

Applying safety management systems in general aviation

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Abstract

Safety Management Systems within aviation are not required for Part 91 general aviation flight operations. However, the failure to establish industry best practices that voluntarily incorporate safety management within their respective flight operations is referenced in the National Transportation Safety Board post-accident findings and recommendations. Aviation Safety Management Systems are pointedly referenced as scalable to individual flight operations; however, the Federal Aviation Administration does not offer an example template at any level for aviation organizations or service providers to follow. This capstone project aims to demonstrate the necessity for flight organizations to voluntarily implement safety management and how a flight operation that does not require a safety management program can develop a program that meets established industry best practices scaled to their unique operations.

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Introduction

Safety within the overall aviation enterprise, specifically safety programs, varies considerably across the spectrum of services, from established, well-staffed, and efficient safety divisions within large international air carriers to small general aviation organizations or companies with absolutely no safety programs or existing safety policies. The required implementation of Safety Management Systems for air carriers has primarily been responsible for the increased safety of commercial aviation travel. 14 CFR Part 5 requires “certificate holders under part 119 of this chapter authorized to conduct operations in accordance with the requirements of part 121 of this chapter must have a Safety Management System that meets the requirements of this part and is acceptable to the Administrator by March 9, 2018.”¹ The bottom line is that part 119 applies to air commerce operations, and part 121 applies to airlines, air carriers, and cargo operators conducting air commerce. There is no requirement for general aviation entities, specifically part 91 General Operating and Flight Rules operators, to implement Safety Management within the United States.

The Federal Aviation Administration’s (FAA) Advisory Circular 120-92B, Safety Management Systems for Aviation Service Providers, paragraph 1-1 c. states,

“The SMS requirements of 14 CFR part 5 apply to a wide variety of types and sizes of operators. Therefore, those requirements are designed to be scalable, allowing operators to integrate safety management practices into their unique business models. An SMS should be tailored to each specific operator;

¹ (Federal Aviation Administration, Title 14 Chapter I Subchapter A Part 5 - Safety Management Systems, 2023)

therefore, this AC cannot provide a single means of compliance that applies to all certificate holders who are required to develop and implement an SMS.”²

² (Federal Aviation Administration, Advisory Circular 120-92B, 2023, p. 1)

The scalability and applicability of Safety Management Systems are essential elements to consider within general aviation and are the central topics of this capstone project. On January 11, 2023, the FAA published a Notice of proposed rulemaking (NPRM) to expand the scope of SMS to require “all certificate holders operating under the rules for commuter and on-demand operations, commercial air tour operators, production certificate (PC) holders that are holders or licensees of a type certificate (TC) for the same product, and holders of a TC who license out that TC for production.”³

These proposed rule changes would expand SMS requirements to Part 135 air charter operations, Part 91.147 air tour operations, and specific production/manufacture certificate holders under Part 21. The significance of this proposed expansion of SMS requirements could indicate things to come for the entire general aviation market writ large. One of the central themes of SMS is increasing organizational and operational safety through a top-down approach to prevent accidents. So, how does an aviation organization establish an SMS program voluntarily or when it is eventually required?

Many of the reference materials available, either commercially or through open-source documents, describe safety management through the lens of commercial air carriers and large corporations that employ hundreds, if not thousands, of employees. These organizations have dedicated safety executives and safety liaison teams, incorporating specialized data collection programs and analysis. How can a small aviation organization digest the requirements of SMS when all the reference material is at a scale far above their level of operation? How does a small aviation organization create a safety management system from scratch?

³ (Federal Register, 2023)

Kansas Highway Patrol

I have been employed with the Kansas Highway Patrol since 2003. The Kansas Highway Patrol has robust policies and procedures that provide the operational framework for the Patrol to conduct law enforcement operations. In 2018, I was awarded a lateral transfer within the Patrol from a field supervisor position to a supervisor-pilot position within the Patrol's Air Support Unit. My aviation experience and background pre-date my joining the Kansas Highway Patrol and the Air Support Unit. I earned my FAA commercial rotorcraft-helicopter rating in 2002. Additionally, I joined the Kansas Army National Guard as an Aviation Officer in 2010, graduating flight school as a UH-60 Blackhawk qualified pilot in 2012. I deployed to Afghanistan as an aeromedical evacuation officer and platoon leader in 2014, flying medical evacuation missions. After returning from Afghanistan, I earned my FAA private fixed-wing – airplane rating in 2015. I became the detachment commander for the Kansas Army National Guard's fixed-wing detachment, flying the C-12 "King Air" and earning FAA multi-engine and instrument ratings in 2017. I am familiar with aviation organizations, such as the U.S. Army, having robust aviation standard operating procedures and safety programs.

While transitioning into KHP's Air Support Unit, I became acutely aware that the Patrol's Air Support Unit did not have an operations manual or standard operating procedure, nor did it have a safety program. This revelation surprised me as the Kansas Highway Patrol has policies and procedures for just about every function within law enforcement, but within the specialized realm of airborne law enforcement operations, there was no objective operational standard and no semblance of a safety program.

Unfortunately, this lack of established or standardized operations and safety elements to flight operations is not uncommon. General aviation is not required to have established SMS programs. Generally, Kansas Highway Patrol Air Support operations fall within two legal realms, either Part 91 General Operating and Flight Rules or Public Aircraft Operations, depending upon the type of flight operation being conducted. Neither currently requires an SMS program. One cannot assume that the agency executive command staff level is aware of safety management systems in aviation as a potential future requirement or even a recommended concept or industry-recommended best practice. The Agency's executive command staff relies upon the Air Support Unit's leadership to advise them of evolving requirements and industry best practices through the Air Support Unit's Captain. The root cause for not having a standardized operations manual and lack of a safety program is, unfortunately, attributed to learned practice and unit culture. Most KHP pilots have earned their flight ratings through the Air Support Unit and serve a career in ASU, operating without an operation manual or established safety program.

The Highway Patrol's Air Support Unit is a small aviation organization. In January 2023, the Patrol's fleet consisted of three Cessna 206H "Stationair" airplanes, one Cessna RG182 "Skylane" airplane, one Bell 407 helicopter, and one Beechcraft 350 "King Air." In January 2023, the Patrol's Air Support Unit was staffed with 19 personnel: 15 uniformed law enforcement pilots, one civilian executive aircraft pilot, two civilian aircraft mechanics, and one civilian administrative assistant. In 5 ½ years, KHP's Air Support Unit suffered two aircraft accidents. In 2017, a KHP helicopter was involved in an accident at the Topeka Billard Municipal Airport. As determined by the National

Transportation Safety Board (NTSB), while attempting to land at the KHP hangar, the pilot drifted aft, and the tail rotor struck the hangar, followed by a hard landing, resulting in significant structural damage and minor injuries to the two-person crew.⁴ On January 27th, 2023, a KHP airplane was involved in an accident at the Osage City Municipal Airport. This accident did not meet NTSB reporting criteria, and a report for this accident is not expected. Fortunately, there were no injuries.

The significance of having one aircraft accident in a small flight organization can be detrimental to continued operations, future funding, and overall public confidence. Examples from other law enforcement agencies illustrate the significance and impact of potentially complacent or mismanaged operations, especially toward safety.

New Mexico State Police

On June 9, 2009, a New Mexico State Police helicopter crashed on a search and rescue mission near Santa Fe, New Mexico. The Trooper pilot and a passenger (rescued hiker) sustained fatal injuries, and a Trooper-spotter on board sustained serious injuries.⁵ The helicopter was a total loss. The findings of the NTSB Aircraft Accident Report are significant, especially concerning organizational issues. Section 2.4 of the report states,

“A number of organizational and management issues, including NMSP aviation section staffing, pilot flight and duty time and rest period limitations, and SMS programs and policies, were identified in this accident investigation.

⁴ (National Transportation Safety Board, 2017)

⁵ (National Transportation Safety Board, Aircraft Accident Report, AAR-11/04, New Mexico State Police, 2009)

Although they may not have directly caused the accident, these latent deficiencies represented a culture and foundation of organizational pressures that contributed to a reduction in the safety of flight operations conducted by the NMSP on a daily basis.”⁶

The NTSB report further identifies, “At the time of the accident, the NMSP aviation section did not have an SMS program. Additionally, the aviation section did not require its pilots to perform a structured, systematic risk assessment before accepting a mission or to reassess risks during a mission.”⁷ The NTSB report directly identifies the New Mexico DPS cabinet secretary's negative leadership and cultural influence on the aviation section's operations.⁸

Alaska Department of Public Safety

On March 30th, 2013, an Alaska Department of Public Safety helicopter crashed on a search and rescue mission near Talkeetna, Alaska. The Trooper pilot, Trooper observer, and the passenger (rescued snowmobiler) all sustained fatal injuries. The helicopter was a total loss. The NTSB Aircraft Accident Report echoes several of the findings from the New Mexico State Police accident.

⁶ (National Transportation Safety Board, Aircraft Accident Report, AAR-11/04, New Mexico State Police, 2009, p. 54)

⁷ (National Transportation Safety Board, Aircraft Accident Report, AAR-11/04, New Mexico State Police, 2009, p. 54)

⁸ (National Transportation Safety Board, Aircraft Accident Report, AAR-11/04, New Mexico State Police, 2009, p. 55)

“In this case, the pilot was not required to perform a formal, systematic risk assessment before or during the mission, and no one else assisted the pilot in evaluating mission-related risk. Thus, the NTSB concludes that the Alaska DPS lacked organizational policies and procedures to ensure that operational risk was appropriately managed, such as formal pilot weather minimums, preflight risk assessment forms, or secondary assessment by another qualified person trained in helicopter flight operations that would have encouraged the pilot to decline the mission or take steps to mitigate weather-related risks.”⁹

Another important analysis provided by the NTSB report regarding Alaska DPS organizational culture revealed the following,

“An organizational safety culture that encourages the adoption of an overly punitive approach to investigating safety-related events tends to discourage the open sharing of safety-related information and degrade the organization’s ability to adapt to operational risks. The Alaska DPS safety culture, which seemed to overemphasize the culpability of the pilot in his past accident and events, appears to have had this effect. The pilot had adopted a defensive posture with respect to the organization and was concealing – rather than openly sharing – safety related information.”¹⁰

The fatal accidents experienced by New Mexico and Alaska, both state-level law enforcement and public safety aviation units, occurred long before KHP’s two recent

⁹ (National Transportation Safety Board, Aircraft Accident Report, AAR-14/03, Alaska Department of Public Safety, 2014, p. 55)

¹⁰ (National Transportation Safety Board, Aircraft Accident Report, AAR-14/03, Alaska Department of Public Safety, 2014, p. 61)

accidents. So why hasn't KHP's Air Support Unit, with full knowledge of the New Mexico and Alaska crashes, been more proactive in establishing a standard operation manual and incorporating a safety management program? Unfortunately, the answer lies in the fact that there were no serious injuries or fatalities in the two KHP accidents (or in any prior incident). Neither event was severe enough to demand or force change from the Agency executive leadership or the Air Support Unit Commander. Stolzer et.al, writes,

“Top management support and commitment is probably the single most important attribute of ensuring a strong safety culture. Meshkati (1997) noted that leaders influence cultures by “what they systematically pay attention to. This can mean anything from what they notice and comment on to what they measure, control, reward and in other ways systemically deal with.”¹¹

In the New Mexico NTSB report, in a letter to the governor of New Mexico, the NTSB's first recommendation was to “require the New Mexico Department of Public Safety to bring its aviation section policies and operations into conformance with *industry standards* (emphasis added), such as those established by the Airborne Law Enforcement Association.”¹² In the Alaska NTSB report, the NTSB made recommendations to Alaska and 44 additional states to “Develop and implement a comprehensive safety management system for aircraft operations that (1) holds senior state personnel accountable for the safety of state law enforcement aircraft operations,

¹¹ (Stolzer, Sumwalt, & Goglia, Safety Management Systems in Aviation, 2023, p. 68)

¹² (National Transportation Safety Board, Aircraft Accident Report, AAR-11/04, New Mexico State Police, 2009, p. 66)

(2) is tailored to the department's missions, and (3) is based on *industry best practices*. (emphasis added)"¹³

If KHP's Air Support Unit were to suffer an accident that resulted in severe or fatal injuries, without doubt, the NTSB's deeper investigation would result in findings that eerily echo the New Mexico State Police and Alaska Department of Public Safety reports and recommendations.

Industry Best Practices

Across the aviation enterprise, some groups and associations champion best practices for their respective market. The International Air Transport Association (IATA), Air Line Pilots Association (ALPA), Regional Airline Association (RAA), and National Business Aviation Association (NBAA) all serve as notable examples. The National Business Aviation Association offers a Light Business Airplane (LBA) Flight Operations Manual Template to assist owners and operators in creating an operation manual.¹⁴

The Airborne Law Enforcement Association (ALEA) was established in 1970.¹⁵ The Airborne Law Enforcement Association was rebranded in 2018 as the Airborne Public Safety Association (APSA). APSA's stated mission is "to support, promote and advance the safe and effective utilization of manned and unmanned aircraft by governmental agencies in support of public safety operations through training,

¹³ (National Transportation Safety Board, Aircraft Accident Report, AAR-14/03, Alaska Department of Public Safety, 2014, p. 72)

¹⁴ (National Business Aviation Association, 2024)

¹⁵ (Bachali, 2016, p. 97)

networking, advocacy, and educational programs.”¹⁶ A sub-entity of APSA is the Airborne Public Safety Accreditation Commission (APSAC) which, “provides, develops, and maintains standards of accreditation for operations performed by public safety aviation units and offers auditing, consulting, and accreditation services to public safety aviation operations in accordance with those standards.”¹⁷ APSAC has published recommended standards, including the guidelines for standard operating procedures. APSAC’s standards address five main areas of a unit’s operations: administrative standards, airborne law enforcement operational standards, safety standards, training standards, and aircraft maintenance standards.¹⁸ The standards, on their own, provide a decent road map for a unit to create policies and procedures as the standards describe what topics or issues should be addressed. However, they do not provide an example of working policies or procedures, essentially the how.

Operations Manual Development

KHP’s Air Support Unit needs a standard operation manual, and more importantly, that operations manual must incorporate an effective safety management system based on established industry best practices. Understanding safety management system components, also known as pillars, dramatically assists in drafting

¹⁶ (Airborne Public Safety Association, 2024)

¹⁷ (Airborne Public Safety Association, Airborne Public Safety Accreditation Commission (APSAC), 2024)

¹⁸ (Public Safety Aviation Accreditation Commission, Standards for Law Enforcement Aviation Units, 2016, p. 3)

the overall operations manual. The four components of safety management are safety policy, safety risk management, safety assurance, and safety promotion.¹⁹

The Texas Department of Public Safety (TXDPS) Aircraft Operations Division (AOD) provided a copy of their operations manual to assist in drafting a proposed KHP equivalent. TXDPS Aircraft Operations Division is accredited by the Airborne Public Safety Accreditation Commission. TXDPS Aircraft Operations Division is larger than KHP's Air Support Unit, with a different structure and more diversified flight operations. TXDPS's website states, "The DPS Aircraft Operations Division is composed of 50 police pilots, 25 tactical flight officers, and 5 essential support personnel. The Division currently operates a fleet of 14 Airbus AS350 helicopters, 3 of which are hoist equipped, 1 Airbus EC145 twin engine helicopter, 4 Cessna 206 single engine airplanes, 2 Cessna 208 Caravan single engine turboprop airplanes, 2 Pilatus PC12 single engine turboprop airplanes, and a King Air 350 airplane."²⁰

The ability to scale down TXDPS Aircraft Operations Division's operations manual to KHP Air Support Unit's operations and applicability is more manageable than scaling down (for example) Southwest Airlines operations manual and safety programs. TXDPS's operation manual is broken down into eight sections: 1) general provisions, 2) organization and administration, 3) training and standardization, 4) objective, mission, and operating procedures, 5) unmanned aircraft systems standard operating procedures, 6) safety management system, 7) maintenance program, and 8) reports.²¹

¹⁹ (Federal Aviation Administration, Advisory Circular 120-92B, 2023, p. 4)

²⁰ (Texas Department of Public Safety, 2023)

²¹ (Texas DPS Aircraft Operations Division, 2022)

Using TXDPS's operation manual as a blueprint, I further broke down chapters/sections to facilitate ease of reference and chapter development for KHP Air Support Unit's draft operations manual".

- 1) Introduction & Commander's Safety Statement
- 2) Mission Statement
- 3) Administration
- 4) Personnel
- 5) Safety Management System
- 6) Training and Standardization
- 7) General Flight Operations
- 8) Fixed-Wing Operations
- 9) Rotary-Wing Operations
- 10) Special Flight Operations
- 11) Maintenance Operations
- 12) Reports
- 13) Appendix

The Aviation Operations Manual's overall layout and organization is based on existing KHP policies and procedures format. This ensures that the proposed Operations Manual appears familiar to Agency leadership. Developing KHP Air Support Unit (ASU)-specific policies, using examples from TXDPS that meet Airborne Public Safety Accreditation Commission standards, requires thorough review to ensure the equivalent proposed ASU policies do not conflict with current general KHP policy and procedures, Kansas Statutes (KSAs), Kansas Administrative Regulations (KARs), Kansas Commission on Peace Officer's Standards and Training (KSCPOST) requirements, or Supreme Court Decisions. Policies alone do not create an effective safety management system. The components and actionable procedures within safety management systems must be incorporated and supported by policy.

Safety Policy

The Safety Policy component of SMS is addressed primarily through the Aviation Operations Manual in Chapter 1. The Agency's accountable executive (Colonel-Superintendent) and Air Support Unit commander (Captain) state their commitment to aviation safety management and establish the manual as an official agency document. Kansas Statute 74-2107 authorizes the Superintendent of the Kansas Highway Patrol to "make all necessary rules and regulations for the conduct of the members of the state highway patrol and the capital police not otherwise prescribed by law."²² Declaring the ASU operation manual as an official agency document ensures that the policies and procedures outlined within the manual are accountable by those over and within the Air Support Unit. Chapter 4 defines ASU personnel roles and responsibilities, explicitly creating and defining a proposed Safety and Training Lieutenant within the Air Support Unit. Creating a Safety and Training Lieutenant establishes an accountable position with access to safety programs to ensure timely reporting and recommended improvements.

Safety Risk Management

The second component of the Safety Management System is Safety Risk Management (SRM). The SRM program can be summed up in two parts: the Hazard Assessment Collection System and the Safety Evaluation Reporting System. The proactive Hazard Assessment's primary purpose is to identify hazards associated with new systems or changes, understand the risks associated with the hazard, assess the

²² (74-2107 Kansas Highway Patrol, 2006)

impact of risks, develop mitigation or control measures for the identified risk, and understand residual risk. Advisory Circular 120-92B helps understand what systems are, “people, hardware, software, information, procedures, facilities, services, and other support facets.”²³ For example, KHP’s Air Support Unit will field new helicopters in 2024 and 2025. The new helicopters are a different make and model with new technology than previously fielded; this would be a new system (hardware) change. However, through a more comprehensive and holistic assessment, numerous sub-systems are affected by the new helicopter fielding. Training pilots, tactical flight officers, and maintenance personnel on the new helicopters and familiarity with new maintenance tools, specialized support equipment, and procedures are all examples of sub-systems. Each area presents a potential hazard that requires identifying the risks associated with the recognized hazard and developing risk mitigation and controls.

The Safety Evaluation Reporting System, identified in the Operations Manual as a reactive process, provides a reporting mechanism for hazards that may not have been identified through the Hazard Assessment Collection process. Additionally, Safety Evaluation Reporting facilitates reporting a failure or change in previously established risk control measures or processes. The Hazard-Occurrence Report Form also allows unanimous reporting of observed hazards or incidents, which assists in Safety Assurance processes.

²³ (Federal Aviation Administration, Advisory Circular 120-92B, 2023, p. 19)

Safety Assurance

The third component of SMS, Safety Assurance, primarily evaluates whether established Safety Risk Management programs are functioning as intended. Safety Assurance is supervised mainly by base Lieutenants, Safety and Training Lieutenant, designated Aviation Safety Officers, and Safety Committee representatives. Assigned personnel generate safety reports that track safety objectives and corrective actions, conduct quarterly inspections, and perform annual internal audits. Safety Assurance may initially be tedious, especially when implementing SMS in a small organization. However, KHP supervisors are familiar with similar inspections. They conduct quarterly equipment inspections as required by KHP general policy ADM-06 Inspections and annual performance reviews of employees under policy PER-22 Performance Review System.

Safety Promotion

The fourth and final component of SMS is Safety Promotion. Safety Promotion is essential for the program to be successful. The most crucial aspect of Safety Promotion is training. All Air Support Unit personnel will require initial training on the content of the proposed Operations Manual and Safety Management Systems. Additional training will be required for key personnel with greater responsibilities within the Unit and SMS, namely supervisors and key safety personnel. This can be daunting for an organization that has never operated with an established standard operation manual and SMS program. Fortunately, resources exist to facilitate initial training from partnered agencies with similar but established programs and formal training from organizations such as the

Airborne Public Safety Association (APSA) and direct liaison with local Federal Aviation Administration Safety Representatives.

Recurrent SMS training is essential to strengthen and sustain SMS. The initial goal may be compliance with newly established standards and programs; however, the ultimate goal is to foster a unit culture that embraces safety awareness and risk mitigation to enhance the Unit's effectiveness and efficiency. Additionally, Safety Promotion can serve as a vital, often overlooked, aspect of the Unit's operations. Safety Promotion can be a tool to educate and promote Unit operations to Agency and State level command staff and accountable executives. Agency and state-level leadership are vested in the Air Support Unit's overall operations. As equipment, facilities, training, or any additional funding topics arise, the increased visibility, communication (transparency), and education of the Unit's processes, risks, and mitigation efforts, essentially all that goes into aviation operations, all aid in funding efforts.

Conclusion

The principal objective of this capstone project has been to create a proposed Operations Manual that standardizes KHP flight operations and establish a viable Safety Management System program that meets established industry standards. This project demonstrates that the scalability of Safety Management Systems is feasible and a recognized best practice. Standardizing operations and establishing recognized safe practices is crucial for the Kansas Highway Patrol's Air Support Unit. The Air Support Unit will undergo significant changes due to recent legislative funding efforts that upgrade KHP aircraft to more advanced airframes with upgraded systems. The hazards associated with new aircraft and upgraded capabilities highlight the risk of continued operations without established standards and safety management. The Kansas Highway Patrol can ill afford an incident under the learned practice of complacency and indifference. Safety Management Systems are

General aviation organizations should be mindful that although SMS may not be required by regulation, it is cited by the NTSB as a contributing factor in operations that lack established safety programs, as evidenced by the New Mexico and Alaska crashes. These NTSB findings can significantly influence criminal and civil court proceedings for any organization that fails to follow industry best practices.

Beyond developing a draft Operations Manual incorporating Safety Management Systems as a course project, the intent is to present this project to the Kansas Highway Patrol executive command staff, namely the Colonel-Superintendent. The draft Operations Manual presented for this project will undoubtedly be further refined with

input from the various stakeholders involved. An additional Chapter is required to address Executive flight operations, and many of the forms and procedures will be modified into digital formats with the expansion of existing Air Support Unit software applications such as Digital Airware. Executive-level leadership must buy into the overall concept and demand implementation as a recognized best practice. The voluntary recognition and necessity to standardize operations and establish aviation safety management systems is preferred over receiving a potential NTSB report condemning existing practices.

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