

Voluntary Safety Programs and Safety Management Systems:

What is needed to move from Reactive to Predictive

Abstract

Timothy J. Logan

ISASI Member MO2711

Safety Management Systems (SMS) are now becoming an integral part of aviation operations safety. SMS is no longer just a concept but has been adopted worldwide as the next step in the evolution of safety programs. It is anticipated that SMS will be ingrained in U.S. Part 121 Operations starting this fall with the issuance of the SMS rule that will require Part 121 operators to develop and implement an SMS within the next few years.

Integral to the success of SMS are the reporting and data acquisition programs that have been developed in the United States and elsewhere around the world in different forms. Known in the U.S. as “Voluntary Safety Programs”, they are specifically named Aviation Safety Action Partnership (ASAP), Flight Operations Quality Assurance (FOQA), Line Operations Safety Audit (LOSA) and Voluntary Disclosure Reporting Programs (VDRP). Without these “voluntary” programs the ability for an operator to have a successful SMS is limited in that the reporting culture and framework necessary to support and drive the engines of SMS (Safety Risk Management (SRM) and Safety Assurance (SA)) would not be in place.

While these voluntary safety programs are now mostly mature within the U.S. Airline industry their own evolution has resulted in data sources that, while very robust, are not structured to support the system safety process that is so important for SMS to be successful.

The author proposes to describe how vital these programs are to SMS and to demonstrate that the current structure and policies of the Voluntary Safety programs actually limit their effectiveness and thus the eventual success of SMS. The author will propose changes to the existing format of these programs both

from a regulatory and process perspective and will discuss how these changes are vital to moving SMS programs from Reactive to Predictive safety.

I. Introduction

Safety Management Systems (SMS) have become the aviation industry's next best innovation for improving its safety record. SMS is the evolution from reactive safety programs, to proactive safety initiatives, with the hope to move toward the pie in the sky "Predictive" Safety programs.

I don't think we really understand what "predictive" safety programs are, nor are we close to being able to predict when an accident will occur. What we do understand is a process that has evolved to a system in which hazards or threats that lead to an accident or incident are identified, tracked, analyzed and corrected. Any one event may include several threats or hazards so a thorough investigation and classification scheme is used to facilitate the systems analysis. The results of the systems analysis is the development of technical, operational, or procedural mitigations to either remove a hazard, lessen its impact by implementing redundant systems or controls, or a combination of these mitigations thus reducing the likelihood that the hazard will cause an adverse outcome. Safety Risk Management (SRM) 101.

SMS also leads us to Safety Assurance (SA), that in essence makes us ensure we are doing what we say we are doing and that the mitigation strategies that we put in place to reduce risks are achieving the desired results. This is not a complicated concept, although we have gone to great lengths to make it complicated and less efficient.

2. Safety Information

No accident is caused by a single element or hazard. Even a straightforward mechanical failure can always be traced back to design,

material selection, installation, continuous maintenance oversight, etc... that lead to the failure. Some of the hazards may have gone unseen in the design phase, but a good reliability in-service review process and a program to identify and manage the issues can lessen the effects of a failure with its origins in the design phase.

The same holds true in operations. Humans will make mistakes. It is a 100% certainty. Just like a certain material will fail under predictive cycling, the human element in our operations will err. System improvements, procedure changes or training can be designed into a process to eliminate, lessen, or control the hazard and its adverse impact of the operation. The term "error tolerance" is good description of the goal. In an airline or operations environment this is a daily issue that must be understood, addressed and committed to.

For the longest time we waited for an accident to occur, investigated the causes and then developed and implemented mitigation strategies for prevention of a repeat of that accident. The development of Ground Proximity Warning Systems (GPWS) and Enhanced GPWS, Traffic Collision Avoidance Systems (TCAS), Stall Warning Systems, Yaw Dampers, Checklists, CRM etc., were developed and implemented using this method. The falling accident rate throughout the past 50 years validates how successful these enhancements have been. EGPWS and TCAS have virtually eliminated the accidents which they were designed to prevent.

For those of us in the safety offices of large operations, our focus is no longer on reacting to hull losses or even serious incidents. Our focus has moved toward preventing incidents through the identification of hazards and threats for which we previously had little to no information. The source of the information used to identify these hazards emanates from programs and systems that have evolved into the primary tools for this prevention effort.

These programs, commonly known as the “Voluntary Safety Programs” in the United States include line employee reporting from the Aviation Safety Action Partnership (ASAP) Programs, flight data from our Flight Data Analysis Programs, also known as Flight Operational Quality Assurance (FOQA), Voluntary Disclosure Reporting Program, (VDRP) and Line Operations Safety Audits (LOSA). In addition, most airline operations have implemented other reporting programs to serve specific purposes within the airline operations. These would include but are not limited to employee Irregularity Reporting programs, occupational injury reports, Internal Evaluation Program Audits, Maintenance Reliability Programs, Aircraft Damage Reports, and Internal Investigation Reports. To make it easy I’m going to group these data sources and the Voluntary Safety Programs into a nice bucket called “Safety Information”

Currently, the Safety Information being collected within the airlines results in a tremendous source of data about the operation and the threats/hazards that are inherent within. The availability of this information has grown significantly in the past 10-15 years. This is attributed to the tremendous efforts of the industry to develop, promote and protect these programs. The result has been a dramatic improvement in accident and incident prevention. While it is impossible to prove a direct link, the fatal accident rate decline in the past 10 years, and the coincidence of the growth and maturity of the Voluntary Safety Programs cannot be dismissed.

It was determined very early that the easy part of the development of these programs was the acquisition of this information (although anyone who has implemented one of these programs knows that data acquisition is not a trivial pursuit). What became apparent once this information started flowing in was there had to be methods and

processes put in place for the analysis of this information and a means to utilize it to fix the issues that were being identified.

Looking back, there appear to have been three main errors made in the development and implementation of these programs:

1. The programs were developed independently from each other;
2. The influence of FAA Enforcement and company discipline into these programs led to misbehavior and reduction in overall effectiveness;
3. The programs were developed with data protections that limit the ability to cross-pollinate the information and effectively conduct system safety analysis.

Let's look at these 3 errors in more detail.

Voluntary Safety Programs Independence

All of the "Voluntary Safety programs have been developed independently of each other. Some of this was based on need, some of this was based on the pace of FAA regulations and guidance, some was based on technology limitations, and in all cases they were kept separate because the participants were not thinking strategically.

For example, ASAP programs are currently in place in most airlines. Most of the airlines have created these programs using separate Memoranda of Understanding (MOU's) for each of their employee work groups. The MOU's lay out the processes and procedures under which the ASAP reports will be accepted and what actions can be taken. The MOU is basically the rulebook for the program. What this means is that the pilots will have a different MOU with the company and the FAA, than the dispatchers, mechanics, or flight attendants. This also has the

result of isolating employee groups who are not covered by ASAP MOU's, such as ramp employees.

The independence perpetuates the silo mentality of operational departments and employee work groups. This also results in inefficiencies, requiring separate computer databases and personnel to manage these programs. It also can result in disparate treatment of employees within a company depending on the protective provisions included in the MOU's, leading to difficulties in achieving "just culture." It also makes it very difficult and labor intensive to correlate and analyze the ASAP information with the other Safety Information, thus complicating hazard identification and SA within SMS.

From a safety perspective, the worst part of the development process for ASAP has been the difficulty to "cross-pollinate" the information across the organization to really accomplish system safety analysis. Separate reporting classification schemes have been developed, separate taxonomies utilized and in the worst case separate software developed to house and operate the programs within the same airline.

The Flight Data Analysis Programs, also called FOQA were developed independently from the ASAP programs. FOQA programs have incorporated some of the most stringent data protection provisions in that the identification of individual flight segments are kept secret and analysis can only be done on aggregate information, i.e. multiple flights. This was done because the pilot representatives would not "allow" the development of these programs unless access to the flight identification information within the software prohibited access to either company personnel or FAA inspectors to prevent discipline or FAA enforcement. This is not meant to be criticism or an editorial statement; it is just a statement of fact.

Having been directly involved in the negotiations of these agreements with both employee representatives and FAA, there was a need for these provisions to put in place at the time they were implemented.

There was no trust between the parties, and the only history was one of “catch me if you can.” In addition, there were no other processes in place by which the issues identified could be dealt with. So as an industry, we worked around the existing regulations and employee disciplinary procedures to develop these programs, rather than strategically rethinking how we should develop these programs. The FOQA Rule¹ was put in place but it was based on protections and limitations on data use. No coordination was done with the ASAP Advisory Circular, nor was there thought on how the safety information could be utilized together. It was left up to the airlines implementing the programs to deal with the data. VDRP and LOSA also were developed independently without consideration of how they information generated should be coordinated to achieve effective system safety analysis. Little if any correlation was done between the guidance documents the programs were based on to align the programs.

Discipline and Safety

Discipline has its place. The subject of Just Culture places the positioning of discipline correctly within an organization. Unfortunately, as currently structured, the industry has forced the determination of whether discipline or enforcement is rendered on the Safety programs, which inherently places undue pressure on the programs where it is not warranted, nor was it designed to deal with.

My intent is not to affix blame for this but in reality to point out the limitations and pressure inappropriately placed on the safety programs. The result is that the reporting culture can't grow which ends up limiting the information available for the SMS to function. I know this was never the intent nor do most understand how their actions adversely affect the reporting culture and ultimate the effectiveness of SMS.

¹ FAR 49 CFR 13.401

The FAA has a regulatory mandate to enforce the regulations. That is not in question. The companies also must maintain the right to manage their people. In both of these instances the court of public opinion drives accountability. Previously, the philosophy was enforcement and discipline as the method to ensure this accountability. The experience with the Voluntary Safety Programs has shown that a process centered on systematic corrective action and incentivized reporting is more effective at improving and promoting safety results. Enforcement and discipline may be effective on the individual and, in some instances, may provide some minor incremental benefit as a deterrent. On an aggregate scale, however, enforcement and discipline do not lead to the promotion of an open reporting culture and cannot result in the safety improvements that the industry must have.

Let me provide an example of how the program limitations affect safety analysis. Under current processes if an unstable approach is detected within a FOQA program, in most cases only a pilot (normally called a Gatekeeper) from the employee labor association is permitted to contact that pilot to discuss the event. No statement can be requested from the crew, no debrief of the crew can be conducted other than contact by the gatekeeper. This is done to protect the identity of the crew and also to prevent either the company or the government from pursuing discipline or enforcement action.

In a perfect world we could use the same techniques we have developed for accident investigations, such as Flight Data information (FOQA), crew interviews (ASAP), and a review of associated data in the investigation to identify hazards. The overhang from discipline and enforcement prevents these programs from being able to take full advantage of the information gained. The result is a reduction in the learning from the “unstable approach” event and in the overall Safety program effectiveness.

The myth of the “rogue” employee must be discussed. When these programs were being developed there was always the mistaken belief that a “rogue” employee would be able to “get out of jail free.” On the employees’ side, there was always the fear that both the FAA and companies would use these programs to target certain “known” individuals. The protective provisions were put in place to prevent this expected misbehavior. At the time, the lack of trust and history probably made these possibilities believable, and therefore the programs were designed to prevent this from happening.

Almost 20 years of history has shown that the “rogue” employee was a myth. While some disciplinary “misbehavior” has been attempted by the airlines and FAA these are isolated cases, so far outside the day to day operations of these programs, that any contention that this is still a significant issue has no basis in truth. In reality, employees are not abusing the reporting incentives. No one starts their working day intending to violate an FAR or company procedure. If they do it is **not the safety program’s responsibility to deal with this.** The success of the VDRP proves that errors discovered by the companies are inadvertent and not intentional.

The value of this information, in spite of the protective provisions, has demonstrated to the parties that misusing this information is not in anyone’s best interest. The value of the information generated from these programs has largely overcome the lack of trust between the parties. For the most part, within the companies discipline and the voluntary safety programs are not mixed.

Unfortunately, on the government side this is not the case. While information shows that over 90% of the events reported to ASAP would otherwise be unknown to the FAA, the guidance within the ASAP program from the FAA is linked to the Compliance and Enforcement manuals and require a determination of corrective action through a

process emanating from the enforcement side of the FAA.² This places a huge burden on the FAA inspectors on the ASAP Event Review Team to focus on determining the level of enforcement rather than the safety aspects of a report.

In addition, the guidance between ASAP and Voluntary Disclosures drives separate investigations, separate data disclosures and duplicative development of mitigation strategies. This has led to the identification of reporting and non-reporting employees, enforcement action against non-reporting employees and increased workload for the airlines and the FAA. The result is an inefficient process that is enforcement, not safety, driven leading to a damaging reduction in the reporting culture. The FAA states that ASAP is for the employee, while VDRP is for the company. The guidance for these programs has not been coordinated, nor has there been a strategic vision laid out in SMS guidance on how these programs should be structured to work proactively. Instead enforcement dictates the processes and procedures of these programs.

Protection Provisions

The inability to directly link the Voluntary Safety programs together results in the loss of valuable information that could otherwise be used in hazard identification. We have implemented barriers that prevent us from obtaining and using the information that is normally generated during an accident investigation in our preventive activities.

ASAP and FOQA programs include data protective provisions to achieve confidentiality for the program participants. There is a widespread belief that these programs were developed to be anonymous. In some cases they were, but in most cases the goal was to ensure no individual airman or reporting employee could be identified in order to prevent the discipline and enforcement issues discussed above. The airlines were also concerned that the identity of the operator could be revealed,

² FAA Compliance and Enforcement Guidance is located @ FAA.gov, FAA Order 2150.3B, Change 4, 5/1/12, and FAA Order 8900.1, Volume 14-1.

thus resulting in adverse publicity and possible enforcement. Thus any sharing of information inside or outside the airline's property is usually prevented except in an aggregated form.

LOSA information is also de-identified and only presented in aggregate form. Most LOSA studies are only accomplished over a short time period every few years using a statistical sampling process for data analysis validation. While LOSA information has provided valuable information the ability to compare it to FOQA and ASAP information is limited since the LOSA results are presented in aggregate deidentified form. As such, the errors detected during the LOSA are given no context, via an ASAP report, nor could the FOQA information from the flight be used to round out the analysis.

Aviation Safety Information Analysis System (ASIAS)

In coordination with the FAA the industry has created and implemented ASIAS. The intent of ASIAS is to utilize the vast amount of ASAP and FOQA information at the airlines and combine it with other available information to enable an industry view of the airspace system. In combination with the Commercial Aviation Safety Team (CAST) a process has been set up to identify safety issues, develop corrective actions and monitor the National Airspace System to ensure the corrective actions are effective.

ASIAS is maturing and it is now providing information in an aggregate sense that the industry never had before. There is significant potential within the CAST/ASIAS partnership to enable the industry to attack issues that previously it could not without waiting for an accident.

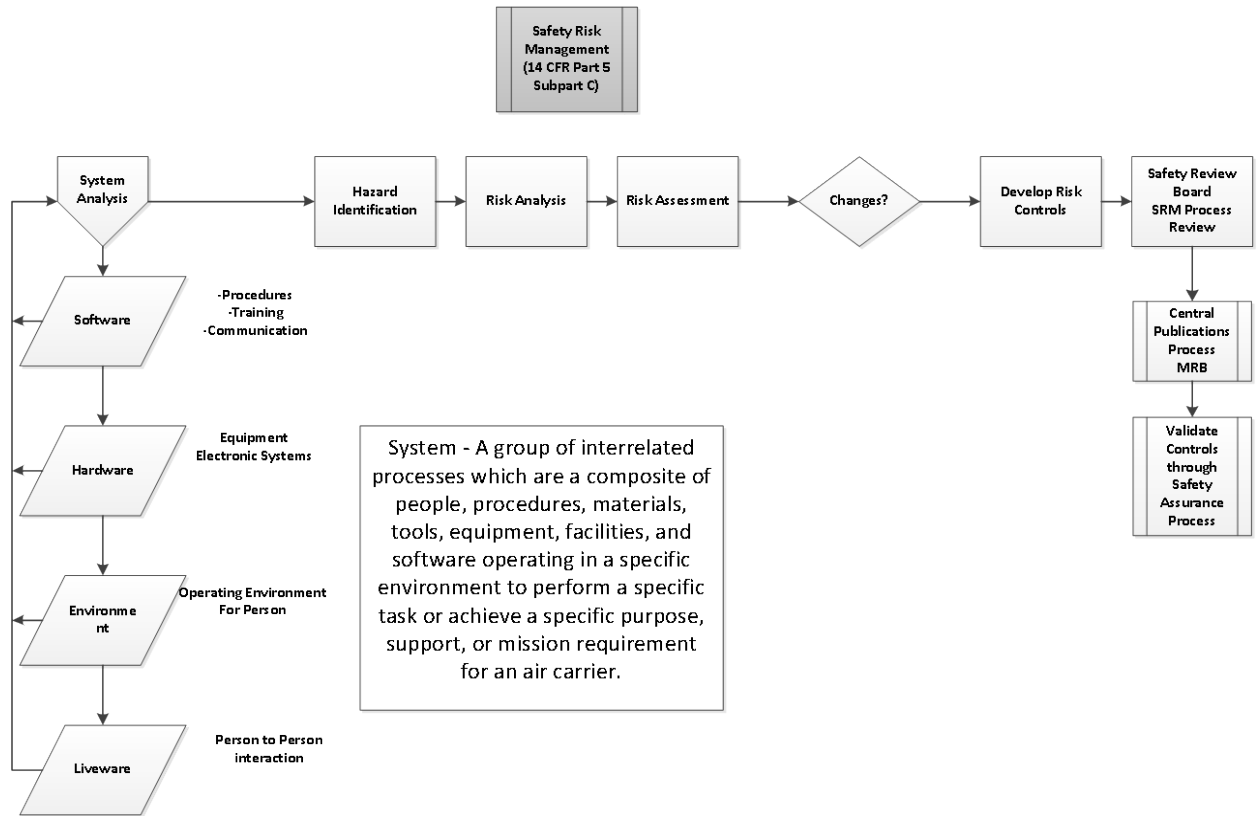
ASIAS has also started working with the NTSB to enable the power of the ASIAS information to assist the Board in the development of their recommendations. Just like the initial development of ASIAS, this will be

an iterative process as we gain experience in the utilization of this information. The industry and the NTSB believe there are benefits to the use of this information, and although we are being deliberate in our progress both parties are excited about the potential. The NTSB must also be open to reviewing and modifying its processes and procedures if it wishes to take full advantage of the vast amount of safety information that is now being generated.

SMS and Safety Information

As stated before, the two main engines powering SMS are a well defined SRM and an integrated SA process. The diagram below outlines the System Safety Process as described within the Proposed SMS Rule³. Safety Information is critical to hazard identification within SRM. SA relies on the steady stream of information to assist in validating system performance and more importantly identifying areas where process controls are insufficient. In its current uncoordinated form the Safety information provided does enable SRM and SA to be accomplished, but as these programs mature the ability to get to root cause and thus true hazard identification and systems analysis will be limited because of the barriers inherent in coordinating and sharing the information from the Voluntary Safety programs.

³ Federal Register, November 5, 2010, Volume 75, number 214, pages 68224 – 68245 “Safety Management for Part 121 Certificate Holders.



What must be brought into the discussion is the fact that these robust safety data programs will identify errors. The vast majority (>99%) of these errors are inadvertent. Our experience with these programs has proven this to be true. Unfortunately, these programs are still governed by the enforcement and discipline based environment from which they emanated. Human errors in the current system are treated as violations. There is no acknowledgement in these enforcement processes of the realities of errors. While the sanctions might be less the process is dependent upon first determining whether a violation occurred. This is not consistent with the principles of an open reporting culture, SMS, and error tolerant system improvement.

The Safety Information programs are designed to identify errors. Thus when errors are discovered, it should not be a surprise. In fact it should be expected. Our experience with the Voluntary Safety programs reveals that on average multiple errors occur on every flight. Are these

violations? While technically they might be, in reality it is just the human involvement in a very complex and threat intensive system. The SMS, including the SRM and SA processes should be designed with this basic tenet in mind. Currently, though, the Voluntary Safety information needed to support SRM and SA has inherent limitations built into its acquisition and review processes that are designed to prevent misuse of the information rather than to promote the use of the information.

SMS provides a methodical, documented process that is system safety based. Embedded in SMS is hazard identification from threats and errors sourced from the Voluntary Safety Programs and other data sources. The SRM process is designed to systematically identify the hazards, risk assess those hazards and develop corrective actions appropriate to the risk. The inefficiencies of the Safety Information system hamper this process and thus adversely affect the ability of the SRM to function. The programs should be structured to support the SMS processes. Barriers to data usage and data correlation should be eliminated. Enforcement and discipline should not be the basis on which the Safety Information processes are established. While this might serve an enforcement philosophy it is not consistent with an open reporting culture or the goals of SMS.

How do we achieve this? Just as implementation of the programs took a team so will evolving the programs to serve SMS. To achieve this I propose the following steps:

1. The FAA administrator should designate an Aviation Rulemaking Committee (ARC) made up of industry, government, academia, and labor to review and propose changes to existing Voluntary Safety Programs and Safety information reporting guidance to ensure the this information is collected, processed and utilized to support SMS. The intent would be to separate the Safety program information from use in enforcement activities and to ensure maximum

coordination between ASAP, FOQA, LOSA and VDRP and other data sources.

2. Part 193 Freedom of Information Act (FOIA) protection needs to be explicitly extended to all Safety Information utilized within an FAA accepted SMS program.
3. There needs to be an education program developed for the public, politicians and all other affected parties that illustrate the overall benefits of proactive Safety Information collection and its relation to SMS. This effort must outline why an open reporting culture in concert with SMS is preferable to a culture that looks to punishment rather than promote safety improvement.

Conclusion

We have never had a period of time in the history of aviation as safe as the last 10-15 years. It is no coincidence that this period coincides with the development and maturity of the Voluntary Safety Programs. The overarching philosophy of the programs has been to develop an open reporting culture that will result in identification of threats and hazards, and the development of mitigation strategies resulting in continued safety improvement. Unfortunately, there was not a corresponding effort to effectively coordinate the development of the Safety Information systems. This has resulted in limitations and barriers to the efficient and comprehensive use of this safety information.

While we were not thinking strategically when we developed these programs it doesn't mean we have to continue to perpetuate these mistakes. Jim Collins, the author of several best selling business books such as Good to Great and Built to Last has said "Change begins when you confront the brutal facts." It is time for us to confront the brutal fact that for SMS to succeed our existing Voluntary Safety Programs and enforcement philosophy must evolved to meet the needs of SMS.

SMS is a continuous improvement process. It will succeed through incremental, almost imperceptible changes that reduce hazards and threats. The ultimate success of SMS will be driven by the Safety Information that must fuel the identification of hazards and validation of controls. We must work to eliminate any barriers that don't enhance an open reporting culture and serve the goals of SMS. Education of the public and of the politicians on the benefits of open reporting cultures and SMS is crucial to creating a just culture that prevents the desire toward blame and enforcement from tipping the critical balance between accountability and safety.