SMS implementation affected safety culture perceptions. The findings suggested that the year group had an effect on safety culture perceptions among students and that students who have been in the program longer had a better understanding of safety culture within the institution than newer students without the same level of experience or exposure. In another study among multiple collegiate aviation programs, Adjekum et al. (2015) found that safety culture perceptions could predict safety reporting behavior, and respondents' age was a significant predictor of safety reporting behavior.

Adjekum et al. (2016) evaluated the effects of safety culture perceptions concerning non-flight students. Adjekum et al. (2016) sought to investigate safety culture perceptions for Air Traffic Control (ATC), management, and Unmanned Aircraft Systems (UAS) students. The findings suggest a relationship between non-flight majors and the general trends, attitudes, and perceived safety values in their collegiate programs (Adjekum et al., 2016). This finding suggests that interaction with flight majors influences safety culture perceptions for the non-flight majors and supports the need to include non-flight majors in safety training and other related safety promotion activities.

Another significant finding from this study was the influence of response and feedback. Providing feedback promptly was shown to have a strong relationship with safety behavior, which includes filing safety reports (Adjekum et al., 2016). The findings suggest that when new students receive their initial safety training in collegiate aviation programs, they may feel more inclined to participate in the safety program by filing safety reports. However, a lack of response and feedback from the collegiate aviation safety office may lead to students not seeing the value in filing the safety report.

In a study on safety reporting among collegiate aviation programs with SMS, Robertson (2016) suggested that trust in a confidential safety reporting system is a sign of positive safety culture, and Jausan et al. (2017) suggested that assessing safety reporting behavior can be beneficial in improving the performance of SMS. Gao and Rajendran (2017) assessed students from an Australian collegiate aviation program using a self-constructed instrument from an earlier study (Gao et al., 2013) and identified four themes: safety reporting culture, safety reporting procedures, organizational culture practice, and general safety knowledge relevant to the topic of safety reporting behaviors. A more in-depth analysis suggested that first-year students had a more positive perception than the students who have been in the program for longer. The vertical mingling of the students was suggested as a means to integrate these differing perceptions.

Robertson (2018) conducted a quantitative assessment of the relationship between SMS implementation and safety culture, safety promotion, and management commitment using a study population of 453 students and employees from 13 collegiate flight schools. Data were gathered through an online survey at collegiate flight schools within the University Aviation Association (UAA) utilizing the Collegiate Aviation Program Safety Culture Survey (CAPSCUS) developed by Adjekum (2014) to measure safety culture at those collegiate flight schools. The results indicated that a relationship existed between SMS implementation and safety culture, safety promotion and safety culture, management commitment, and safety culture. The relationship for all three was more prominent within the Formal Safety Program major scale of the CAPSCUS.

Adjekum and Fernandez-Tous (2020) assessed the perceptions of aviation students, flight instructors, academic faculty, and collegiate administrators in a large U.S. collegiate aviation with a fully implemented SMS program on the relationship between four (4) organizational management factors (*Principles*, *Policy*, *Procedures*, *Practices*) and resilient safety culture using an online survey instrument. The results suggest all four management factors had a significant predictive relationship with resilient safety culture. *Practices* had the weakest predictive

relationship, and *Policy* had the highest. Results suggest that more focus should be placed on resilient safety practices to sustain a resilient safety culture in a collegiate aviation program.

Byrnes et al. (2022), in a recent longitudinal study of the effects of safety crises on safety culture in a collegiate aviation program, suggested that various safety culture and safety climate variables were impacted during the COVID-19 pandemic. Based on these results, the leadership of the flight training program was able to mitigate and adjust safety policies and procedures to improve the safety culture and climate and ensure continuous accident-free performance.

It becomes apparent that most of the studies reviewed were quantitative and suggest an apparent gap in the qualitative research approach that probes deeper into the relationship between SMS implementations and safety culture among multiple stakeholders in collegiate aviation operations. As an example, much of the work done by Adjekum (2014, 2015, 2016, 2017) and Adjekum and Fernandez-Tous (2020) have been primarily quantitative. While there have been qualitative components in some of the studies (Adjekum, 2016; Robertson, 2016), the semi-structured interviews were restricted to collegiate aviation leaders and safety professionals in these collegiate aviation programs respectfully.

The current research expands the research paradigm by including multiple programs with varying types and implementation levels of SMS using semi-structured interviews of key stakeholders in the collegiate aviation programs. The current study also focuses on an in-depth understanding of the potential effects of SMS types and implementation levels on the perceptions of safety culture among research respondents. The current research adds to the extant literature on the relationship between SMS and safety culture in collegiate aviation operations in the United States,

Method

Research design

This qualitative research design was used to explore the perceptions of respondents on how collegiate aviation program's SMS implementation was related to the safety culture within their various programs. Safety culture perceptions of respondents from multiple collegiate aviation programs and at varying levels and types of SMS implementation were explored. Saldana and Omasta (2017) have suggested that a qualitative approach using interviews that seek to explore a subject's personal experiences related to the study topic based on their values, attitudes, and beliefs can be an effective empirical tool for such probes.

Semi-structured interviews of a cross-section of students, certified flight instructors (CFI), and safety management leaders were conducted to gain an in-depth understanding of their perceptions of the study constructs. It was envisaged that such an in-depth probe of perceptions of SMS implementation effectiveness, potential effects of varying levels/types of SMS, and year-group effects on the safety culture in collegiate aviation could provide pragmatic safety improvement strategies.

Past research has found significant variations in safety culture perceptions within a collegiate program based on the demographic variable "year group" (Adjekum, 2014; Gao & Rajendran, 2017). However, most of these studies did not comprehensively articulate a rationale

for such significant findings, and that provides an opportunity to use a semi-structured interview format to understand how and why such variations exist, especially within the framework of SMS implementation. Attempting to gain perspective on what has made the most significant impact and how these perceptions may have changed were key in investigating the first sub-question.

Research sub-questions two and three explored perceptions of respondents on SMS implementation and how components such as safety promotion and communication influenced safety culture in the collegiate aviation program. Given the relatively recent introduction of SMS into collegiate aviation, exploring the related impact on stakeholders is needed. The semi-structured interview outline can be found in Appendix A.

Population

This qualitative study was limited to three collegiate aviation programs. These three universities have different types of SMS and are at varying levels of SMS implementation. One of these universities had just commenced the implementation process of the FAA-recognized SMS voluntary program (SMSVP) and was considered in the *active applicant* stage. The second university had attained the *active conformance* level of the FAA's SMSVP. The third university had reached the third and final stage of the International Standard for Business Aircraft Operations (IS-BAO™) SMS program, which is a third-party vendor for SMS implementation. It was envisaged that this sampling pool would provide insight into any potential differences in the SMS type. Additionally, the varying levels of implementation (e.g., *active application* versus *active conformance*) will provide insight into any potential differences based on the implementation level required by the FAA.

Sampling procedures

Sample size selection. The sample (n=12) for the study was derived from two lower-class members (a first-year student or sophomore), four upper-class members (junior or senior), four CFI, and two safety management leadership personnel from the three universities (See Appendix B for details of demography). Sampling students from different year groups were meant to assess varying perceptions across these levels of academic and flight training experiences at their universities. Given that past research has posited significant variations in safety culture perceptions based on year group (Adjekum, 2014; Gao & Rajendran, 2017), recruiting representatives from varying levels was desired. Moreover, it was required that the CFI respondent in each university was a previous student and has been at the institution for potentially longer than four years. These requirements for the CFI, along with the change in the role from a senior student to an employed CFI, provided insight into any potential effects on perceptions of SMS and the safety culture associated with such transitions.

Interviewing safety management leadership provided strategic perspectives on safety and levels of perceptual alignments with student and CFI perspectives on SMS and safety culture. Since those in safety leadership positions are responsible for promoting their institution's safety culture, they will provide insight into their desired cultural perception. A comparison between those in safety leadership positions to the frontline personnel (i.e., students and CFIs) will

provide helpful insight into how and how well safety culture is being promoted, communicated, and instilled throughout each organization.

Procedures for recruitment, participation, and data collection. The University of North Dakota Institutional Review Board (IRB) provided approval for all the research protocols. Representatives, namely the chair/ head of the aviation program from each institution selected to participate in the study, were contacted to provide permission and access to students, CFIs, and safety management leadership personnel in this study. After permission was granted by these representatives, a formal invitation letter outlining the research and requesting volunteers to participate in a semi-structured interview was sent to the student and CFI population. The letters were sent via emails by the various representatives. Participation was voluntary, and there were no financial or material incentives offered in any case.

A purposeful sampling technique was utilized, and this approach allowed the researchers to specifically select respondents for the interviews based on an equitable representation of various year-groups and CFIs. Despite the approach, there were challenges due to time constraints and scheduling during the COVID-19 pandemic period. Individuals designated in a formal safety management leadership role, such as the Director of Aviation Safety or Flight Safety Officer, were interviewed at two institutions. Given that one of the researchers currently worked at one of the institutions where responses were being sought and had a recent role in a safety leadership position, it was deemed redundant to interview someone within the institution.

Interviews were conducted using the Zoom® video conferencing tool. Before conducting the interview, each participant was sent a copy of the interview outline to review the questions ahead of time (Two weeks lead time). Participants were also sent the consent forms for electronic signature before conducting the interviews. The interviews were recorded, and the audio files in the form of mp3 files were stored in a secured folder for transcription. Before concluding the interview, participants were informed that interview transcripts would be sent to them for member checking and validation.

Saturation is viewed as a point where the researcher feels they are learning nothing new about the participants (Saldana & Omasta, 2017). After 12 interviews, participants provided consistently repeated responses to the interview questions, and no further interviews were conducted. Field notes were compiled during the interviews, and analytic memo writing was done after the interviews.

As part of the transcription process, the researchers listened to the entire recordings of the various interviews and made corrections to a draft transcript in text format produced by the Zoom tool. The trustworthiness of qualitative content analysis is defined in terms of credibility, dependability, conformability, transferability, and authenticity (Elo et al., 2014). The semi-structured interview data meets the trustworthiness factors based on the experiences and background of the respondents regarding the study constructs. Also, the interview transcripts were verified for trustworthiness using member-checking. All the respondents provided feedback to confirm that their interview transcripts were a credible reflection of their perceptions of study constructs.

The transcripts were analyzed through the use of a computer-based qualitative coding software tool (Nvivo 12 ®) and manual coding. "Coding is the process of organizing the material

into chunks or segments of text before bringing meaning to information" (Rossman & Rallis, 1998, p. 171, as cited in Creswell, 2009). A deductive or theory-driven coding was used in the analysis. Deductive coding can be used when there are particular topics of interest (Vanover et al., 2021). In this case, three primary areas of concern were explored: safety culture development, SMS implementation, and safety promotion and communication. The coding was developed around these topics for analysis.

As stated earlier, field notes and analytic memo writing were additional methods employed for the qualitative analysis. The analytic memos were written after each interview, or sometimes after a series of closely conducted interviews, to develop connections (Saldana & Omasta, 2017). After multiple interviews, reflecting on common themes to determine associations between the interviewees' data helped the researcher condense the qualitative data to derive themes effectively. These field notes and analytic memos were instrumental in the development of the deductive coding strategy.

A codebook containing all the emergent codes and their over-arching themes was developed from the nodes of Nvivo® software and corroborated by complementary codes derived manually through open coding of selected extracts from transcripts by each researcher. To further consolidate the trustworthiness of the coding and theming process, the verified transcripts and codebook with emergent themes were sent to a team of research advisors who did an audit of the codes/emergent themes. There was generally an acceptable level of agreement on all the codes and themes among the three research advisors who have considerable experience as aviation safety researchers.

Results and Discussion

The semi-structured interviews were meant to probe deeper into previous findings of similar research on study constructs. Three primary areas were considered for the qualitative portion of this research: safety culture, SMS implementation, and safety promotion and communication. These themes are provided below to relate to the elements in question in these interviews.

Safety Culture

The first series of questions in the semi-structured interviews were aimed at perceptions of safety culture. These questions were designed to gauge their overall perception of safety culture at their institution, what factors have had the most influential impact on their perception of safety culture, how their perception of safety culture may have changed over time, and what their organization could be doing to improve how students and CFIs perceive the safety culture.

The role of the CFI. Two questions from the interviews regularly referenced the CFI's role in their responses on the perception of safety culture: *How has your perception of safety culture at your institution changed over time,* and *What has had the most significant impact on your perception of safety culture*. The CFI's role was more frequently referenced compared to Directors of Safety, Accountable Executives, or the presence of an SMS.

The interviewed students and CFIs would refer to how the CFI set the example for behaving. While it was noted that those in Safety Leadership would advocate for certain behaviors, the CFI had a more considerable influence over the day-to-day behavior. In addition, many of the interviewees had experienced multiple CFIs during their flight training, which exposed them to various perspectives on how to approach safety. These varying experiences further confirmed that the CFI significantly influenced the student's development of essential attributes of a safety culture, such as proactive hazard identification and safety risk reporting during their time in their program.

The interviewees would sometimes reflect on differences in CFIs and how that affected their behavior. In some cases, a given CFI may show a disregard for particular safety policies or procedures, and that leads to a situation where such disregard for existing safety policies by these CFIs adversely impacts the perceptions of their students on the relevance of such policies and procedures in ensuring safety in flight operations.

Later, after transitioning to a new CFI, they would gain a new perspective. This could be differences between instructors on the importance of safety reporting or the risk associated with specific hazards in the flight training environment. The reflection on their past experiences highlighted the influence of the CFI. Regardless of written policy and procedure, the CFI's influence could supersede these policies and procedures promoted by those in Safety Leadership positions.

The role of the CFI in safety culture also highlights the importance of people in an SMS. Multiple interviewees noted that a written policy is not enough to encourage the desired behavior. The people involved in the system must execute that policy. This sentiment was echoed by students, CFIs, and those in Safety Leadership positions. While a Safety Policy is a vital component of an SMS, it needs to be understood and implemented by all organization stakeholders. Consider the following quotes from flight instructors reflecting on their past CFIs and students reflecting on their recent experiences from varying institutions generating the theme for the *Role of the CFI*:

> Flight Instructor A:
>
> Oh god, without a doubt, without a doubt, it's definitely [the CFI]. I feel like even if you can't if you got a student who wasn't very safety-oriented, I feel like if you had the right CFI and the right mindset. I think you could change that, so without a doubt, the CFIs are that frontline, backline, middle on everything. Honestly, at least in my opinion.
>
> Student A:
>
> I think maybe if there was more encouragement from our instructors. I know, like in the beginning of my training. It's just at the beginning, my training is a lot different than it is now, and I was with a different instructor at the time. So, I think the perception that I was given from that individual really shaped what I thought to be a bother. And so, it took something. It took something small happening and me coming out and talking to safety individuals to realize that it's okay, and as long as you're safe and it pertains to your

> safety that it's okay to do that and bring that up rather than to not and hide it and have something worse happened to you.
>
> Student B:
>
> That's where you have to have flight instructors that do that because the first flight instructor I had always… he didn't want to admit his mistakes and you always want to put these mistakes on students. So you kind of had this like, okay, you don't want to. You don't want to seem stupid. You don't want to make mistakes. But then I had a bunch of other flight instructors. After that, those who were kind of echoed that and they were great. And then it just kind of made you see what it really was. So yeah, it's definitely having the flight instructors to iron out all the creases and give the students more of a look under a magnifying glass like a more specific.
>
> Student C:
>
> I would say like the biggest influence is instructors and students just because if we don't abide by the... because it's, I mean, it does come from the top, but if it's not being adhered to by like the I mean, there's only one Director of Safety and then there's hundreds of flight students and instructors, you know, so it's up to the moving pieces more. So I'd say in terms of the day to day.

The role of safety leadership. Students and instructors were interviewed across varying points on their institutional experience. When asked who or what played the most significant role in shaping their perception of the safety culture, the Director of Safety was often cited as a critical individual. Although, Safety Leadership was admittedly not as crucial of an influence as the CFI. Moreover, students earlier in their experience at a given institution were more likely to reference those in safety leadership positions as having a powerful influence on their safety culture perception. However, once the students have been in the institution for a longer time, the CFI became the predominant influencing force for safety culture perceptions.

First-year and sophomore students at one of the institutions would reference safety leadership as having the most profound influence. Upper-level students referenced their CFI as having a more powerful influence. This seemed to suggest that a CFI's influence could overpower the influence of safety leadership. Even the CFIs that were interviewed would refer to their past CFIs and how they influenced their behavior. This finding supports findings from Brondino et al. (2012), suggesting the stronger role co-workers play over supervisors when assessing safety climate perceptions. Their findings suggested that co-workers' safety climate can reduce or cancel the effects of the group level association between the supervisor's safety climate and co-worker's safety climate (Brondino et al., 2012). This, along with findings from Chiaburu and Harrison (2008), suggest that co-worker support was a better predictor of employee outcomes than leader support.

The role of safety policy. The organization's safety policy would come into consideration when students and CFIs were asked how they would describe the safety culture at their institution. Students and CFIs often mentioned that the policy clearly articulated non-

punitive reporting and just culture philosophy. The students and CFIs relate the safety policy to the reporting system. This finding makes sense at an intuitive level. Since the primary interaction students and CFIs have with the SMS is through reporting, both groups relate their perception of the SMS and prevalent safety culture to their collegiate programs' safety reporting system.

When asked if this policy were enough to encourage reporting, students and CFIs both said it took time to build trust in the system to begin reporting. Despite a clearly stated policy, it took additional influence to facilitate participation in reporting systems. This additional influence was typically a first exposure to the reporting system through their CFI or hearing of other students' experiences. Again, the CFI seems to play a critical role in shaping students' perceptions of the safety culture and encouraging reporting behavior. Consider the following quotes from CFIs and students reflecting on their initial exposure to the reporting system:

Flight Instructor A: "As a student, having an instructor submit an ASAP report was pretty significant to seeing them do it for you, you know, use the program when a mistake has been made."

Student A:

> Actually, seeing how it remained anonymous and that it wasn't just you guys saying it. You know, this is how we do it. But actually, going through the process once and realizing that. Because, you know, sometimes you don't trust the system until you're actually going through the system, and that's probably what really made me open my eyes, and I guess really trusting the whole procedure and process.

Safety reporting feedback and safety behavior. Providing feedback for submitted safety reports was noted as a perceived critical influence on the institutions' safety culture by those in safety leadership positions. In addition, when students and CFIs participate in the reporting system, it is viewed that those who take that time to report deserve feedback for their effort. This, in turn, is believed to encourage future reporting.

Students and CFIs also addressed the importance of feedback. Feedback provided by the safety office for reports filed by students and CFIs creates a positive indicator that top leadership takes their concerns seriously. When discussing the role of feedback, one student said, "It's probably just going to go sit on the desk and build dust," when commenting on the lack of feedback. When students and CFIs do not receive feedback for their efforts to file a safety report, the adverse perception that nothing will happen with that report is further enhanced. Providing a form of feedback could mitigate this perception. One student said, "That helps me know whether it's going to be continually pursued or not," when discussing the effects of receiving feedback after a safety report.

SMS Implementation

Given that many collegiate aviation programs are beginning to pursue formal SMS programs (i.e., FAA SMSVP or IS-BAO), the following SMS implementation questions were designed to gauge perceptions related directly to SMS.

SMS type. Of all the students and CFIs interviewed between three different collegiate aviation programs with varying levels and types of SMS programs, no student or CFI accurately identified what kind of SMS they had in place or was pursuing. Moreover, when students and CFIs were asked what kind of SMS they had, they would reply with a description of the safety reporting system (e.g., non-punitive, voluntary). As previously mentioned, when discussing the role of safety policy on student and CFI perceptions of safety culture, students and CFIs view the SMS through the lens of their role (i.e., reporting). Students and CFIs perceive that their role within the SMS is to contribute safety reports, which seems to be how they relate to the SMS.

Those in safety leadership positions discussed the type and level of implementation of their respective SMS programs. When asked what role their SMS played with their students and CFIs, none believed it was critical for students. The formal elements of the SMS were viewed as more critical for those responsible for safety processes. The SMS was thought of as a guide, and the people were responsible for executing it.

One response that highlighted this perspective was, "So our SMS is literally just a document. It doesn't define who… We could have the best document in the world, and it does nothing for you if leadership doesn't follow it. If the students don't follow the responsibilities within that. So it's a guide, but I don't think the document itself makes the organization, how the organization uses the document that makes the culture actually thrive and exists." Another quote echoing this sentiment was, "It does more for those of us to say [SMS]. It means a lot more to those of us in this office in our, in our management flight department management. To the student, I don't think it means anything, or the instructor even."

SMS knowledge and understanding. Based on responses received from students and instructors, it was clear that their knowledge and understanding of what SMS is and how it works is lacking. This is highlighted by student and CFI responses, indicating that their SMS is "voluntary" or "non-punitive." While these are attributes of a safety reporting system, these do not represent the SMS. Safety reporting is one element, albeit a critical one of an SMS.

It should be noted that students and CFIs participating in the interviews were sent a copy of the interview questions ahead of time to review and begin thinking through their responses. In this case, students and CFIs were aware that they would be asked what kind of SMS their institution had in place or was implementing. Despite being aware of this question, no respondents were able to answer the question correctly. Some admitted they did not know, and others answered by offering answers describing the non-punitive or voluntary nature of the safety reporting system.

This finding shows a gap between the organization's SMS status and frontline stakeholders' understanding of this status. Determining the effect of this gap was not the scope of this research. Although, the prospect of improving SMS knowledge and understanding was discussed with students and CFIs during interviews to gain their perspective if they believed it would have an impact or not. For instance, one student responded to the question of what effect a deeper understanding of SMS would have, and replied, "Yeah, probably. I think the more you learn about anything is gonna tie into your performance."

Those in safety leadership positions agreed that there is potential to address the gap between students and CFI SMS knowledge and understanding. Those in safety leadership positions acknowledged that their students and CFIs do not fully understand everything that goes into their organization's SMS. Moreover, all acknowledged that students and CFIs having a more profound understanding could impact their behavior or perception of safety.

SMS impact on safety culture. Despite respondents being unable to explicitly state the type of SMS implemented or being pursued at their institution, students and CFIs were aware of SMS as an entity. Students and CFIs were aware of their organization's safety policies and procedures. According to respondents, they were aware of these policies and procedures' robust nature, which influenced their perception of safety culture—having these policies in place positively impacted their perception of safety and safety culture.

When students and CFIs were asked to describe this impact, responses often alluded to a foundational influence. Moreover, the presence of the SMS was said to be an initial primary influence early on in their flight training. To illustrate this point, one respondent had the following response when asked what impact the presence of SMS had on their perception of safety culture, "Now I will say that that has very foundational. I mean, when you go into, you know, you're learning straight away from private pilot you learn about SMS."

Students and CFIs would occasionally allude to the high volume of policies and procedures present at their institutions. However, they did not indicate that this had a negative impact on their perception of the safety culture. Instead, they acknowledged the presence of those policies and how it relates to SMS as being there for a reason. For example, one respondent highlighted the role of these policies by stating, "And I feel like that, that alone, knowing that if I'm a student, knowing that or just me knowing that that lets me know that we're trying to set ourselves apart even more and doing more so that perception definitely in a positive way would increase, I guess."

Safety Promotion and Communication

This final area addressed in the semi-structured interviews was directed at determining how SMS is taught and how effective it promotes SMS. Themes arose surrounding SMS training, formal versus informal SMS training, and the role of the Accountable Executive.

SMS training. When discussing the extent of SMS training offered at different institutions, those in Safety Leadership discussed classes that are offered that cover SMS. There is typically some formal class or similar delivery method to provide SMS training to students. Additionally, different collegiate programs embed SMS training in dedicated safety classes as part of the curriculum and ensure it is addressed on the flight training side.

The role of this initial safety training is not necessary to provide a robust understanding of SMS to students as viewed by those in Safety Leadership positions. Instead, this training is viewed to provide students with the necessary knowledge to function within the SMS. This is the way to articulate the role of students in SMS. For instance, one respondent stated, "That is

literally it. They are. They are the eyes and ears of what we do. Day in and day out, because I am not sitting in a cockpit for 50 hours in a week, the CFIs and the students are, and they are the ones that see it."

The student responses would refer to these classes offered. However, when asked if these classes played a vital role in developing their perception of safety culture, they did not believe it was as important as other elements such as day-to-day interactions with their CFI. Instead, the influence of CFIs, peers, and stories was typically cited as playing a more important role in functioning with the SMS.

Formal versus informal training. The discussion of the role of SMS training with students and CFIs developed a theme around how these students and CFIs learn SMS. All students and CFIs referenced formal classes, but these were not viewed as having the most profound impact on how they learned SMS and their role in the SMS. This distinction can be viewed as a difference between a theoretical versus practical approach to learning SMS. Thus, the theme of formal versus informal training.

Given the CFI's role in developing students' understanding of SMS and their role in SMS, this was thought of as the practical application of the concepts. Students and CFIs would reference their interactions with their CFIs and how that shaped their understanding of how the SMS worked. The students often refer to their CFIs as being more like a peer. Learning from the example of CFIs and the stories CFIs tell influenced how students developed their SMS understanding. This point was articulated by one student when saying, "I think the theoretical side definitely comes from the professors, but the practical side of seeing where the theoretical side needs to the practical side is done by the flight instructors."

The Accountable Executive's role. SMS touts the importance of support from the Accountable Executive as a critical element (FAA, 2015a; ICAO, 2018). Students and CFIs were asked how well the relationships between top-level individuals and frontline personnel are managed and what impact their relationships have on safety culture perceptions. Students and CFIs would typically address salient individuals within their institution that represent safety. This was usually the Director of Safety. Comments would address how approachable these individuals are and the importance of an open-door policy.

When students and CFIs were asked what role the Accountable Executive would play in their perception of safety, they did agree that it was crucial. The support from these top-level individuals was necessary for the functionality of the SMS. It is believed that this support has a "trick down" function, which is in line with the traditional top-down implementation of SMS (FAA, 2015a; ICAO, 2018). One quote that addressed this concept stated:

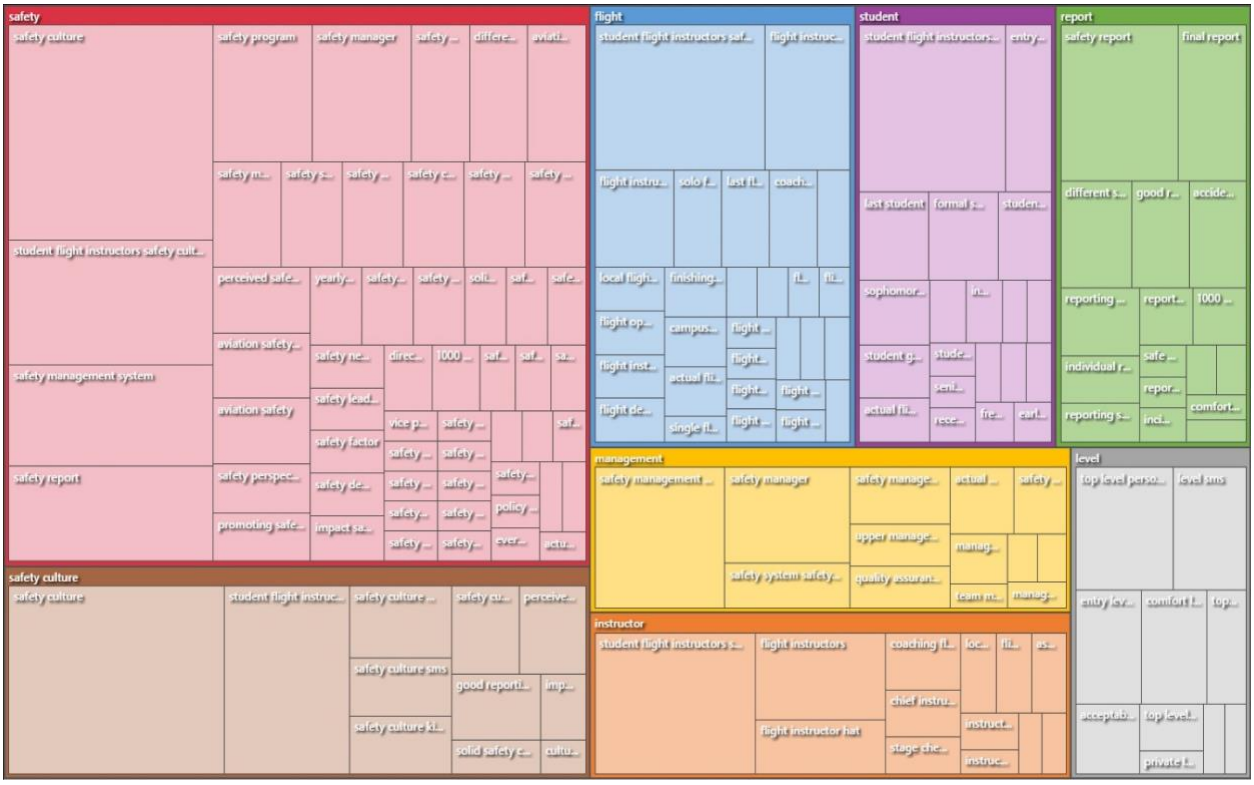
> I think [the Account Executive] definitely plays a major role because if he didn't care about safety. It wouldn't trickle down: When you know I think we [the CFIs] have the most influence directly but I don't think we would care about it as much if we didn't have that the top leaders who were constantly talking about safety how important safety is.

This concept seems to tie together the role of the Accountable Executive and the CFI. While the CFIs seem to have a substantial influence on students and students' development of SMS knowledge and safety culture, this is only possible with the support of higher-level individuals—namely, the Accountable Executive. One student participant highlighted this relationship well:

> So there's definitely a closer generally a closer connection between students and flight instructors and because there's a close connection between them and you know say higher-ups, they're more willing to listen to the flight instructor.

Figure 1 shows an automated coding output of nodes and emergent themes from qualitative analysis using the Nvivo® tool, and specific themes outputs can be found in Appendix C.

Figure 1.
Automated coding results from Nvivo®



Discussion

This discussion focuses on three primary areas: safety culture, SMS implementation, and safety promotion and communication.

Safety Culture

A resounding theme of the influential role the CFI plays in developing a safety culture and safety behavior was a critical finding. Students and CFIs interviewed from all institutions pointed to their current and past CFIs as playing a significant role in how they developed their sense of safety culture. The CFIs would set the example for proper behavior. This is not surprising given the number of contact hours CFIs have with students. Students and CFIs typically meet multiple times per week and engage in what is considered frontline operations. The influence of this high frequency of meetings is likely to contribute substantially to how students will perceive acceptable safety behavior in their organization.

This finding also corroborates some of the points made by those interviewed in safety leadership positions. Those in the safety leadership positions did not believe the presence of their SMS or their policies were powerful enough on their own to influence behavior. The people were responsible for carrying out those expectations. While the policy statements were a guide for describing desired behavior and outcomes, people (i.e., students, CFIs, Chiefs, managers) were responsible for carrying out the policies outlined in that document. While the document can serve as a top-down influence in guiding desired behavior, the document alone is not sufficient. The CFI can, directly and indirectly, influence students' safety behavior and may enhance strict adherence to these safety policies or negatively lead to non-compliance. The proximal effects of CFI on safety policy implementation within a collegiate aviation program cannot be underestimated.

The nature of how the CFI can explicitly exert a more considerable influence on the operational level implementation of higher-level policy guidance from leadership is not a novel finding. Research has shown that lateral or peer relationships can have a more significant impact than managerial influences (Brondino et al., 2012; Chiaburu & Harrison, 2008). Nonetheless, these findings suggest that attention should be given to CFIs to ensure they are setting proactive examples of safety behaviors worthy of emulation. Students and CFIs are considered the frontline of collegiate aviation. Therefore, their role in establishing and optimizing the desired safety behavioral traits among personnel and students is critical.

Another interesting finding on how students and CFIs develop their safety culture was their first exposure to the safety reporting system. Frequently stated during the interviews was how it took an initial exposure to the formal reporting system in the collegiate aviation program to build trust. This first exposure seemed like a critical barrier that needed to be overcome before students and CFIs were willing to contribute to the reporting system. Given the influential role of CFIs on student behavior, CFIs should prioritize exposing students to the reporting system early on in their training. This initiative could surmount the first exposure barrier and set an example for future behavior and participation.

In addition to the first exposure, the feedback was another component of safety reporting commonly cited by students, CFIs, and those in safety leadership positions. Furthermore, feedback has been shown to affect safety reporting behavior in previous quantitative studies (Adjekum et al., 2015, 2016; Jausan et al., 2017). These findings further validate those claims and suggest that collegiate aviation programs pursuing SMS should ensure they incorporate a feedback mechanism for their stakeholders.

SMS Implementation

A key finding from this research was the apparent knowledge gap students and CFIs have regarding the SMS implementation at their institutions. None of the students or CFIs interviewed correctly identified what kind of SMS their institution had in place or was pursuing. Interestingly, most respondents would reply by describing the reporting system. This response suggests an association of the safety reporting system with their perceived role in the SMS. A good understanding of the types of SMS and SMS implementation processes through structured academic coursework can be a primer for acceptability and engagement in SMS processes among students and instructors, as suggested by Adjekum (2017) and Velazquez and Bier (2015b).

It may be beneficial for the collegiate aviation program to promote these fundamentals of SMS and get stakeholders to know their role within the SMS implementation process. Active involvement of students and CFIs in the applied aspects of SMS processes, such as the fundamentals of safety risk assessment or developing safety policy and objectives, could provide a more profound understanding for these stakeholders.

Interestingly, all interviewees in safety leadership positions did not think it was practical for students and CFI to have a deeper technical understanding of SMS processes such as risk assessments and safety assurance due to the complexities and time required for training. It was viewed as being more important for students and CFIs to understand how SMS applies to their specific roles within collegiate aviation programs, such as identification of hazards during flight operations and reporting of such hazards for risk assessments.

Once it was determined that students and CFIs did not have an in-depth knowledge of SMS, they were asked if a more profound understanding would influence how they perceive SMS and their perception of safety culture. The students and CFIs indicated that it could have an effect, which corroborates previous studies on the need for an increased sense of ownership in SMS implementation (Adjekum, 2017; Patankar & Sabin, 2008).

The findings suggest some knowledge gap on SMS and its implementation complexities among respondents, which corroborates findings by Velazquez and Bier (2015), who suggested that there is not much standardization to the way SMS is taught in collegiate aviation and that many programs offer just a single class addressing SMS. Providing initial and recurrent training to address smaller SMS components may make it easier for students to retain and understand SMS.

The findings suggest that students and CFIs desire a pragmatic approach to teaching SMS. Recent research into teaching safety science has suggested using pragmatism which is "…centered on linking theory, research, ideas, actions to practical effects and focuses on aligning these with the student's experience and environment" to educate safety-orientated professionals (Klockner et al., 2020, p. 3). Structuring SMS training for students and CFIs around the "4P's of Pragmatism" (i.e., practical, pluralistic, provisional, and participatory) could benefit administrators. Utilizing a scenario-based approach has also been proposed as a method to allow students and CFIs to apply SMS skills in a practical manner (Adjekum, personal communication, 2020).

A respondent in safety leadership referred to their collegiate SMS as "a guide" and did not believe that the mere presence of SMS inherently played a role in the students' and CFIs' perception of safety culture in their collegiate aviation programs. The respondent, however, surmised that SMS implementation outputs, such as cogent safety policies and procedures, play a significant role in moderating desired safety behaviors in line with Grote and Weichbrodt (2017), who strongly advocate for strict reliance on policies and regulations to address cultural factors and Hollnagel (2014)assertions that people's role within the organization and cultural influences drive compliance with organization policies and procedures. This position seems at variance with Dekker (2017), who posits that organizations cannot regulate or proceduralize their way to safety.

Nonetheless, another respondent in a safety leadership position did view the implementation of SMS in collegiate aviation programs as a positive change. While the implementation and presence did not explicitly impact their perspective regarding safety culture, the improvements to processes, such as enhanced accountability and robust audits, provided better outcomes than their previous safety programs. They suggested that these audits could identify system weaknesses and guide the development of policies and procedures to address these deficiencies.

Promotion and Communication

The training provided to students in programs with and without fully implemented SMS programs does not seem to provide students and CFIs with an in-depth knowledge of SMS. While students and CFIs are well educated in their respective roles within the SMS, there is a gap in SMS's deeper understanding. Formal training on SMS and its components can be challenging and must be viewed within a collegiate aviation program's scope and complexity.

Based on these research findings, a suggested approach will be a step-wise building block approach in SMS training that is incorporated as part of the syllabus for the degree program in aviation. Fundamentals of SMS can be introduced as a required course in the first-year class, and subsequent intricate details on SMS are introduced at the upper-class levels. Subject-matter experts may be brought in occasionally to build the capacity of professors who teach SMS to enhance course delivery and ensure a cogent link between theory and practices.

Moreover, students and CFIs often mentioned a need for a practical SMS application. Involving students or CFIs in some of the higher-level SMS processes, such as safety risk

assessments (SRAs), could be a way to address this issue. Additionally, these applied exercises would give students the experience they could use moving forward in their careers. For example, many aviation students aspire to be airline pilots, and part 121 carriers are required to have SMS (FAA, 2015b), and there is a demand for SMS in the part 135 environment (NTSB, n.d.).

Conclusion

This study qualitatively assessed the relationship between SMS implementation in multiple collegiate aviation programs and perceptions of safety culture. A literature review on SMS and safety culture provided an empirical framework for a semi-structured interview of a cross-section of students and safety leadership in three SMS implementation in most U.S collegiate aviation programs is still in its preliminary stages, with only one program attaining the FAA SMSVP status of active conformance.

However, findings from the semi-structured interviews suggest an apparent knowledge gap among respondents on the SMS implementation phases and some essential attributes of a fully-functional SMS program. Structuring or restructuring SMS training for students and CFIs could improve safety behaviors for stakeholders.

A significant finding was that CFI plays a critical role in developing the student's perception of safety culture by setting the example for desired safety behavior and exposing students to the safety processes institutions have in place. Initiatives to address the role of the CFI to empower them to be leaders for students and encourage active participation can influence the efficiency and effectiveness by which students develop a sense of safety culture.

The current research added to extant literature supporting the benefits of feedback and robust reporting systems (Adjekum et al., 2015, 2016; Dillman et al., 2010; Freiwald et al., 2013). Ensuring these systems are in place and being utilized is recommended. Much of the research done on SMS in collegiate aviation has not qualitatively probed the understanding of SMS implementation processes by its stakeholders, such as students and CFIs.

Given the findings from this research, further research into factors that influence the understanding of SMS implementation and its effect on safety culture beyond the scope of collegiate aviation programs of these three universities will be very helpful. Such assessments of SMS implementation process understanding by all stakeholders in a collegiate aviation program could provide a deeper sense of process ownership, which can inure to the safety benefits of these programs (Adjekum, 2017; Patankar & Sabin, 2008).

Trust has been suggested to be a key component of a robust reporting culture (Robertson, 2016). The current research supports this position but adds that this needs to be established early. Moreover, findings related to the role of the CFI suggest that the CFI could play a critical role in exposing new students to the reporting system early on to establish trust. Based on the influence of the CFI, poor interactions early on during a student's training could impede their ability to develop trust in the reporting system and SMS as a whole.

Limitations and Biases

The findings from the current research are limited to collegiate aviation programs in universities with fully implemented FAA SMSVP and others that have formally initiated some form of the implementation process (FAA SMSVP or IS-BAO). Social desirability bias can influence some respondents to provide responses that are acceptable to enhance their reputation among peers in their social settings. The use of an individualized interview format, which provided some levels of privacy and the assurances of confidentiality, was used to minimize such biases.

The likelihood of confirmation bias in deductive or theory-driven coding and theming needs to be considered. All the data obtained were analyzed independently among the researchers and later compared and were also audited by three SMS experts who were on the research advisory committee. Finally, even though data saturation was attained, it would have been desirable to have more respondents from the various year groups, and safety management leadership teams take part to enhance more diverse viewpoints. As stated earlier, there were challenges with recruiting more respondents due to schedule during a pandemic period, and the relatively small sample from the three universities must be considered when interpreting the findings.

Recommendations for Future Research

There is still a need to perform longitudinal studies to investigate how SMS implementation impacts perceptions of safety culture in collegiate aviation programs in the U.S. Analyzing a cohort of students across the span of their tenure at an institution would provide a new perspective of how some of the variables are affected over time. In addition, given the knowledge gap found in the current research, a quasi-experimental approach before and after an SMS training initiative may determine any potential effects of enhanced SMS knowledge on safety behavior.

As more collegiate aviation programs pursue and implement SMS, there may be a need to further expand this current research scope of assessing the effects of SMS implementation on safety culture perceptions in collegiate aviation programs by including other stakeholders such as academic staff, administrative support personnel, maintenance personnel, and dispatch personnel. Finally, as more collegiate aviation programs successfully implement SMS, an investigation into effectiveness and impacts on safety performance in observed safety behaviors and attitudes (safety culture) may be necessary.

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APPENDIX A

Semi-Structured Interview Session Guide

Date:

Time:

Interview Code Number:

Location of Interview:

Parts of the Interview	Interview Questions
Introduction	Hi, I am [redacted], the principal investigator for this study. Thank you very much for agreeing to be participants in this semi-structured interview. As you were informed earlier in the invitational email, the purpose of this interview is to seek your views of safety culture within your institution and how Safety Management Systems (SMS) has affected that perspective. This interview session should last about an hour. Please be reminded that this session will be audio-recorded and contemporaneous notes will also be taken. After the interview, I will organize and transcribe your responses, which will be coded and themed for our study. Please be reminded that every effort will be made by the researchers to ensure that no personal identifying information about you such as name or employee number inadvertently divulged during the session will be used in our final report. All audio recordings of this session will be deleted once the transcription process is completed and you have had the opportunity to validate the contents of the transcript which will be sent to you for your comments. You can choose to stop this interview at any time or decline to answer any question you feel uncomfortable with. I once again remind you that this interview will be audio recorded for transcription purposes. You will also have to read and sign the informed consent statement sheet before we start the interview.
	Do you have any questions? Are you ready to begin?
Part A	**Biographic Data (Taken for each participant)**
	Age: Sex: Year group (if student) or position: Level of education: Number of years at institution:
Part B	**Safety Culture**
	1. In your own words, how would you describe the safety culture at your institution? 2. How has your perception of safety culture at your institution changed over time? 3. What has had most significant impact on your perception of safety culture? 4. Why? 5. Is there something that your institution could do to further promote safety culture that they are currently not doing?
Part C	**SMS Implementation**

	6. What kind and level of safety management systems (SMS) does your institution currently have in place? 7. Does this have a significant impact on how you perceive safety culture in your institution? 8. How? 9. Are there any negative impacts of SMS implementation at your institution? 10. If so, how could they be better addressed? 11. If not, were there ever and how did you remedy them?
Part D	**Safety Promotion and Communication**
	12. What kind of SMS training does your institution provide? 13. How does this training impact safety culture perception at your institution? 14. How frequently is SMS training offered and/or repeated? 15. How are the relationships between front-line personnel (students) and top-level (accountable executive) personnel managed at your institution? 16. Does this have an effect on safety culture perception? 17. How could this be improved? 18. How well do you understand the SMS process?

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	19. Do you feel you have a responsibility in your role to know and understand these processes? 20. Why?
Part E	**Close**
Close	21. Do you have anything else you'd like to share? 22. Do you have any questions for me? 23. Thank you for your time and we will get in touch with you later with the transcript for your validation before the data analysis. Goodbye.

APPENDIX B

Table 1

Demographic Details of Semi-structured Interview Participants

Participant	Sex	College	Position	# of Years in College	Time spent per interview
1	Male	A	First-year	1	36 minutes
2	Male	A	Sophomore	2	32 minutes
3	Female	A	Senior	3	45 minutes
4	Male	A	Senior	3	40 minutes
5	Male	A	CFI	3	46 minutes
6	Male	A	CFI	5.5	61 minutes
7	Female	B	CFI	3	24 minutes
8	Male	B	CFI	6	35 minutes
9	Male	B	Safety Leader	6.5	52 minutes
10	Male	C	Senior	2	35 minutes
11	Male	C	Senior	3	29 minutes
12	Male	C	Safety Leader	21	59 minutes

APPENDIX C

Table 3

An extract from the codebook showing nodes and emergent themes descriptors (NVivo®)

Semi-Structured Interviews

Nodes	
Safety Culture Development	
Role of CFI	This theme was developed surrounding the codes referring how the CFI played a role with safety culture
Role of Safety Leadership	The theme arose when participants discussed the role of those in leadership positions within their institutions. This could be Department Chairs or Directors of Safety.
Role of Safety Policy and First Exposure	Participants often referenced the presence of robust safety policies but would also state that it took some form of exposure to the safety reporting system to develop trust—it was more than a policy in place.
Safety Reporting Feedback and Safety Behaviour	Feedback on reporting was consistently mentioned and how it impacted the willingness to participate in reporting systems.
Safety Promotion and Communication	
Formal vs. Informal Training	All institutions had formal training in place, but this was consistently mentioned that practical approaches through applied use of the concepts during flight lessons and similar methods were preferred
Role of the Accountable Executive	Participants believed the Accountable Executive played a key role in ensuring a top-down effect. However, their influence was limited given the hierarchal distance perceived by students and CFIs.
SMS Training	All institutions offered SMS training, but the impact on safety culture and development was not viewed as impactful. This training was primarily viewed as a means to establish expectations for stakeholders functioning within the SMS.
SMS Implementation	
SMS Impact on Safety Culture	Stakeholder perceptions of the impact that the presence of SMS had at their institutions was developed around responses when discussing the impact of their institution's SMS
SMS Knowledge and Understanding	Those not in leaderships positions had limited knowledge and understanding as to the intricacies of SMS and was developed surrounding the concept that students and CFIs would describe their SMS through the means by which they interacted with it (i.e., reporting system).
SMS Type	This theme was developed around participant responses describing their understanding of their institutions SMS (i.e., FAA SMSVP or IS-BAO)

Figure 2C
Automated output of themes - Safety

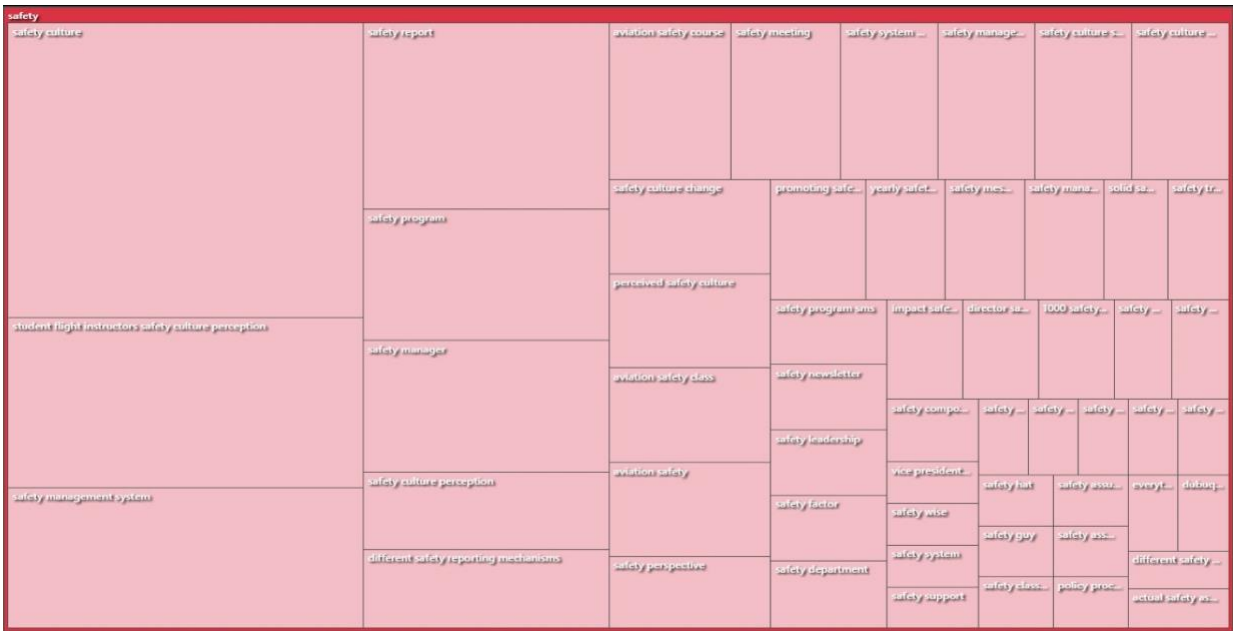

Figure 3C
Automated output of themes – Flight