

The Evolution of Airline Safety and Security Programs

Ken Hylander
Delta Air Lines Inc.

ABSTRACT

Career paths are not something that one can predict. They are as much about being in the right spot at the right time with the desired skill set as they are about having a detailed, calculated plan. How does one go from being a young Original Equipment Manufacturer (OEM) test engineer to being an airline Senior Vice President of Safety, Security and Compliance and the joint industry/FAA co-chair of the Commercial Aviation Safety Team?

It is a bit unusual that a non-pilot ends up on an airline Operations Specification listed as the Federal Aviation Regulations (FAR) Part 119 Director of Safety for one of the largest airlines in the world. Engineering background and experience were key stepping stones on that journey along with a healthy dose of skepticism. An initial assignment to make an airline's safety program robust, credible and data driven, much like the very successful aircraft reliability programs, set the direction and path forward.

Today's commercial airline safety and security programs incorporate sophisticated hazard identification and risk mitigation processes taking advantage of millions of data points painstakingly reviewed for hints of emerging issues and trends. Working with just one airline's data is no longer sufficient. Broader industry analysis is required utilizing experience and information from airline partners, both domestic and international, as well as the wealth of public information available, from government radar surveillance data to social media.

CITATION: Hylander, K., "The Evolution of Airline Safety and Security Programs," *SAE Int. J. Aerosp.* 6(2):2013, doi: 10.4271/2013-01-2229.

CAREER PATH

I would like to share some thoughts and observations from a career in the airline business; specifically some thoughts about the transferability of engineering skills to many fields, and the interrelationship of engineering and engineering processes with the sophisticated safety and security programs at airlines that exist today. I'd like to provide you a sense that safety and security programs are no longer simplistic but rather consist of detailed and sophisticated analysis. These are not necessarily the sexiest new technology topics, but rather the evolution and hard work of aviation safety and security that we have come to expect today is based upon solid engineering principles of data gathering, analysis, corrective action development and implementation, and, finally, monitoring.

I did not start out with a plan to lead a large safety organization. I remember thinking that someday I might be lucky and achieve a first level engineering manager job. In fact, I pursued my MBA purposefully to assist me in achieving the goal of being a better engineering manager.

My career has taken me on an unpredictable journey which still surprises me even today when I stop and reflect upon it. I think my career has had four parts to it ([Figure 1](#)). First, there is the entry level and traditional working engineer stage. In my case I was an OEM fuel system test engineer for a brief period of time followed by an airline power plant engineer. I also took a brief detour to try out a maintenance logistics planning role but then quickly came back to lead engineer and engineering manager roles. These were all classic hands on the hardware engineering reliability roles.

Then there was the stage of my career when I stepped away from Engineering to gain "real world" experience. I think these sorts of experiences are important from a learning and development perspective. In my case, I spent time as a powerplant overhaul shop manager and a machine and plating shop manager. In these roles I managed several hundred licensed mechanics and highly trained machinists. I learned to be a more balanced leader and to be a customer of engineering work products. These roles also gave me an outside view of engineering and I learned that there was a life different and distinct from engineering.

I then jumped back into the role of senior engineering leader and spent much of my career in various senior roles where I not only managed and oversaw large groups of engineers but I began to get exposed to the impact of engineering on the business, both in terms of product safety, reliability and regulatory compliance.

Finally, the stage I am still in is one of diversification. For me, that placed me in roles as an airline quality assurance leader and chief safety officer. It also put me in charge of environmental programs, covering items such as permit compliance and climate change strategy and, most recently, gave me a unique opportunity as a member of an oil refinery with a focus on safety performance.

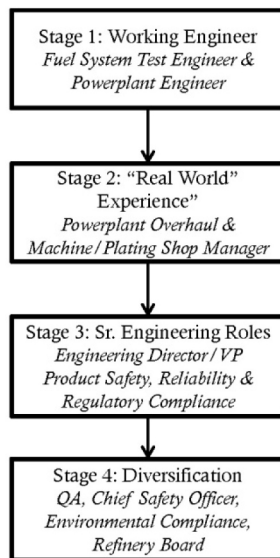


Figure 1. Career progression.

With this background on my career, you can see that it has not been about being on the forefront of any one great technological breakthrough. Being an airline engineer is not really about that. Airline engineering is typically about being a successful implementer of existing technology. It is about managing a product or process to ensure a high state of safety, reliability, and consistency. In one sense it is about managing quality. We're involved in making that aircraft seat you sit in, which these days can be a complicated avionics rack, function at near 100% reliability, or the engine turbine blade repair more durable or building a management process with the controls needed to ensure that the Airworthiness Directive requirements are implemented to the letter of the law 100% of the time for the remainder of the life of the fleet. This is hardly cutting edge technology but it's no less critical to safety and reliability.

Common Themes

When I reflect on personal highlights of my career I have been blessed that there are some projects I have been involved in that have been of great interest to me. These have included:

1. Development of an industry process, with the FAA and my airline peers, to improve the quality of Airworthiness Directives to ensure airlines could actually implement these new safety requirements when they are released from the FAA.

2. Managing the first airline Boeing 777 entry into service program with 180 minutes ETOPS, or extended range operations. While this is standard stuff today, it was not in 1995.

3. Changing the reputation of an engineering team from "down and out" to a respected and a recognized leader in the industry.

4. Managing the consolidation to a Single Operating Certificate of, at the time, the largest merger in the airline industry.

5. Putting into practice the principles of Safety Management Systems and guiding the creation of a safety and security threat and risk assessment process for airline operations.

Upon some reflection there are some common themes to these projects.

1. They were mostly long time frame, complex, projects.
2. They required extensive project and process management efforts.
3. They required gathering, analyzing, understanding and socializing data.
4. They required implementation of technology into a repeatable, effective and efficient processes.
5. They provided an opportunity to lead teams of great people.
6. They required lots of communication up and down the chain of command as well as outside the company.

Hopefully you can see that there are some similar attributes in this list to managing large engineering design and development projects. This is one of the key points I hope to leave you with today. The engineering skill set is transferable. Every airline must have five required positions listed on their Operations Specification; Director of Operations, Chief Pilot, Director of Maintenance, Chief Inspector and Director of Safety. It is a bit unusual that as a non-pilot I have ended up as the Operations Specification Director of Safety at one of the largest airlines in the world. I started my remarks by saying career paths were not entirely predictable and I would never have predicted this outcome when I started my career. But, I can definitively say that it was my engineering background that got me this role and I think it makes good sense.

RELATIONSHIP BETWEEN ENGINEERING AND SAFETY

There has always been, in my opinion, a strong relationship between engineering and safety programs ([Figure 2](#)). For me, that realization hit home when I got my first assignment as a new airline chief safety officer. That assignment was to make my airline's safety program credible and data driven, much like the industry standard Reliability Centered Maintenance and Continuous Analysis and Surveillance programs already recognized for having these attributes. Safety issues need factual support so that they are understood and readily accepted by senior leaders. I credit my leadership with having the wisdom and foresight to see that opportunity and connection. Over the past 12 years that I have been a safety leader I have been comfortable being able to capitalize on my engineering skills and background when needing to analyze a situation and make difficult safety assessments.

[Figure 2](#) shows that many of the data elements that support both engineering reliability and safety program oversight and advancements are the same. Performance metrics, audit data and employee reporting all provide valuable process improvement information, both long and short term.

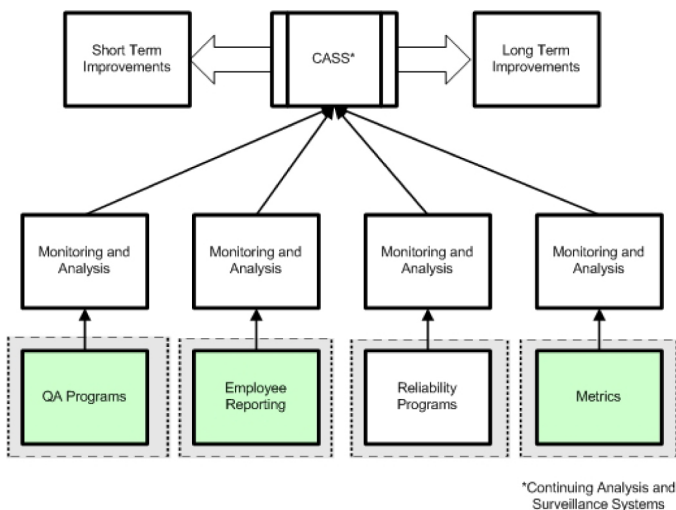


Figure 2. The relationship between engineering and safety.

INDUSTRY EVOLUTION

Throughout the decades of structural change since 1978 there has been one constant that makes the airline industry stand out. Safety and security have remained a priority. Safety performance in the airline industry has evolved to phenomenal levels. Air travel is widely recognized as the safest form of travel. Industry accident rates have improved year after year based upon the introduction of new technologies, management processes and an intense focus on safety. Other industries have turned to aviation looking for

the key to replicate that success. Sure there have been failures, and in aviation failures are spectacular, and media events, but importantly the industry learns from them. There is a culture of safety for operations, which benefits customers and employees that, in my opinion, is unique and continually evolving. So, what is behind that culture? A bit of historical perspective may help that understanding.

Early efforts to improve safety included rudimentary provisions for the certification of airmen and aircraft, as well as the establishment of air traffic rules and governmental regulatory bodies.

After years of fatal industry errors, aviation safety began to develop more rapidly as improvements in investigation techniques led to better understanding of mechanical and human performance failures; yet the process still relied heavily on reactionary efforts following an accident. An increased focus on human factors helped set the foundation for continuous safety improvements through mitigation of risks and hazard identification. Further improvements and technological advancements were seen in aircraft engineering, air traffic management and airport design which, when combined with regulatory oversight, helped to drive accident rates lower and survivability rates higher. The industry has moved from a 1998 accident rate of 1 fatal accident every one million flights to a current accident rate of one fatal accident every five million flights. And while there are still accidents, the equipment and safety processes and practices in place now allow people to walk away from accidents with increasing frequency. The news media calls these lucky events. We know they are actually the result of decades' long continual improvement efforts in engineering techniques, aircraft systems design, reliability and safety systems.

As a result of these improvements, commercial aviation has realized the enviable safety record I noted previously. Yet inherent hazards remain. It is generally accepted that broadly-applied remedies and technological advancements have approached their limit of effectiveness. Those risks remaining in the system tend to be specific to air carriers, airports, and suppliers of aviation services and are introduced into the system by the organization itself. These risks, therefore, can only be identified by analysis of the specific operational process and mitigated by the responsible parties or organizations.

SAFETY MANAGEMENT SYSTEMS

This realization has led to the birth of air carrier Safety Management Systems, or SMS, as the next step in the evolution of safety in the aviation industry's global arena ([Figure 3](#)). Mandated by the United Nations' International Civil Aviation Organization (ICAO), SMS concepts are already regulatory standards in Canada, most of Europe, and many other countries. The United States, in an effort to ensure a complete understanding and consistency of such a system, has not yet mandated the implementation of SMS,