



Challenges of large airline aviation safety investigation organizations and their Safety Management System

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Introduction

A mission of an Aviation Safety Investigation (ASI) organization may be simple; to prevent the next accident. But there are many obstacles that may affect the realization of this mission: mergers, acquisitions, bankruptcies, and cost cutting measures are a few of the latest activities. For any airline trying to implement Safety Management System (SMS) principles, many challenges will always exist. In the past several years, many United States airlines have gone through mergers and acquisitions that usually involve integrating two differing safety cultures. This adds additional challenges in the implementation and integration of an SMS culture throughout the airline.

This paper will discuss the challenges large United States airlines face with the cultural and technology challenges in implementing the components of SMS. For the purpose of this paper, the use of the term Airline will be used when referring to both large United States passenger and cargo operators. Throughout this paper are the results from survey responses and interviews with airlines and individuals involved with aviation safety investigations.

While the scope of this paper is focused on United States airlines, any safety or investigative organization around the world can take the lessons learned to improve their organization. All ASI organizations share similar challenges of making airlines safer and preventing accidents globally. The ASI organization realizes that it cannot prevent every accident but mitigates it as low as reasonably practicable (ALARP).

United States airlines follow the guidance in FAA Advisory Circular AC 120-92A and will soon comply with 14 CFR Part 5. Similarly, most international carriers have their own guidance or regulations for their SMS framework. Some international airlines have SMS guidance and established practices that may be healthier and further advanced than where the United States is at this time. But the United States will catch up.

Thank you to those airlines and individuals that participated in the surveys and interviews, and assisted in the research for this paper. Information collected from surveys and interviews has been de-identified and data is used in aggregate. The opinions expressed by the author do not necessarily reflect the opinions, policies, practices, or experiences of United Airlines.

Bureaucracy

Recent industry mergers and acquisitions have forced airlines to consolidate, downsize, or do more with less, and historically this has included bankruptcy as part of the equation. As these events unfold, most organizations that were functional in stable periods, may find it difficult to operate in the dynamics of organizational and cultural changes.[1]

Many airlines have experienced a loss of talent through the relocation of offices and headquarters, downsizing, elimination of redundant functions or positions that are no longer seen as value added. This has also happened to airlines that have not gone through a recent

merger or acquisition. Some airlines in mid-merger still have two organizations doing the same parallel function; this can end up with differences in philosophies. These differences which have been experienced in management and work force representation may hamper the Aviation Safety Investigation (ASI) organization's mission.

Integrating processes, cultures, philosophy, procedures, equipment platforms, information technology (IT), and legacy systems may be tough challenges. Sometimes work force issues become the bigger challenge. Collective bargaining agreements, work rules, both written and assumed, can hinder the safety culture efforts. Sometimes vital safety information may be off limits to the investigation.[14]

There may be a time, even after a Single Operating Certificate (SOC) is granted by the FAA or Single Legal Entity (SLE) business incorporation has been achieved, where there is still a large amount of merger related work remaining to be done and Ops Spec A502 does not give enough detailed guidance. Most likely, the synergies that were promised are not being realized in a timely manner. After everyone has worked long hours putting in a lot of effort, and frustrations may be running high, comes a time referred to as merger fatigue. Usually after deadlines have passed or initial promises have been postponed, merger fatigue becomes widespread. The hard battles may have been won, but there are many more hurdles to go before the war is over.

Separated, Isolated, and Layered Organizations (SILOs) may exist prior to a merger or acquisition. SILOs can exist laterally or vertically in any airline or within any department. Airlines that have merged may have ASI offices that remain geographically separated for long into the merger. Even when a single location is chosen, there still can be isolation between legacy groups and even between individuals. It is sometimes difficult to combine legacy cultures, and even if the SMS cultures are similar, there may still be an "us versus them" reluctance to trust each other, or an "our way is better" mindset.

Vertical layers can prevail within an organization that has recently merged. These layers can be manifested in the chain of command, where it is dictated that the decisions be made at a higher level than needed. Vertical layers can also be in the form of a lack of empowerment and there may be an initial lack of faith between levels of management. This can be a result of being unfamiliar with each other's policies, methods, abilities, or competencies, and can be caused by members that may be in direct competition for a single position in the end-state organization.

Mergers and acquisitions may have helped the ASI organization by forcing it to do more internal collaboration. And while other organizations become more reliant on the ASI organization to provide information and effect change for them, the ASI organization should not be responsible to incorporate those changes. Because of the many hats an investigator must wear, it is critical that the investigator maintains independence and objectivity. In addition to internal collaboration, the ASI organization must also consider collaborating externally and globally.[13]

Aviation Safety Investigation

Many of us that are pilots were told by our flight instructors that your Pilot Certificate was a license to learn. If you have an A&P Certificate, you were probably told something very similar. When you first joined your Aviation Safety Investigation (ASI) organization you may have heard a similar statement, or eventually realized, that even with your previous experience, there was a lot more to learn.

Due to downsizing of the ASI organization, the luxury of being a specialist may be gone. We may have to be satisfied with being a generalist, but with the expectations of being a Subject Matter Expert (SME) in all areas of an investigation. We may have to rely more on SMEs that have the expertise and experience that we may not possess. In addition to a loss of expertise within the ASI organization, the airline as a whole has lost expertise and experience in many areas. An experienced SME for us to consult with may no longer be available in our airline. This may result in having to rely more on external expertise, such as a manufacturer.

United States airlines follow guidance contained in FAA Advisory Circular AC 120-92A. The AC was designed to be scalable from a single plane operator to a large multi-fleet air carrier. Both this AC and ICAO, Document 9859, Safety Management Manual provide a framework for SMS implementation and maintenance. Most United States airlines have followed the guidance in AC 120-92A, as well as other FAA guidance. This is in anticipation of regulation 14 CFR Part 5, Safety Management Systems, being implemented in the near future.

The AC and ICAO documents, along with others, give a framework for an organization to start their SMS program and assists in establishing the ASI organization. It is up to each airline to build upon that framework to establish their ASI organization's role in the airline SMS culture. From this framework the ASI organization's SMS Safety Policy can be developed. The ASI organization must also make sure that the Safety Policies of other groups support the ASI organization's mission.

As the ASI organization works to streamline processes, 49 CFR Part 830 Notification and Reporting, and Part 831 Accident Investigation Procedures, may need to be revisited. United States operators are closely looking at the Notice of Proposed Rule Making (NPRM) for Part 831 to see if it fulfills the airline's needs and also if it fits into ICAO guidance. For Part 830, we may look at modernizing the language or perhaps creating clarification and interpretations that may address general aviation and the air carriers separately.

Several years ago, most airlines may have had smooth sailing on the Sea of Obstacles (figure 1), but financial duress, geopolitical unrest, terrorism, and other external and internal forces have resulted in mergers, acquisitions, bankruptcies, downsizing, and belt tightening. The level of insulation from those obstacles may have decreased. Many obstacles may not be readily apparent, remaining below the surface, but they can still inflict serious damage. This is where SMS helps the ASI organization to see those hidden obstacles, to prepare for them, or to mitigate the consequences. This is how SMS Safety Risk Management can be used to make sure

all potential dangers are considered, and making sure that the new mitigations do not introduce new threats or remove previously implemented safety mitigations.



Figure 1. Sea of Obstacles.

Each time an investigator creates a final accident or incident report; SMS is being validated and tested. When findings that are based on the investigator's analysis, and recommendations are made: the follow through and holding organizations accountable to those recommendations is part of the Safety Assurance and Safety Risk Management components of SMS.[1]

The ASI organization may have several conduits to share its lessons learned and successes. These conduits can be through other airlines, including airlines of other States, USSASI, ISASI, A4A, Safety InfoShare, ICAO, IATA and other entities. Not only should the ASI organization be sharing its findings and recommendations internally, it should be consulting with other airlines and having discussions at United States USSASI meetings. Forums, such as A4A, the Safety InfoShare, ICAO, and IATA can be used. Information must also be shared with our alliances and other international airlines. The ASI organization must practice each of the SMS components globally.

No Accidents

Having no accidents is a threat in itself. The airline industry has created a double-edged sword of having very few serious accidents to test the interfaces of Aviation Safety Investigations (ASI) and SMS. Airlines may have drills or practice scenarios which are valuable; but the chaotic, emotional, fatiguing, pressure filled aspects of a real life accident are difficult to simulate.

Safety successes have led to a resistance to change by other internal groups. It may be perceived that if we have so few accidents; then, why do we need to have an ASI organization if

there is nothing to investigate. Those other groups may not realize how safety efforts evolved to where they are.

Program and industry success have removed a vital training and experience building block. This prominent issue was discussed in several of the papers at the Vancouver 2013 ISASI conference. Presenters exposed the challenges an Aviation Safety Investigation program faces in obtaining the experience and seasoning that a new investigator needs.

The experience in an ASI organization is usually lost by cyclic attrition and the organization is usually able to absorb the loss. But mergers and acquisitions accelerate the drain of expertise to a point where the organization may not recuperate fast enough to maintain the same standards and level of expertise.

The top survey responses to the question: What did you do when told to “do more with less”, was to reduce the number, or narrow the scope of investigations, and to reduce the level of detail in an investigation report. The main concern expressed with these actions is that there may be a safety threat that is not identified or addressed. See Appendix A for a table with the survey responses to this question in grouped rankings.

The resistance to change is a tough obstacle for any safety organization to overcome. But organization decision makers may be driving the ASI organization to change. This may be due to so few serious accidents to investigate; the ASI organization needs fewer investigators, those investigators can perform other duties or be part time, the ASI organization is no longer relevant and can be combined with another group. These are just more dangers in the Sea Of Obstacles that need to be identified and mitigated by the ASI organization to maintain its effectiveness.

Comparable Challenges

The Aviation Safety Investigation (ASI) organization must always be successful in assisting the airline in achieving effective change. Dwindling budgets, reduction of manpower, and reduction in accidents may have resulted in the perception that the safety organization is doing less. It may appear that there is no tangible evidence that the safety program is working. It is often difficult to objectively quantify an accident that has not happened.

Even if an airline has not gone through a merger or acquisition, there are still the challenges of changing the existing culture to an SMS culture. There will be the small percentage of people that embrace and can champion the transition to an SMS culture. These people are the allies and advocates of SMS. There will be a slightly larger percentage that are resistant to change, feel threatened, or see a Just Culture as adding cost or delaying programs. These people may provide a lot of roadblocks, but are the ones that make the program continuously improve. Then, there is the majority that is in the middle, they don't yet trust and are waiting to see proof of the value of SMS. These are the ones that the safety organization needs to recruit.

The perception of other departments within an airline of the ASI organization will most likely change throughout the merger or acquisition. Figure 2 below depicts how three aspects of the perception of the ASI organization can change. The three lines show acceptance, trust and reception. They are interrelated, but are separated for discussion.

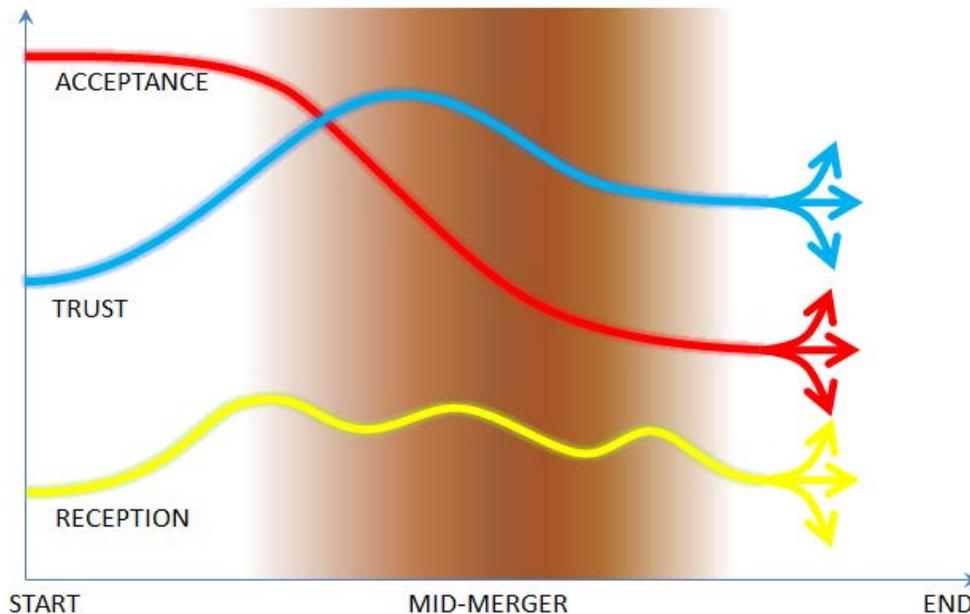


Figure 2. Perception of the Aviation Safety Investigation organization.

Acceptance is how the function and mission of the ASI organization is valued by others. The ASI organization may be respected and relied upon to effect safety changes in an airline. But as the merger progresses, when new process and procedures are introduced to at least half of the workforce, mistakes happen. The holes in the slices of Swiss cheese (Orlandella & Reason, 1990) start becoming aligned or protective layers may have been removed. The perception may be that the ASI organization is not as effective as it once was.

Trust may be somewhat neutral and during the merger may actually rise. This may be due to reliance on the ASI organization to help with identifying problems in new processes and procedures. Other departments may be caught up with merger related activities and can't monitor the outcomes of their changes. In order to use the ASI organization's help, they have to trust it.

Reception of the ASI organization by others is usually low and the investigation findings and recommendations may be seen as being costly and preventing other organizations from meeting their goals. Especially prior to SMS principles being practiced and accepted, the ASI organization is not seen as value added, but more as just a necessary evil.

Towards the end of a merger any of these three aspects can be influenced to increase, decrease, or maintained at the status quo. One facet of SMS Safety Promotion is selling the successes and importance of the ASI organization. This requires an active role that utilizes effort and time, which is a scarce commodity. Merger fatigue may also play a role in reducing

acceptance, trust, and reception. If an ASI organization is satisfied with a minimum effort to maintain the status quo, this can result in permitting each of the lines to drop lower and lower.

Consolidating and shrinking some departments within an airline, may make it become more difficult to maintain the independence of the ASI organization. A single group may have responsibility for investigations and for executing the mitigating actions, which may make it seem easier to implement improvements. This can be perceived as an increase in credibility. But in the long run, it can be detrimental to finding root cause and determining true mitigating actions. To maintain its credibility, the ASI organization must continue its independence, objectiveness, and impartiality. An ASI organization must use SMS Safety Risk Management to help in identifying these threats and mitigating them.

Culture

A true cultural change does not occur if only a majority of people accept the culture. Survey results indicate percentages need to approach ninety to one hundred percent of people that must accept the SMS culture to achieve success. And this is the goal that every airline surveyed is trying to reach.

Figure 3 shows the four forces acting on an aircraft in flight; thrust, lift, drag, and gravity. These forces are translated to show how the aspects of an airline's culture affect the organization.

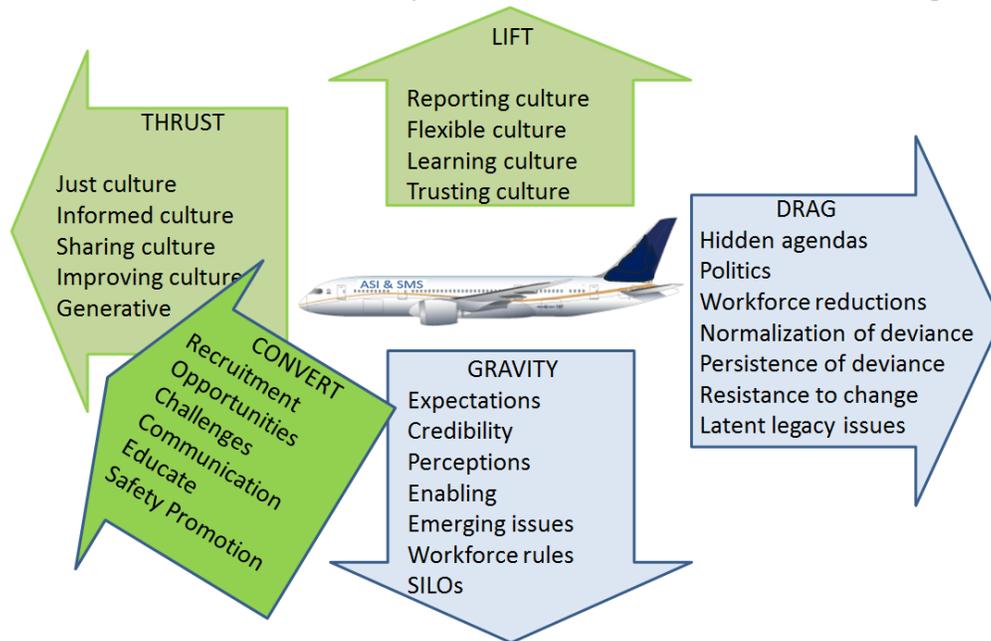


Figure 3. Organization culture conversion.

Lift and Thrust are the positive forces that have been achieved through the successes of the SMS program and the Aviation Safety Investigation (ASI) organization moving from being reactive, to proactive, and on to being predictive.[2] Many ASI organizations have moved from a flight safety focus to an emphasis towards aviation safety.

Drag and Gravity may work together to impede the SMS process, but they provide the challenges and opportunities to change. Drag can include; resistance to change, hidden agendas, normalization and persistence of deviance and other latent legacy issues. Gravity can include the perceptions of our antagonists, the failure to recognize emerging or latent issues, becoming an enabling organization, and building or maintaining SILOs.

Those that have flown gliders know that gravity can be converted to thrust. The issues that can weigh you down and create the resistance to forward progress can be converted to a positive force. By addressing the challenges, the ASI organization has the opportunity to move the SMS culture in a positive direction. Every group in the airline must move towards a Just Culture or a Generative Organization (Westrum, 1984), the ASI organization cannot do it on its own.

As the ASI organization tries to do more with less, it must not become an enabling organization. When recommendations are made from investigation findings, the organization involved must determine the actions that will correct and prevent future occurrences. Those changes must be communicated to the workforce. It should not be the responsibility of the ASI organization to make the changes.

Referring back to the Sea of Obstacles, as the airline merger or acquisition progresses, the water level decreases in height. Latent legacy and emerging issues that may have been present, but culturally were not given any credence, start to emerge. If these threats are not addressed, it is fostering a normalization of deviance. If these threats continue without being mitigated, they can become engrained in the culture and create a persistence of the normalization of deviance. Fortunately, the SMS processes should identify these threats. But, if there is no time to manage them, they can present a hazard.

As communications go out from the ASI organization about investigations, findings, recommendations, and the status of effecting change; these safety messages form part of the SMS component of Safety Promotion. But the ASI organization's safety message should be part communication and part education. The ASI organization must help the airline stakeholders understand the ASI process and the value it has to the airline. Without this self-promotion, the ASI organization runs the risk of receiving less funding, having its manpower reduced, or investments may not be approved.

Data Mass

Many internal data streams (LOSA, FOQA, ASAP, VDRP, SDR) and external data stream sources (NTSB, FAA, ASRS, ASIAS) exist for the Aviation Safety Investigation (ASI) organization to analyze. The luxury of having the time, manpower, tools, or expertise to handle the information may not always exist. The ASI organization may not have the benefit of an analyst or an intern to effectively evaluate the vast amount of data. An organization can end up data rich, but information poor.

The safety organization may have collected a lot of information in data files, but the infrastructure and hardware/software may have not kept up. There may be limited server space for large data files. The ASI organization may still be using an older relational database or even a hierarchical database. Without an investment in tools that can help the ASI organization analyze the vast amount of available information, it may be stuck in a reactive mode.

With the software available to take flight data recorder information and produce a realistic 3D graphic animation, there are new issues that can emerge from these improved technologies. When the Investigator in Charge (IIC) uses additional information that the pilot doesn't experience, no longer is the IIC looking at the event from the Pilot's Perspective. If a 3D video rendering of the flight is utilized for analysis purposes, the IIC must remember that it may not be what the pilot was aware of or what the pilot experienced. Techniques must be revised to fit the advancement in technology.[13]

The animations synthesized from flight data information may look too realistic. By rendering flight data; conversions, calculations, interpolation, corrections, translations, and other methods are used so that it no longer represents the actual data. But some of the users of the data may request an animation for every investigation or every flight data recorder that gets downloaded. Even though flight data recorder information may not provide anything value added, its looks "cool" if we can see a video of the flight.

This "wow" factor which can become an expectation bias, can get in the way of the investigative process. The ASI organization must guard against this inflated expectation. There may be times that the investigator is asked, "Why didn't you create an animation of this event?" Many times a flight data animation gives no additional information. And sometimes runs the risk of drawing the wrong conclusions and assumptions.

By not adjusting and investing in new techniques and new equipment, the ASI organization cannot be sure it is following SMS Safety Risk Management when it is not properly looking at all existing information. By being careful about how data is analyzed and presented, and making sure that the IIC is making the correct investigation findings and recommendations, is part of the Safety Assurance component of SMS.[1]

SMS Components (Pillars)

Of the four SMS components; Safety Policy, Safety Risk Management, Safety Assurance, and Safety Promotion, "Where does the Aviation Safety Investigation organization fit?" Some may say it fits in Safety Assurance because that is where it is listed in 14 CFR 5.71(a)(5) and AC 190-92A 7.d.(2)(e).

Whatever your answer is, a better question might be, "How does the Aviation Safety Investigation organization fit into each of the four components of SMS?"

Safety Policy: An airline may not have its ASI organization directly involved with policies of other departments, but it does have a substantial influence on making sure that other departments support the mission to moving towards zero accidents or at least what is As Low As Reasonably Practicable (ALARP).[9] Not only the ASI organization's policies must support SMS, but other organizations within the company must support the mission of preventing accidents.

Safety Risk Management: Aviation Safety Investigators are many times are looking into incidents involving new or changed procedures or processes in the safety system or latent problems that have finally emerged. When an investigation has findings with recommendations the IIC must be sure that any new threats are identified before implementation.

Safety Assurance: If the SMS is not fully matured, investigations may be regarded as a waste of time and that mitigation equates to added costs, manpower, and time. A fully matured SMS culture sees an investigation as helping to identify those areas that can be improved. The investigator must make sure that the corrective and preventive actions for investigation recommendations are finalized. There must be a follow-up loop process and an accountability process established. This moves the organization from the reactive to the proactive and primes it for the predictive.

Safety Promotion: This is the true barometer of an airline's SMS efforts. Is there objective evidence of a reporting, informed, just, sharing, learning, trusting, flexible, and improving culture? Not just policies and written procedures, but what is actually being consistently practiced, and is being refined and continually improved. The Just Culture must be pervasive throughout the company.

The Aviation Safety Investigation organization is a key stakeholder in all four components of SMS. The ASI organization can facilitate, but not assume ownership. The ASI organization must make sure that it does not become an enabler, but can provide guidance to those departments that are trying to incorporate SMS into their programs.

Solutions

The Aviation Safety Investigation (ASI) organization must continue leveraging existing systems of internal and external data streams, as they are still fertile fields of information and data. Interns or part time experts can assist the IIC in data analysis, but should not be used as investigators.

ASI organizations have harvested most of the low hanging fruit and the aviation industry safety record shows the bounty of those efforts. Now, the ASI organization must sometimes be satisfied with incremental changes, instead of renovation, but still seek out innovation. The continuous improvement cycle is constant, it just gets smaller.

Whether or not the ASI organization is considered the stewards of the airline SMS program, or if there is another team responsible for the SMS in the airline; all investigators are contributors and owners of the SMS culture. The product of our investigations should be strengthening and moving airlines to a more mature and generative SMS organization.

Not only should investigation findings and recommendations be shared internally, they should be shared globally. Forums, such as USSASI, ISASI, A4A, Safety InfoShare, ICAO, and IATA should be used. Information should be shared with our alliances and other international airlines. SMS must be practiced globally.

There is no doubt that any ASI organization would not be successful as it is today without the aviation industry adopting SMS. SMS is definitely helping the ASI organization move from being reactive, to proactive, and towards predictive. SMS is also helping the ASI organization and airline realize the mission of preventing the next accident

Conclusions

The changes in culture, policy, procedures, workforce, and organizational functions, including bankruptcy, are all threats to an airline. These are just a few of the reasons that during these events, the FAA increases its surveillance and oversight of the Operator.

Each individual and each organization reaches a mature level of SMS at different times; eventually they may reach the same ideal level, but at different rates and this makes it difficult to synchronize SMS efforts and implementation.

Any airline, whether United States or international, must reach its goal of having a reporting, flexible, learning, just, sharing, improving, trusting culture that is healthy and can be truly described as a Generative Organization. Once SMS has become widespread in the aviation industry, it will be ready for the next advancements in safety.

There is no other established forum for the Aviation Safety Investigations (ASI) community to freely share and collaborate on its successes and lessons learned. Information may be shared internally; but industry wide, there must be a sharing culture. On a grass roots level, at the next Safety InfoShare, a request can be made to include an Investigative section. At the next USSASI meeting, a panel discussion, workshop or just sharing of successes and lessons learned can be part of the agenda. Next steps would be to gain support from A4A, ICAO, and IATA to address an Aviation Safety Investigation forum.

As we aggressively compete to fill every seat or every inch of our cargo holds and are fierce competitors in the marketplace; we are all collaborators in safety. The Aviation Safety Investigation organization cannot allow the compromises of mergers, acquisitions, financial duress, or other obstacles from impeding the mission of the ASI organization to help the airline prevent the next accident.

Acronyms and Abbreviations

A4A-Airlines for America
AC-Advisory Circular
ALARP-As Low as Reasonably Practicable
A&P-Airframe and Powerplant
ASAPs-Aviation Safety Action Programs
ASIAS-Aviation Safety Information Analysis and Sharing
ASI-Aviation Safety Investigation
ASRS-Aviation Safety Reporting System
CFR-Code of Federal Regulations
FAA-Federal Aviation Administration
FOQA-Flight Operations Quality Assurance
ICAO-International Civil Aviation Organization
IIC-Investigator in Charge
ISASI-International Society of Air Safety Investigators
IT-Information Technology
LOSA-Line Operations Safety Assessments
NPRM-Notice of Proposed Rule Making
NTSB-National Transportation Safety Board
Ops Spec-Operations Specification
SDR-Service Difficulty Report
SILO-Separated, Isolated, and Layered Organization
SLE-Single Legal Entity
SME-Subject Matter Expert
SMS-Safety Management System
SOC-Single Operating Certificate
USSASI-United States National Society of ISASI
VDRP-Voluntary Disclosure Reporting Problem

Appendix A

What did you do when told to “do more with less”:
Aggregate survey responses in grouped rankings.

Grouped rankings	What did you do when told to “do more with less”:
1	Reduced the number of investigations Reduced the scope of investigations Reduced the amount of detail of investigation reports
2	Delayed investigative software/hardware or tools purchased or investments Reduced the number of seminars/conferences/symposiums attended Delayed hiring of investigators
3	Used part time investigators or investigators have other duties(ASAP, auditing, other)
4	Reduced the amount of training an investigator receives Adopted the easiest or least costly choice

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