

# SMS, Safety Culture, and the Four Pillars of Safety Applied to Airline Pilot Training: NextGen Demands to Improve Safety

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## ABSTRACT

The history of airline safety includes both FAA economic and safety measures that have grown over the years. This article provides a timeline of airline safety trends from crew resource management to safety management systems. Industry challenges are identified to include operational constraints, training challenges, economic concerns, and human factors to indicate a necessary paradigm shift from reactionary strategies toward proactive measures required by a safety culture—reporting culture, just culture, flexible culture, and learning culture. A safety culture is the foundation for safety management systems (SMS) mandated by the FAA for airline operations, to include the four pillars of safety: safety policy, safety risk management, safety assurance, and safety promotion. This article will identify how to integrate SMS, safety culture, and the four pillars of safety into the airline pilot training environment with cost effective strategies to improve safety within an SMS framework supported by a safety culture.

## KEYWORDS

AQP, ASAP, ASRS, Automation, Complexity, Human Factors, Fatigue, CRM, FOQA, LOSA, Nextgen, Pilot Training, Safety Culture, Simulator, SMS, TEM

## INTRODUCTION

A discussion of pilot training associated with safety culture, safety management systems (SMS), and NextGen would be incomplete without reviewing the history of aviation safety and regulatory processes (Adamski & Doyle, 2010; Gesell & Dempsey, 2011). Human factors research led to programs such as crew resource management (CRM), advanced qualification program (AQP), threat and error management (TEM), and line operations safety audits (LOSA), to reduce pilot error and improve safety (Patankar & Sabin, 2010).

Airline safety shifted focused to an organizational goal with the mandate of safety management systems (FAA, 2015a). Organizational safety culture became the mechanism to support SMS in preparation for the implementation of NextGen (Stolzer & Goglia, 2015). SMS is an organizational wide program mandated in January 2018 for all airlines to improve safety. However, until SMS and safety culture takes root in flight operations and the training department, aviation industry issues associated with automated aircraft and flight operations will continue to impact aviation safety (FAA, 2013; OIG, 2016). A strategic plan for the implementation of SMS into pilot training would provide opportunities to improve safety given that pilot procedures and actions in the flight deck are the last defense preventing an accident or incident.

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## **AIRLINE SAFETY TRENDS**

The early years of aviation saw many safety challenges resulting in regulatory change due to economics, more so than safety; yet, eventually the FAA became a dual gatekeeper of both safety and economic protection (Adamski & Doyle, 2010; Gesell & Dempsey, 2011). The aviation industry expanded quickly and aircraft crashes were due, in part, to under-developed technology, the inability to avoid weather, and a paucity of ground support systems (Perrow, 1999). Early aircraft were unsteady, demanded continuous pilot input, and required unyielding attention due to unreliable external cues for navigation (Mosier, 2010). Aircraft technology evolved, and human factors specialists worked with engineering and flight crews to reduce cockpit workload. In the early 1970s CRM became the first regulatory mandate to deal with crew interpersonal and communication issues (Helmreich, Merritt, & Wilhelm, 1999).

### **Crew Resource Management (CRM)**

Crew resource management (originally termed cockpit resource management) was a movement to teach crewmembers interpersonal and communication skills in effort to reduce pilot error. CRM was not a one-time fix, but a process that evolved over five developmental generations during the 1990s—theory; teamwork emphasis; team expansion; AQP; and TEM (Helmreich, Merritt, & Wilhelm, 1999). One of the greatest challenges with CRM was to convince pilots that they needed to improve their communication skills (Helmreich, et al., 1999). However, once leadership understood that errors were unavoidable, yet could be mitigated, corporate support was gained (Broyhill & Freiwald, 2012). CRM was mandated, and programs were developed and subsequently forced upon flight crews. Despite resistance from some pilots, CRM took hold and became the way flight crews operated—CRM became embedded in airline culture (Broyhill & Freiwald, 2012; Helmreich, et al., 1999; Valazquez & Bier, 2015). When CRM moved into simulator training in the form of AQP, operational training combined with interpersonal communication practice ensued.

### **Advanced Qualification Program (AQP)**

AQP provided airlines an economic benefit by granting training departments the ability to reduce training footprints with a train-to-proficiency concept (FAA, 2006), notably reducing training expense. At the same time, airlines were required to track crew performance to ascertain training effectiveness, yet managers were perplexed how to accomplish this task (Nemeth, 2015). AQP also required the inclusion of CRM training, line-oriented flight training (LOFT), and line operational evaluation (LOE) scenarios (FAA, 2017). These training/checking scenarios changed traditional processes where a pilot was trained and checked on individual performance, to training and checking crew-based performance (Helmreich, et al., 1999). Line-oriented training processes not only enabled crews to learn how to manage the aircraft, but also worked toward improving team and communication skills. With the availability of highly reliable automated aircraft, designed to reduce workload and improve situation awareness (SA), training departments could achieve results quicker than ever before. CRM opened the door to exceptional communication, where crewmember briefings began with, “Today the threats are...”

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