CRM and SMS: Directing the Evolution of Aviation Organizational Culture

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Abstract

The implementation of Safety Management Systems (SMS) in aviation organizations has often been met with skepticism and suspicion from employees, primarily because the organizational culture did not adequately support the SMS. With regulatory requirements for SMS a near-term reality for commercial air carriers and similar requirements for other operators looming, skepticism and suspicion about SMS must be overcome through the directed evolution of aviation organizational culture. The historical example of the implementation of Crew Resource Management (CRM) is highly instructive because CRM faced similar skepticism and suspicion until the senior leaders of the aviation industry directed the evolution of their organizational cultures to accommodate it. Today, the organizations which enjoy the greatest success with SMS implementation illustrate the necessity of senior leadership direction in the evolution of organization culture to include a true safety culture. Without this directed evolution, without a true safety culture, SMS implementation will not succeed.

In the January 2011 edition of Professional Pilot magazine, a corporate pilot states an opinion which probably expresses the view many have on the subject of Safety Management Systems (SMS) when he describes them as “perfect, document-based solutions” which create only a “perceived improvement in operational safety” and are really nothing more than “meaningless drivel in pursuit of an ill-defined goal.” (McClendon, 2011, p. 104)

His words demonstrate the results of one of the greatest errors in the implementation of an effective SMS in any organization — not changing the culture of the organization before the SMS is put into place. The consequences of this error can go far beyond misperception and discontent in a few employees. Reportedly, the Deepwater Horizon oil rig, which exploded, burned, then sank in the Gulf of Mexico in April of 2010, had an SMS in place, but workers were still hesitant to voice their concern over safety issues due to their uncertainty about the safety culture of their company (Thurber, 2011). When this lack of cultural change occurs, the SMS can become marginalized or rendered completely ineffective and viewed as nothing more than “a check in the box just to gain an approval” (Smith, 2010, p. 36).

As a result, many within aviation have come to look upon SMS with the same disdain they looked upon management philosophies like Zero Defects, Total Quality Management, Six Sigma and others that sold books and launched training companies. According to them, SMS looks “like just another float in that long parade” (Larson, 2010, p. 78).

Notwithstanding such contrarian opinions, SMS is clearly here to stay. On November 5, 2010 the FAA released a formal proposal requiring scheduled airlines to adopt SMS programs but says the proposal will serve as template for other certificate holders, specifically charter operators under 14 C.F.R Part 135, repair stations under 14 C.F.R Part 145 and aircraft design and manufacturing organizations operating under 14 C.F.R. Part 21 (Lynch, 2010). While the FAA currently has no intent to require SMS for non-commercial operators, there are many who believe that SMS regulation for private operators is merely a question of time (Thurber, 2011).
In fact, Transport Canada already requires private operators to maintain an SMS that meets regulatory standards (Esler, 2009a).

With embedded suspicion on one side of the issue and looming regulatory requirements on the other, a dilemma exists: how to effectively implement SMS in an industry where many are still skeptical about its necessity and efficacy. The solution is simple to describe but difficult to accomplish. The culture must change. However, the change must go beyond the point where SMS is merely understood and accepted. Aviation organizational culture must evolve to include a true safety culture with SMS as an integral part of it.

Fortunately, cultural evolution like this has occurred before. The implementation, acceptance and inculcation of Crew Resource Management (CRM) required a similar evolution of aviation culture and in particular an evolution in the culture of the aviation organizations in which it was implemented. Over the past thirty years it has become so deeply ingrained in the culture of aviation that more recent models for dealing with cockpit performance like Threat and Error Management use CRM as a foundation (Helmreich, Klinect, & Wilheim, 1999). Over time, CRM did not merely affect the culture; it became part of the culture. More correctly, the culture evolved to include it. For SMS to gain an equal level of acceptance, to gain an equal level of inculcation, organizational aviation culture must evolve to include it in a like manner.

The Evolution of CRM in Airline Training

Formal CRM training effectively began in the 1970s with the inception of a program at KLM Royal Dutch Airlines based primarily upon the human factors principles of the SHELI (Software, Hardware, Environment and Liveware) model and a study of cockpit authority gradients (Wiener, Kanki, & Helmreich, 1993). By the 1980s multiple CRM courses were being developed and implemented, largely focusing upon post-mortem analysis of accident and incident scenarios, the human factors elements in the event, and the changes in attitude taking place in cockpit management. As Helmreich and Foushee noted,

> What was not present in early efforts was a focus on organizational behavior. Many early CRM courses faced considerable resistance from crewmembers who expressed concerns about both the motivation for and possible outcomes of the training. Some saw it as unwanted psychological meddling, equating the training with clinical psychology or psychotherapy. Others feared that the captains’ authority would be eroded by a kind of Dale Carnegie charm school approach to developing harmonious interpersonal relations, without regard for operational effectiveness (1993, p. 28).

In these early iterations, CRM faced an uphill struggle in its implementation because the required change in organizational culture was not first addressed.

Occasionally derided as a soft subject, CRM was not merely a procedural change with which training departments had significant expertise in implementing; it was instead a much larger change, an evolutionary step, in an organization’s operational culture. This conceptual change required a practical application, or demonstration of value, if acceptance was to occur. United Airlines provided that demonstration in its Command, Leadership, and Resource Management Course, the first airline in the industry to do so.

United’s program was unique in that it gave participants insight into their own management style with respect to task and interpersonal orientation (Wiener, Kanki, & Helmreich, 1993). Combined with Line Oriented Flight Training scenarios, this program allowed the end user to see a real-world function for the heretofore touchy-feely subject of CRM. By embracing CRM at the highest levels and directing the evolution of its organizational culture, United made the program effective. Throughout the 1980s variations on this
program were replicated throughout the U.S. and Western airline industry, as well as in the U.S. Air Force's Military Airlift Command and numerous corporate and regional operations.

Now, a quarter century later, CRM is so thoroughly ingrained in modern aviation culture that an entire generation of professionals (including the authors) has never experienced civilian flight operations without it. Indeed, it has also become an integral part of military aviation (Taylor and Taylor, 2008), air traffic control services (Federal Aviation Administration, 1995), and is mandated by nearly every regulatory authority and the International Civil Aviation Organization (Federal Aviation Administration, 1992). The underlying concepts have stretched outside the aviation industry to the medical profession where even a cursory literature review reveals hundreds of works on applying the principles of CRM to improving healthcare processes, communication, and safety (Sax et al., 2009).

**Understanding the Resistance**

While CRM’s acceptance in the aviation industry has been nearly universal, it did not come easily. It has faced its fair share of resistance and this resistance is instructive because it parallels the opposition currently seen to SMS.

Helmreich and Wilhelm (1991) have shown that the overwhelming majority of flight crews exposed to a mature CRM training program respond positively and demonstrate a constructive attitude towards CRM initiatives in line operations. Hayward’s subsequent investigation of a broader segment of Australian aviation professionals yielded similar results (1995).

Given these results, it would seem that such an approach would engender universal support, yet this was not the case. A “small but significant percentage of participants 'boomerang' or reject CRM training” (Wiener, Kanki, & Helmreich, 1993, p. 38). This rejection typically manifested itself in a failure of crews to utilize CRM in regular line operations or a failure of management to fully support CRM programs, or both. Merritt and Helmreich describe that crew-related resistance is purely a function of an ego-driven refusal to admit fallibility, typified by the opinion: “There are some bad pilots out there, but I am not one of them!” (1996a, p. 2) But the management rejection was more complicated, largely stemming from the expense required to implement CRM programs often seen as more extensive than the regulatory requirements. Ironically, the reluctance to incur additional expense is often due to the lack of negative events, a phenomenon at least partially due to CRM implementation.

But these elements of resistance were overcome by ensuring flight crews and management both understood the full context of CRM in light of the organizational culture. By defining CRM as a “safeguard for the limits of human performance” (Merritt & Helmreich, 1996a, p. 2), the universal applicability and value of CRM principles was demonstrated to all aviation professionals, eliminating the perception that it was a remedial exercise for substandard aviators and in turn removing ego from the cockpit equation. Convincing management was easier. All that had to be proved was that human error is inevitable, a concept more readily accepted in the boardroom than on the flight deck. Then, the mitigation role of CRM training became an accepted, if not welcome, expense. Both of these elements laid the foundation for the no-blame culture, a critical sub-culture required for an effective safety culture.

**The Importance of Culture on CRM Implementation**

The role of check airmen, instructors, and management has been found to be a critical determinant in the operational success of CRM programs. While positive emphasis on CRM by key personnel in the training department of an organization is fundamental, the support of senior management directly correlates to the
effectiveness of implementation and to changes in cockpit management attitudes even before formal training begins (Edkins, 2002). Ted Mendenhall, the retired head of Gulfstream Aerospace’s flight operations agrees. He sees CRM as a measure of cockpit discipline and in his words: “Cockpit discipline really has to come from the top. It has to start with the organization’s management. They have to want it.” (George, 2007, p. 138)

Research has also shown that the effect of CRM training decays without reinforcement (Helmreich, 1999). While this may seem to be a function of elementary pedagogy and the justification for mandated recurrent CRM training by regulatory authorities, it is actually more significant than use-disuse educational theory (Lynch, 2011). If organizational commitment is not present, even the best-received CRM training can be expected to return to baseline attitude levels (Holt, Boehm-Davis, & Beaubien, 2011). In the organizations studied, when regression occurred there was one common factor: an unwillingness of leadership to formally commit to a cultural change evidenced by nominal support of CRM training.

**Safety Culture: The Evolution of Organizational Culture**

Organizational culture as it relates to safety has been in the public eye since the nuclear accident at Chernobyl in 1986 (Stolzer et al., 2008; Wiegmann et al., 2002). Since the in-flight structural breakup and crash of Continental Express Flight 2574 near Eagle Lakes, Texas, on September 11, 1991 which killed 14 people and was directly attributed to the failure of the airline to establish a corporate safety culture, culture has been in the forefront of any discussion of aviation safety-related issues (Wiegmann, Zhang, von Thaden, Sharma and Mitchell, 2002).

**Safety Culture Defined**

With that backdrop, Wiegmann et al. define safety culture as follows:

Safety culture is the enduring value and priority placed on worker and public safety by everyone in every group at every level of an organization. It refers to the extent to which individuals and groups will commit to personal responsibility for safety, act to preserve, enhance and communicate safety concerns, strive to actively learn, adapt and modify (both individual and organizational) behavior based on lessons learned from mistakes, and be rewarded in a manner consistent with these values. (2002, p. 8)

Stolzer, Halford, and Goglia (2008), building on the work of Professor James Reason and Helmreich define a safety culture as a fusion of several separate, desirable sub-cultures within an organization that is generated from the top of the organization downward. These sub-cultures are summarized in Table 1 below.

<table>
<thead>
<tr>
<th>Subcultures</th>
<th>Key attribute</th>
<th>Key behavior of members</th>
</tr>
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<tbody>
<tr>
<td>The Informed Culture</td>
<td>Knowledge</td>
<td>Know what they need to know</td>
</tr>
<tr>
<td>The Flexible Culture</td>
<td>Adaptation</td>
<td>They can adapt when required</td>
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<tr>
<td>The Reporting Culture</td>
<td>Information</td>
<td>They tell what happened</td>
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<tr>
<td>The Learning Culture</td>
<td>Growth</td>
<td>They learn from the lessons</td>
</tr>
<tr>
<td>The Just Culture</td>
<td>Expectation</td>
<td>They know what to expect</td>
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**SMS: An Evolving Culture’s Tool To Combat Organizational Risk**

SMS is the next step in the evolutionary ladder of risk management because it focuses on a category of risk that until now has been less apparent and thus less important: organizational risk. Over the course of aviation history, aviators have worked their way through three categories of risk. First was technical risk, or the risk of the aircraft itself, whether it was due to the failure of the engine or another critical component. As aircraft became more reliable, human risks had to be contended with, e.g., controlled flight into terrain, approach and landing accidents, or the lack of procedural guidance for maintenance technicians. With technical risks now largely controlled if not conquered and mechanisms in place to address the human risks, organizational risks are in view (Esler, 2009b). Improved manufacturing methods and increased regulatory scrutiny combated the mechanical risks. Tools such as CRM and TEM were designed to combat human risks. SMS now addresses the organizational risks by addressing the processes that define an organization. It focuses on constantly improving and evolving the culture of that organization to make it safer.

There is an interesting parallel between CRM and SMS which should be noted. One of the outcomes of the CRM cultural evolution was the empowered role of the co-pilot, or second-in-command (SIC) (Kanki, Helmrich & Anca, 2010). Years ago, the SIC was often relegated to second-class citizen status. His or her job could consist of reading checklists, raising and lowering the landing gear, and speaking on the radio. When events arose that required a decision, the SIC was perceived as merely a doer, not a thinker. Today, as a result of CRM, the SIC has a distinct role in the cockpit decision process. While the captain’s role in the cockpit is still one of command, the culture has evolved to encourage joint decision-making. The captain must listen and take his or her SIC’s input into account.

Safety culture and SMS have had a similar effect on organizations. Previously, management established operational procedures while line employees were directed to execute them. Complaints or suggestions often were either ignored or were grounds for disciplinary action. Now line employees have a role in the process and a voice. While management is still ultimately responsible, those in charge must listen and process the inputs of line employees. What CRM did for the cockpit, SMS does for an organization.

**Implementing SMS: Change the Culture First**

Before an organization can implement an effective SMS, it needs to possess an appropriate safety culture (Donoghue, 2008). Stolzer et al. underscore the necessity of having the culture in place first. They define an SMS as a “dynamic risk management system … applied in a safety culture environment.” (Stolzer, et al., 2008, pp. 18–19)

This is where the implementation of CRM provides a valuable lesson. Per the example of United Airlines in the 1980s, CRM was not able to fully succeed until it had the unconditional support of senior management; until senior management directed the evolution of the organizational culture so that CRM was a central element. CRM then became an organizational norm. It was first accepted on a formal, organizational policy basis and then, when the culture was seen as a consistent force, its implementation went from forced acceptance to willing and enthusiastic application on the part of line employees.

SMS implementation must follow the same pattern. The first step is a firm commitment on the part of leadership at the highest level to make a safety culture a reality, to direct the evolution of the organizational culture. The Canadian Air Regulations (CARs) actually force this to occur by requiring the appointment of an accountable executive over the safety management system of a commercial operator. The CARs go so far as to provide a flowchart to determine who that executive will be and with very few exceptions, it is the CEO (Transport Canada, 2010). Once leadership commitment is made and the safety culture is instituted, the
ensuing SMS must become an organizational norm. Then the culture and the SMS must be perceived as a consistent, real force, largely through the actions of senior leadership. If an organization’s key players do not support it, the culture will deteriorate and the SMS will assume the status of an unread manual on a bookshelf (Thurber, 2011).

Ultimately, the value of the culture and SMS must be maintained throughout the organization and the forced acceptance of the safety culture and SMS will transition to willing participation on the part of employees. A recent study of the safety culture of a large European airline with an enviable safety record demonstrated distinct formal and informal safety systems in the company and showed that line personnel were acutely aware of safety-related items and procedures that were otherwise obscured from leadership (von Thaden, Kessel, & Ruengvisesh, 2008). This awareness and action, at the line employee level, shows the end result: an evolved organizational safety culture where SMS is alive and functioning, not “meaningless drivel in pursuit of an ill-defined goal.” (McClendon, 2011, p. 104)

**Conclusion**

The implementation of Crew Resource Management has had profound operational and cultural implications for aviation organizations. Through the direction of senior leadership, aviation organizational culture evolved to include CRM with a highly measurable and significant improvement in operational flight safety. Rather than remaining confined to siloed operational areas as CRM has been, safety management systems can bring an even greater level of awareness and operational benefit to all parts of organizations, but only if organizational culture evolves to include and facilitate the SMS mechanism.

The results of cultural evolution thus far are clear: the accident rate for Western-built and Western-operated aircraft decreased from 1.32 serious accidents per million departures from 1990–1994 to 0.55 serious accidents per million departures from 2005–2009 (Features, 2010). The largest single decrease came from 1995–1999 at 1.06 down to 0.58 during 2000–2005, a drop of nearly fifty percent (Features, 2010). Taken in concert with the focus on safety culture that began after the Continental Express accident in 1991, the correlation between an evolving culture and decreasing accidents does not seem to be coincidental.

**References**


