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United States Marine Corps
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MASTER OF MILITARY STUDIES

Reducing Preventable Mishaps: Safety Culture in Marine Corps Aviation

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES

Major Tyler E. Burnham, USMC

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Executive Summary

Title: Reducing Preventable Mishaps: Safety Culture in Marine Corps Aviation

Author: Major Tyler E. Burnham, United States Marine Corps

Thesis: Considering Marine Corps aviation safety as a way of life instead of a requirement produces a *safety culture*. In turn, a *safety culture* places the organization at a lower risk of experiencing preventable mishaps.

Discussion: Marine Corps aviation established a mandate of acceptance in safety, but whether quality understanding exists, is questionable considering the number of preventable mishaps that occur. Issues such as lack of bottom-up refinement, "check-in-the-box" mentalities, and shortfalls in key programs, as well as billets, severely limit the potential for establishing or maintaining an effective safety culture.

An effective safety culture gains buy-in from all personnel at every level and develops an appreciation for the importance of safety and how it breeds organizational success. Safety culture must be understood as both an institutional and individual effort that consists of macro-levels and underlying subcultures. Commanders must ensure common understanding and buy-in from each subculture when establishing and maintaining a successful safety culture.

According to data received from the Naval Safety Center, more than 85% of USMC Aviation Class A mishap investigations since 2005 list human factors as causal to the incident. The technological and human factor interactions are thoroughly considered throughout aviation operations, but the USMC continues to experience preventable mishaps. In fact, the FY2016 USMC mishap rate is tracking toward a higher rate than experienced over the previous ten years.

The methods for creating or maintaining a safety culture must first begin with leadership affecting a command climate born from buy-in by the entire organization. The commander must communicate his vision and demonstrate the value he places on safety. Doing so results in a safety program strengthened by a deeply rooted safety culture, serving to reduce the number of preventable mishaps and increase capacity and capability for mission success.

Conclusion: Success in safety is often measured by mishap rates, and with the increasing trend of preventable mishaps, the Marine Corps must reassess its approach to safety. As the goal of aviation safety programs is maintaining combat readiness through the preservation of lives and equipment, the USMC must continually evolve to meet that intent. Approaching USMC aviation safety from the perspective of establishing a safety culture is a viable means for success. Developing a safety culture involves the difficult task of affecting mindsets, and addressing existing shortfalls may be a good starting point.

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United States Marine Corps (USMC) aviation reasonably focuses on mission accomplishment while eliminating or mitigating risks to mission and force, yet preventable mishaps continue to occur. In order to minimize these mishaps, squadrons follow specific safety programs. However, these safety programs have seemingly become orders based functions focused on adhering to program requirements rather than developing a culture of organizational safety. Considering Marine Corps aviation safety as a way of life instead of a requirement produces a *safety culture*. In turn, a *safety culture* places the organization at a lower risk of experiencing preventable mishaps. Following a spike in aviation mishaps in 2004, *Commandant of the Marine Corps (CMC) Policy Directive 1-05* provided guidance stating, "Marine aviation must cultivate a new sense of urgency that reinvigorates professionalism and operational safety during our daily flight operations."[1] This renewed focus led to the creation of multiple reporting requirements to ensure squadron, group, and wing compliance to aviation safety orders.

Report effectiveness in lowering aviation mishap rates is not the topic of this paper even though mishap rates decreased significantly following the introduction of additional reporting requirements in 2005 (Table 1). Even though these reporting requirements have had positive effects, additional ways to further lower mishap rates may be possible. Therefore, this paper addresses possibilities to further lower USMC aviation mishap rates by focusing on the people within the squadrons. Many of the viewpoints presented in this paper are based on personal experience and discussions with peers, and encompass a variety of USMC aviation platforms.

Table 1.

FY02-15 Marine Class A Flight Mishap Rates

Fiscal Year	Flight Hours	Number of Mishaps	Rate
2002	385,640	15	3.89
2003	377,510	11	2.91
2004	347,811	18	5.18
2005	339,988	9	2.65
2006	309,675	6	1.94
2007	340,410	7	2.06
2008	309,685	7	2.26
2009	283,356	4	1.41
2010	275,919	4	1.45
2011	296,461	7	2.36
2012	278,511	6	2.15
2013	250,342	8	3.20
2014	263,629	5	1.90
2015	243,303	7	2.88
Totals	**4,302,240**	**114**	**2.65**

Source: Naval Safety Center, Statistics Department, *Aviation Tables: FY02-15 Marine Class A Flight Mishap Rates*, 17 February 2016, http://www.public.navy.mil/navsafecen/Documents/statistics/StatsPrevYrs/AviationTables.pdf.

Why a Safety Culture is Necessary

The obvious goal of any safety program is to lower mishaps to zero. Therefore, the question remains: "How can this be accomplished?" Realists argue that it is impossible to achieve, but reasonable people do not quantify an "acceptable" number of mishaps. Acceptance of that number becomes the norm, resulting in normalization of deviance. Unfortunately, no single person or research paper provides a definitive answer for reducing mishaps to zero; however, an analysis of the problem viewed from the perspective of creating and maintaining a *safety culture* can place organizations at a lower risk of experiencing preventable mishaps.

Among the efforts for increasing the safety performance of an organization, culture has proven to be the greatest driver of both positive and negative results.[2] The discourse surrounding explanations of culture and cultural change is extensive, yet academics agree that culture is a powerful indicator and driver of success (or failure) within organizations. McCune, Lewis, and Arendt explain that, "Safety professionals cannot show senior leadership how many accidents

have been prevented by a strong safety culture, but when an accident does occur, it usually uncovers a flaw in the organization's safety culture."[3] Overall, it is difficult to measure culture, specifically the success it generates within an organization.

Safety Culture Defined

Given the varying academic positions regarding culture, defining safety culture is challenging. In her article "Taming Prometheus: Talk About Safety and Culture," Susan Silbey explains, "safety culture…seems to refer to a commonly shared, stable set of practices in which all members of an organization learn from errors to minimize risk and maximize safety in the performance of organizational tasks and the achievement of production goals."[4] A simpler definition of safety culture may be "an organizational commitment to safety at all levels of operation."[5] A Marine Corps squadron with an effective safety culture gains buy-in from all personnel at every level and develops an appreciation for the importance of safety and how it breeds organizational success. Safety culture must be understood as both an institutional and individual effort that consists of macro-levels and underlying subcultures.

Theories of Culture and Cultural Change

The term *culture* has many meanings and differing interpretations. There is widespread agreement that culture encompasses things shared by specific groups of people. The most popular definition of culture is provided by prominent social psychologist, Edgar Schein:

> A pattern of shared basic assumptions learned by a group as it solved its problems of external adaptation and internal integration, which has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems.[6]

To fully understand Schein's definition, it is necessary to discuss his three levels of culture described as artifacts, espoused beliefs and values, and basic underlying assumptions. Schein's paradigm may be depicted as an iceberg, with the artifacts being the only level found above the

surface, espoused beliefs and values, and basic underlying assumptions below the surface (Figure 1).

Figure 1.
Schein's Three Levels of Culture
Source: "How to consistently Build a Lean Culture," Francois Dumez, *Essence-Leadership*, accessed 11 March 2016, http://essence-leadership.com/en/how-to-consistently-build-a-lean-culture/.

Such a graphic explains why culture cannot be determined by face value. The people that belong to that culture solely provide the explanations for the artifacts being viewed. Otherwise, a false understanding of the organization's culture occurs. Schein explains, "When you see a very informal, loose organization, you may interpret that as 'inefficient' if your own background is based on the assumption that informality means playing around or not working."[7] Therefore, a discussion of culture must consider the macro and sub-levels.

For the purposes of this paper, the USMC (as an organization) establishes the institutional culture (macro-culture). Schein argues that to understand what is occurring within the institutional culture one must appreciate the interactions of the subcultures, and he provides three general groups: (1) "the operator subculture;" (2) "the engineering/design subculture;" and (3) "the executive subculture."[8] It is also important to understand that subcultures can exist within a subculture (sometimes labeled as micro-cultures).

Considering this from a Marine Corps aviation perspective (a subculture of the USMC), the operator subculture is made up of the pilots, the engineering subculture is the maintenance Marines, and the executive culture is the commanding officer and department heads. Each subculture shares common values based on the USMC macro-culture, but the specific trades and experiences of each subculture produces differing norms and points of view. Therefore, commanders must ensure common understanding and buy-in from each subculture when establishing and maintaining a successful safety culture.

Theories of Organizational Change

Effectively creating, changing, or sustaining organizational culture is a lengthy and rigorous process. Renowned authority on leadership and organizational change, John Kotter presents a proven model for organizational development of and/or maintaining a desired organizational culture. Furthermore and from the military perspective, Adam Grissom's analysis of military innovation discusses how organizational culture influences innovation.

Kotter primarily discusses the importance of understanding the differences between management and leadership. Leaders establish direction while aligning, motivating, and inspiring people, whereas managers plan, budget, staff, and organize; both crucial to successful organizational change. Kotter argues that a dual operating system comprised of the hierarchy and strategy acceleration network, "is more about *leading* strategic initiatives to capitalize on big opportunities or dodge big threats than it is about management."[9] The hierarchy typically does not change form; however, the network continuously evolves and facilitates innovation.

Kotter's eight-step process for leading change, recently modified as the "eight accelerators," provides a proven framework for achieving organizational transformation:[10]

1. Create a sense of urgency.
2. Build and evolve a guiding coalition.

3. Form a change vision and strategic initiatives.
4. Enlist a volunteer army.
5. Enable action by removing barriers.
6. Generate (and celebrate) short-term wins.
7. Sustain acceleration.
8. Institute change.

The eight accelerators are considered the basic process within the acceleration network to accelerate activity. Well known as a hierarchical system, the military commonly creates working groups to analyze problems and develop recommendations. However, many of those working groups lack representation from necessary levels and expert entities. Established properly, Kotter's acceleration network is made up of employees from all levels of the hierarchy resulting in team building and understanding throughout the organization. Listed as a function of the strategy acceleration network, innovation is necessary for any change model.

Grissom's article, "The Future of Military Innovation Studies" article, published in the *Journal of Strategic Studies*, explains military innovation as having three distinct qualities: (1) a military innovation changes how military formations function in the field; (2) is significant in scope and impact; and (3) increases military effectiveness.[11] All of these qualities are desired results of establishing a safety culture. Grissom's work provides two additional concepts important to the organizational change models for creating a safety culture: the four primary schools of thought in military innovation, one of which focuses on organizational culture, and the importance of bottom-up innovation.[12] The cultural model argues that a well-developed military culture results in emulation of principles, but may limit innovation. Regarding safety culture, the concept of emulation is desired, but the opportunities for innovation must remain. The inclusion of all levels of the hierarchy within Kotter's strategic acceleration system provides the necessary conduit for continuous innovation of the safety culture.

Marine Corps Aviation Safety

The *Naval Aviation Safety Management System* (OPNAV 3750.6S) aims to "enhance operational readiness by preserving lives, preventing injury, and protecting equipment and material."[13] Naval aviation adopted the Safety Management System (SMS) from the Federal Aviation Administration (FAA), which closely matches previous military safety programs. The FAA defines SMS as a "top-down business approach to managing safety risk, which includes a systemic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures."[14] Based on the FAA model, the Naval Aviation SMS is built on four pillars: safety policy, safety risk management, safety assurance, and safety promotion. Both the FAA and Naval Aviation Safety Management Systems explain safety promotion as being integral to the development of a positive safety culture. (Figure 2).

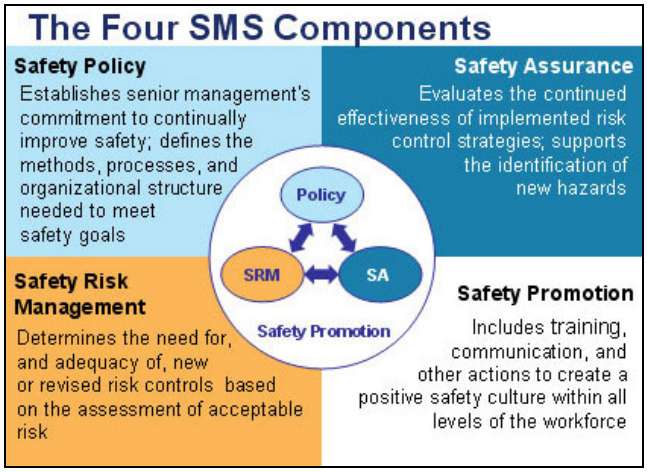


Figure 2.

Source: Department of the Navy, *Naval Aviation Safety Management System*, 1-3; and "The Four SMS Components," Federal Aviation Administration, last modified 27 August 2014, https://www.faa.gov/about/initiatives/sms/explained/components/.

Lowering *preventable* mishaps may seem overly obvious, but the majority of mishap causal factors are human error related, whether due to the operator or maintainers. According to data received from the Naval Safety Center, more than 85% of USMC Aviation Class A mishap investigations since 2005 list human factors as causal to the incident (see Appendix A).[15] The

technological and human factor interactions are thoroughly considered throughout aviation operations, but the USMC continues to experience preventable mishaps.

As of February 20, 2016, the USMC mishap rate for FY16 is 3.20, with three Class A mishaps.[16] Considering the time remaining in the fiscal year, the USMC is tracking toward a higher rate than experienced over the previous ten years. (Figure 3).

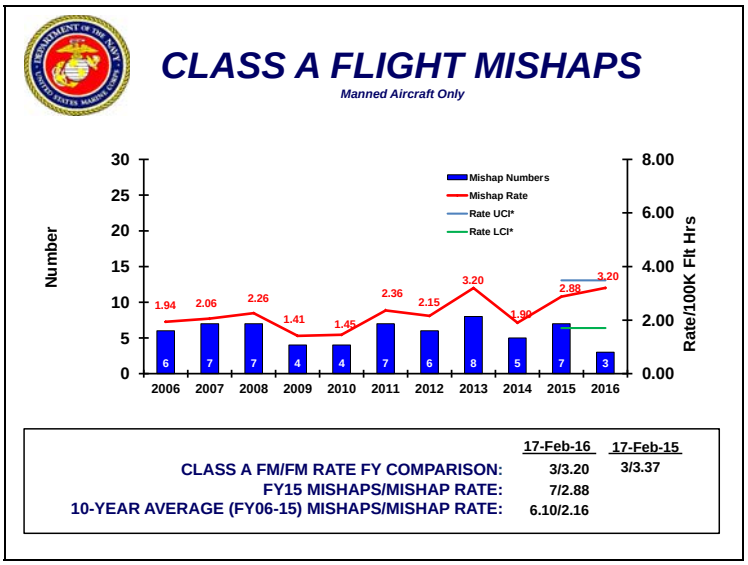
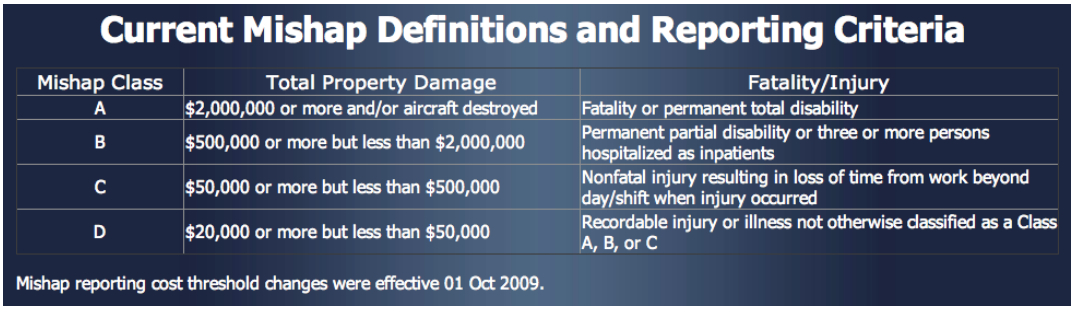


Figure 3.

Source: "FY 2016 Mishap Summaries: Mishap Stats File for Current FY," Naval Safety Center, accessed 20 February 2016, http://www.public.navy.mil/navsafecen/Pages/statistics/MishapSummaries.aspx.

Mishaps rates are consistently measured in regards to Class A mishaps with less attention paid to Class B, C, and D mishaps (see Table 2). All mishap types are annotated and tracked through systems such as the Web-Enabled Safety System, but due to their severity, Class A mishaps are the primary, if not singular, item made widely known to the entire aviation community. The lack of socialization of other than Class A mishaps is concerning. Organizations with effective safety cultures consider all mishaps, even those below the Class D threshold, as concerning events.

Table 2.



Current Mishap Definitions and Reporting Criteria

Mishap Class	Total Property Damage	Fatality/Injury
A	$2,000,000 or more and/or aircraft destroyed	Fatality or permanent total disability
B	$500,000 or more but less than $2,000,000	Permanent partial disability or three or more persons hospitalized as inpatients
C	$50,000 or more but less than $500,000	Nonfatal injury resulting in loss of time from work beyond day/shift when injury occurred
D	$20,000 or more but less than $50,000	Recordable injury or illness not otherwise classified as a Class A, B, or C

Mishap reporting cost threshold changes were effective 01 Oct 2009.

Source: "Current Mishap Definitions and Reporting Criteria," Naval Safety Center, last modified 19 May 2015, http://www.public.navy.mil/navsafecen/Pages/statistics/mishap_def.aspx. Prior to October 1st, 2009, the monetary threshold for a Class A mishap was $1,000,000.

This is not to say that the Marine Corps is doing everything wrong in terms of aviation safety. Overall, the USMC employs a capable aviation safety management system encompassing many effective programs. Historically, Naval aviation (inclusive of Marine Corps aviation) has achieved great success in reducing aviation mishaps through standardization policies and programs such as Operational Risk Management and Crew Resource Management (Figure 4). The intent of the *Marine Corps Safety Program* is "To establish and maintain a safety culture throughout the Marine Corps that preserves all resources through risk management, reinforces on- and off-duty safe behavior, and results in an enhanced state of combat readiness."[17] As current trends indicate an increased aviation mishap rate, the USMC aviation community must address the shortfalls that negatively influence the ability to achieve the Commandant's intent.

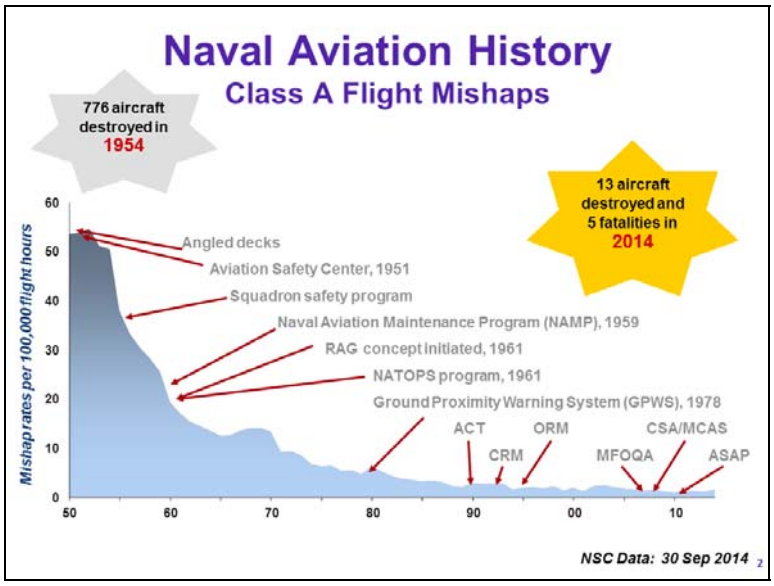


Figure 4.

Source: Naval Safety Center, *Naval Safety Center Annual Mishap Overview: FY14*, accessed 23 December 2015, 5, http://www.public.navy.mil/navsafecen/Documents/media/FY14_Annual_Report.pdf.

Marine Corps Aviation Safety Shortfalls

Marine aviation safety has primarily been addressed through policy, orders and directives, creating reporting requirements and making statements like "safety is paramount" during safety stand-downs.[18] Marine Corps aviation established a mandate of acceptance in safety, but whether quality understanding exists, is questionable considering the number of preventable mishaps that occur. Issues such as lack of bottom-up refinement and buy-in, "check-in-the-box" mentalities, and shortfalls in key programs, as well as billets, severely limit the potential for establishing or maintaining an effective safety culture.

Lack of Bottom-Up Refinement and Buy-in

The USMC consistently charges commanders with ensuring the capacity for safe operations in squadrons, holding them accountable for adhering to safety orders and instructions through multiple reporting requirements. The top-down approach creates potential obstacles for the commander to influence the basic underlying assumptions referenced in Schein's model. To effect change in culture, USMC aviation must obtain buy-in from all personnel.

Effective organizations have well-organized and focused management, but in most cases, it is the mid and lower level workers' efforts that result in successes. In order to become more effective, upper level management must embrace safe practices, but that does not necessarily result in a trickling down effect to the lower ranks. The *Naval Aviation Safety Management* instruction uses the word *culture* twenty-seven times, explaining many of the points addressed in this paper. Unfortunately, the continuance of preventable mishaps indicates that the culture is not changing, which may indicate a lack of opportunity for innovation.

Grissom explains that all major models of military innovation reference the "senior officers and/or civilians [as] the agents of innovation," but he also points out a shortfall in all of the models: none of them include bottom-up innovation processes.[19] Grissom supports his theory on bottom-up innovation by illustrating the interwar success of mid and lower level USMC personnel to "assess, synthesize, and disseminate the Corps' experience in small wars…through an informal discourse carried on in the Corps' schools and journals."[20] Enabling and provoking thought from all levels of the squadron hierarchy will likely result in innovative ideas for furthering safety programs while gaining buy-in to the safety culture.

"Check-in-the-Box" Mentality

The *Marine Corps Safety Program* requires squadron commanders show adherence to safety orders by submitting multiple reports through their chain of command. Such reports may be necessary for higher headquarters to effectively oversee the execution of safety programs, but whether these reports make a squadron safer has been questioned. Arguably, the reports simply ensure that commanders are fulfilling their duties as outlined in the orders and do nothing to foster a safer operating environment. Safety program requirements are not the issue. The issue resides in the reporting requirements becoming another "check-in-the-box".

The reporting requirements established by *CMC Policy Directive 1-05* (in response to an exorbitantly high number of Class A mishaps in 2004) seem to have had a positive impact, with the average mishap rate having been cut in half over the following eleven years. That being said, the mishap rates have doubled since 2010, perhaps due to a lack of cultural change. The author argues that reporting requirements have become the norm instead of successfully instilling a culture that minds safety in every respect. Reporting adherence to orders is a sound policy, but USMC aviation must find a way to ensure a "check-in-the-box" mentality is replaced with an appreciation for safety.

Key Programs and Billets

Programs are required to provide the guidelines and framework necessary for an organization to operate smoothly. Existing within current USMC aviation programs, command climate surveys, culture workshops, and Tactical Risk Management (TRM) are viable tools for furthering the development of a safety culture. As discussed in *Warfighting*, "…our philosophy of command must be based on human characteristics rather than on equipment or procedures."[21] For programs to be successful, key billet holders, such as the Director of Safety and Standardization, and the Aviation Safety Officer must be enabled to "accommodate [and] exploit human traits such as boldness, initiative, personality, strength of will, and imagination,"[22] as required to impact organizational change.

Command Climate Surveys. The USMC also places emphasis on the importance of maintaining a command climate that contributes to operational success. Squadron commanders are required to complete command climate surveys (aircrew and maintenance specific) within thirty days of assuming command and annually thereafter.[23] The surveys are valuable tools for the commander to use in assessing the climate of the squadron, but they do not necessarily

provide an accurate depiction of the culture. The ability to distinguish between culture and climate is important when analyzing the ability to influence or change an organization's culture.

Culture and climate are clearly linked and one cannot exist without the other. That being said, both possess independent meanings and should not be used interchangeably. McCune, et al., explain culture as "speak[ing] to the development of safety regulations and related organizational safety systems, which work to create a stable and long lasting environment. Safety climate, on the other hand, more often refers to the psychological perception of the state of safety at a particular time, which, of course, can be expected to change frequently under the influence of any number of social and environmental factors."[24]

Commanders must understand two things when addressing climate: climate surveys provide only a snapshot of the current perceptions, and simply changing the climate does not necessarily result in a change to a deeply rooted culture. Additionally, surveys are only as useful as the accuracy of the information received. Accuracy is purely based on the level of openness that people are willing to provide. Acceptance of the organization's beliefs and values must occur, which requires buy-in from all personnel.

Culture Workshops. The Naval Safety Center offers culture workshops aimed at providing commanders insight into their squadron's culture from an outsider's point of view. Culture workshops are designed to identify potential hazards that may inhibit success, and they highlight strengths to be exploited. The workshop is conducted over a three day period by three team members consisting of a Naval Safety Center lead facilitator and two assistants from another squadron (one aviator and one maintenance senior enlisted).[25] A key attribute of the culture workshops is the facilitators' ability to interact with every rank in the organization, which

facilitates bottom-up refinement. This enables the team to gain a full understanding of the command climate and insight into cultural norms in the organization.

Culture workshops are a proven method for lowering the likelihood of experiencing a mishap. In a 2004 *Approach* article, Quessenberry and Boyer state, "During the last two years, Navy and Marine Corps squadrons had 72 Class A flight mishaps. During this period, 99 squadrons (36 percent of naval aviation) had culture workshops. Of those units, only five had Class A flight mishaps after a culture workshop, accounting for just seven percent of the total mishaps."[26] Given the success of the culture workshops, it would seem logical for the USMC to require them.

Navy squadrons are required to conduct a culture workshop on a biannual basis and before a deployment. The USMC has no such requirement. Per the *Marine Corps Safety* Program, squadron commanders are given the option of using one of four methods on an annual basis: [27]

1. Command climate surveys
2. Culture Workshop
3. Informal safety site survey conducted by squadron personnel or by a sister squadron
4. A formal Naval Safety Center Safety Site Survey

Considering that the commander's intent of the order is "To establish and maintain a safety culture…,"[28] it is perplexing that more emphasis is not placed on culture workshops. This fact may be perceived as an indication of the lack of attention paid to the importance of a safety culture, directly impeding the desired end states.

Tactical Risk Management. Created in response to *Commandant of the Marine Corps (CMC) Policy Directive 1-05*, TRM seeks to address the connection between enemy (red) and non-enemy (blue) threats. The CMC directive instructed Marine Aircraft Weapons and Tactics Squadron One (MAWTS-1) to "develop a WTI [Weapons and Tactics Instructor] course of

instruction WRT [with regard to] ORM [Operational Risk Management] and aviation safety and its incorporation into units training management program. Additionally, MAWTS-1 shall investigate the feasibility of incorporating ORM training in all instructor qualification programs."[29] Due to the high number of preventable mishaps experienced in FY04, the CMC recognized the need for tying tactics (red threat focused) with ORM (blue threat focused). Blue threats can be described as many different things, to include human error, aircraft systems malfunctions, other aircraft, incorrect maintenance, etc.

Prior to 2005, and arguably still today, aviation risk analysis treated the red and blue threats separately with WTIs focusing solely on tactics to avoid or defeat red threats and the ASO concentrating on the blue threats. Included in all WTI courses of instruction: "TRM teaches the students that a tactically sound plan is an inherently safe plan. The principles taught during TRM are risk management, ethics, leadership, human performance, aerodynamics, managing red and blue threats, and professionalism in their trade."[30]

The goal of the Tactical Risk Management program goes beyond simultaneous consideration of the red and blue threats: ultimately, the intent of TRM is to "foster a culture of excellence in risk management and tactical execution throughout the fleet."[31] With formal TRM training being provided only to prospective WTIs, its principles have not yet been fully inculcated among all aircrew. One of the primary roles of the WTI is to "ensure all training conducted under [their] supervision adheres to established training standards, safety, and ORM procedures…,"[32] therefore, WTIs incorporate TRM in their instruction. It is questionable whether all aircrew are exposed to Tactical Risk Management through occasional flights with squadron WTIs.

Squadron Director of Safety and Standardization. Interestingly the *Marine Corps Safety Program* order from 2004 *required* that a Director of Safety and Standardization (DOSS) be a graduate of the School of Aviation Safety (SAS) ASO course, but the 2011 revision states the DOSS "*should* be a graduate of the SAS [Aviation Safety Commander's] ASC course or the SAS Aviation Safety Officer (ASO) Course."[33] Changing DOSS training from a requirement to a suggestion is a mistake that should be reexamined. The exact reason for this change is unknown, but the less stringent requirement may indicate a lack of investment in squadron safety programs. Undoubtedly, the change was never intended to negatively impact safety programs. The change was most likely due to things such as manning or funding. One could argue that the wording of the current order provides emphasis on the importance of training a DOSS and would be correct when considering the naval aviation definition of the word *should*.

A well-defined word in naval aviation, *should* is "used only when application of a procedure is recommended"[34] and "connotes standard policy and deviation is discouraged."[35] Considering the low number of DOSS or future DOSS who attend the ASC course,[36] commanders have either not been well informed on the matter or simply overlook the recommendation. Without attending formal training, the DOSS is left to self-study and complete reliance on his ASO, placing him in a challenging and, arguably ineffective, position.

The *Marine Corps Safety Program* clearly describes the Director of Safety and Standardization as a department head and additionally states that they shall "be on a level with all other department heads."[37] The successful completion of a department head tour in a squadron is a requirement for Marine aviators to progress to the rank of Lieutenant Colonel, although the DOSS billet does not meet this requirement. Treating the DOSS billet as anything

less than a department head (as directed by the orders), sends a troubling message as to its importance in the organization.

Squadron Aviation Safety Officer. The ASO billet is highly regarded in Marine and Navy safety orders and instructions, which state that the billet should be filled with skilled aviators whom commanders consider top performers. In fact, the *Marine Corps Safety Program* is quite specific on the matter:

> Commanders should select their ASO with a weight matching that's given to the selection of the squadron's Weapons and Tactics Instructor or Quality Assurance Officer. Commanders should consider experience level, demonstrated judgment and maturity, as well as the officer's ability to work with and affect other departments within the squadron when selecting the officer with which to entrust the squadron's Aviation Safety Program and its contributing piece to the larger Marine Corps Aviation Safety Program. The requirement to have a school trained ASO is considered a minimum acceptable requirement and is reported on the ORM status report.[38]

Three primary points can be taken from the above excerpt: ASOs are to be highly qualified and trusted aviators; the ASO billets are crucial not only to the squadron's safety program, but to the entire Marine Corps SMS; and commanders are encouraged to have multiple school trained ASOs in their squadron. The last point directly supports the need for sending squadron safety directors to either the ASC course or ASO School. Crucial to establishing a safety culture, commanders must create (and be provided) the necessary tools, to include numerous ASOs.

For the safety culture to be effective, the squadron safety department must have the capacity to give due attention to its duties, which the *Marine Corps Safety Program* order communicates regarding both billets: The DOSS and ASO "should not be assigned collateral duties or responsibilities outside the [Department of Safety and Standardization] DOSS."[39] Whether this is fully adhered to is questionable and requires further review; however, experience reveals that this guidance is often ignored.

Squadron commanders are charged with maintaining safe practices within their organization. The ASO is one of their most important tools in achieving success. During the five-week Aviation Safety Officer Course at the Naval Safety Center's School of Aviation Safety, students are required to create a document titled "ASO 30-60-90." The document is meant to provide the newly trained ASO with a plan for his or her first 90 days in the billet, but remains unused when the ASO is assigned duties outside the scope of safety. Furthering the issue, squadron Departments of Safety and Standardization are commonly undermanned or billets are filled with temporary personnel to simply fill the role.

The ability to positively impact safety culture requires creativity and dedication, but most importantly, time. 2d Marine Aircraft Wing recognizes that time is a critical component to achieving success and, therefore, requires the squadron ASO maintain their position for a minimum of twelve months.[40] 3d Marine Aircraft Wing does not provide a minimum time for a squadron ASO to remain in the billet, but it does provide a twelve-month requirement for the Group ASO.[41]

Largely due to the high operational tempos experienced today, many squadron billets (to include the ASO) are filled for periods of less than six months. To substantiate these claims requires further analysis (possibly in the form of surveys), but empirical evidence clearly supports these viewpoints. For the commander to benefit from the ASO's training, the ASO must be given the time and resources necessary for success. A lack of attention given to properly manning and equipping the squadron safety department will result in an ineffective safety culture.

Case Study: Continental Express Flight 2574

The aviation industry continually responds to mishaps by reviewing and changing existing safety programs. Arguably the most impactful event for mandating focus on safety

culture,[42] the crash of Continental Express Flight 2574 on September 11, 1991, was due to a portion of the tail departing the aircraft during descent, resulting in the aircraft becoming uncontrollable. The investigation found that multiple maintenance shifts failed to adhere to established procedures during routine maintenance on the aircraft's horizontal stabilizer deicing boots. Additionally, the lack of quality assurance inspections and poor pre-flight inspections resulted in improper maintenance going unnoticed.

This mishap provides a prime example of normalization of deviance, raising the question of who or what allowed the normalization to occur. Normalization of deviance may indicate a deeper issue that exists within the organizational culture. One member of the investigation board, John Lauber, provided a dissenting statement arguing that a causal factor in the mishap was the failure of management to establish a culture that encouraged and enforced adherence to procedures.[43]

In *The Safety Management Manual*, the International Civil Aviation Organization (ICAO) outlines the "Evolution of Safety" with three distinct eras, the first two being the technical era (1900s to late 1960s) and the human factors era (early 1970s to mid-1990s).[44] Shortly following the completion of the Continental Express investigation, the aviation industry shifted to the third era, the organization factors era. The focus on organizational factors created the building blocks for today's Safety Management System and its goal of establishing a safety culture.

How Marine Corps Aviation May Develop a Safety Culture

Multiple shortfalls of USMC aviation safety have been discussed, but the *Naval Aviation Safety Management System* and *Marine Corps Safety Program* provide the required framework

for an effective safety program. Given the emphasis placed on culture in each of those documents, safety culture should not be something the organization overlooks.

The USMC emphasizes mishap rates as a tool for analyzing safety performance, but *safety culture* is not an issue of statistics. Complete reliance on statistics will likely result in the development of or changes to procedures. Although necessary, procedures provide a framework for people to perform within, while a safety culture establishes understanding and buy-in where people make safe decisions regardless of procedural allowance. Many of the recommendations provided are, in fact, procedural; however, without addressing these issues, leaders will be unable to effect change in the organization.

Organizational change requires the leader's implementation and expression of the necessity for the change, and requires buy-in from the members of the organization. This is especially true when addressing culture. Academics from every specialty agree that culture is something that is shared by everyone within a particular group. Developing a safety culture involves the difficult task of affecting mindsets, and addressing existing shortfalls may be a good starting point.

Enable Bottom-Up Refinement and Buy-in

Marine Corps Doctrinal Publication 1 provides a top-down perspective on warfighting philosophies, but deliberately avoids establishing mandated techniques or procedures. *Warfighting* makes clear the need for delivering commander's intent as it "…provides consistency and continuity to our actions and establishes the context that is essential for the proper bottom-up exercise of initiative."[45] Squadron commanders should deliver their safety vision (intent) while applying Kotter's acceleration network to further promote bottom-up refinement and buy-in to a safety culture.

In the foreword of *Warfighting*, General Krulak explains the importance of inculcating the USMC with a shared understanding of warfighting:

> Experience has shown that the warfighting philosophy described on these pages applies far beyond the officer corps. I expect all Marines—enlisted and commissioned—to read this book, understand it, and act upon it. As General A. M. Gray stated in his foreword to the original in 1989, this publication describes a philosophy for action that, in war, in crisis, and in peace, dictates our approach to duty.[46]

The philosophies found in *Warfighting* have successfully been spread throughout all ranks and organizations within the USMC, ultimately being accepted as doctrine. Moreover, *Warfighting* is the basis of the Marine Corps ethos.

Concepts such as attacking gaps and avoiding surfaces "…reduce casualties and [are] more likely to yield decisive results."[47] Safety is engrained in our warfighting philosophies, as safety programs aim to preserve the force through appropriate risk management; however, the word *safety* is not found in *Warfighting*. The USMC should reference the success of *Warfighting* as a guideline for furthering safety culture while engraining *safety* into our existing ethos to enable buy-in from all levels.

Avoid the "Check-in-the-Box" Mentality

The USMC prides itself on their ability to "get it done." This mentality often leads to an under-appreciation of the actual goals of a task or mission. Adherence to reporting requirements is necessary, but commanders must avoid a "check-in-the-box" mentality where their people focus more on completion than the enculturation of safety.

Use of Command Climate Surveys and Culture Workshops

Academic discourses regarding differing definitions of climate and culture aside, experts agree that one cannot exist without the other. Rather than continuing to singularly focus on climate surveys, the USMC should place additional emphasis on culture workshops by making

them a requirement. The Navy's requirements (biannual and prior to deployments) should be considered as a reasonable starting point for facilitating the change.

Indoctrinate Tactical Risk Management

For Tactical Risk Management to become widely understood and practiced, USMC aviation should require TRM training for all aircrew. To avoid piling on additional requirements, incorporate TRM in the Operational Risk Management and Crew Resource Management discussions, as they are interrelated.

Enable the Squadron Department of Safety and Standardization

The safety department facilitates emphasizing safety, but the commander must lead this effort. It is necessary to organize the safety department to align with the hierarchical framework, but safety must exist throughout all elements of the organization. Commanders should consider Kotter's dual operating system, specifically the strategy acceleration network, as a means of implementing change.

Serious consideration should be given to the value of the Director of Safety and Standardization being a trained Aviation Safety Officer or attending the Aviation Safety Commander's course. Attending the course will provide the safety director with the necessary knowledge for serving as a capable advisor to the commander.

Consider the Director of Safety and Standardization billet as a department head. Some may argue that the experience gained in the DOSS billet is not equal to that gained in the operations or maintenance officer billets. This mentality demonstrates an undesirable attribute of the culture, indicating that safety is less important than flying and maintaining aircraft.

Squadron Aviation Safety Officer

Provide the Aviation Safety Officer with the time and resources required to propagate desired safety mentalities throughout the organization. The *Marine Corps Safety Program* guidance of not assigning the ASO collateral duties outside of the Department of Safety and Standardization should be strongly adhered to. Additionally, create a standardized requirement for personnel to remain in the ASO billet for a minimum of twelve months. Doing so will aid in reinforcing the commander's commitment to his vision of establishing safety as normal practice.

Energize an active and positive relationship between the WTI, ASO, and Quality Assurance Officer. Commanders must ensure they communicate their priorities through what they value most. If the commander places the majority of emphasis on mission accomplishment, maintenance may struggle to succeed and vice versa. Increasing value in a safety culture serves to facilitate high performance in both operations and maintenance.

Commanders should consider sending ASOs to the WTI course and WTIs to ASO School. The value of attending both is immeasurable. The author has personally benefited from the experience as it created a mindset focused on both tactics and safety.

Conclusion

The aviation industry has a reputation of having well-established and effective safety programs. Civilian organizations from the medical, oil and gas, and railroad industries have looked to aviation safety programs as a model for developing and enhancing their own programs. The emulation of aviation safety programs is indicative of the industry's success, which USMC aviation has contributed to and benefitted from. Success in safety is often measured by mishap rates, and with the increasing trend of preventable mishaps, the USMC must reassess its approach to safety.

Through technical advancements and human factors considerations, naval aviation mishap rates have declined dramatically since the 1950s (Figure 4). The lower the rates become, the more difficult it is to lower them further. As the goal of aviation safety programs is maintaining combat readiness through the preservation of lives and equipment, the USMC must continually evolve to meet that intent. Approaching USMC aviation safety from the perspective of establishing a safety culture is a viable means for success. The methods for creating or maintaining a safety culture must first begin with leadership affecting a command climate born from buy-in by the entire organization. The commander must communicate his vision and demonstrate the value he places on safety. Doing so results in a safety program strengthened by a deeply rooted safety culture, serving to reduce the number of preventable mishaps and increase capacity and capability for mission success.

Notes

[1] Commandant of the Marine Corps, *CMC Policy Directive 1-05 on Marine Corps Aviation Operational Safety*, December 21, 2004.

[2] "Creating a Safety Culture," *Occupational Safety and Health Administration, US Department of Labor*, accessed February 12, 2016; Department of the Navy, *Naval Aviation Safety Management System*, OPNAVINST 3750.6S, May 13, 2014, 1-2, https://www.osha.gov/SLTC/etools/safetyhealth/mod4_factsheets_culture.html; and Commandant of the Marine Corps, *Marine Corps Safety Program*, MCO 5100.29B, July 28, 2011, 2, http://www.marines.mil/News/Publications/ELECTRONICLIBRARY/ElectronicLibraryDisplay/tabid/13082/Article/126809/mco-510030b.aspx.

[3] Dan McCune, Curt Lewis, and Don Arendt, "Safety Culture in Your Safety Management System," in *Implementing Safety Management Systems in Aviation*, ed. Alan J. Stolzer, Carl D. Halford, and John J. Goglia, 135-160 (Farnham, GB: Ashgate, 2012), ProQuest ebrary, 135.

[4] Susan S. Silbey, "Taming Prometheus: Talk About Safety and Culture," *Annual Review of Sociology* 35 (2009): 343, http://www.jstor.org/stable/27800082.

[5] McCune, et al., "Safety Culture in Your Safety Management System,"136.

[6] Edgar H. Schein, *Organizational Culture and Leadership*. 4th ed. (Hoboken, NJ: Jossey-Bass, 2010), 18.

[7] Schein, *Organizational Culture and Leadership*, 25.

[8] Schein, *Organizational Culture and Leadership*, 55-68.

[9] John Kotter, *Accelerate: Building Strategic Agility for a Faster-Moving World* (Boston: Harvard Business Review, 2014), 19.

[10] Kotter, *Accelerate*, 27-34.

[11] Adam Grissom, "The Future of Military Innovation Studies," *Journal of Strategic Studies* 29, no. 5 (October 2006): 907.

[12] Grissom, "The Future of Military Innovation Studies," 908-918, 920-924.

[13] Department of the Navy, *Naval Aviation Safety Management System*, OPNAVINST 3750.6S, May 13, 2014, 1-1, https://doni.daps.dla.mil/opnav.aspx?RootFolder=%2FDirectives%2F03000%20Naval%20Operations%20and%20Readiness%2F03%2D700%20Flight%20and%20Air%20Space%20Support%20Services&FolderCTID=0x012000E8AF0DD9490E0547A7DE7CF736393D04&View=%7BCACF3AEF-AED4-433A-8CE5-A45245715B5C%7D}.

[14] "Safety Management System," Federal Aviation Administration, last modified January 12, 2015, https://www.faa.gov/about/initiatives/sms/.

[15] Naval Safety Center, USMC Class A Aviation Mishaps from FY2005-FY2015 Involving Human Error Causal Factors, obtained by the author via Freedom of Information Act Case 2016-NSC-73; DON-Navy-2016-002772, February 23, 2016.

[16] Mishaps are calculated by dividing the number of mishaps by every 100,000 flight hours flown. For example, in 2015 the Marine Corps executed 243,303 flight hours and experienced seven mishaps. 7 / 2.43 = 2.88 mishap rate.

[17] Commandant of the Marine Corps, *Marine Corps Safety Program*, MCO 5100.29B, 2.

[18] A safety stand-down in Marine aviation is an operational pause focused primarily on conducting required annual safety training. Safety stand-downs are also conducted in response to events such as mishaps or close-calls.

[19] Grissom, "The Future of Military Innovation Studies," 920.

[20] Grissom, "The Future of Military Innovation Studies," 922.

[21] Headquarters US Marine Corps, *Warfighting*, MCDP 1 (Washington, DC: Headquarters US Marine Corps, June 20, 1997), 78.

[22] *Warfighting*, 78.

[23] Commandant of the Marine Corps, *Marine Corps Safety Program*, MCO 5100.29B, 3-5 to 3-6.

[24] McCune, et al., "Safety Culture in Your Safety Management System,"139.

[25] Naval Safety Center, "Process Detail for Culture Workshop" (working paper, January 25, 2016), Microsoft Word file. http://www.public.navy.mil/navsafecen/Pages/CWS/index.aspx; and Naval Safety Center, "Team Member Responsibilities" (working paper, January 25, 2016), Microsoft Word file. http://www.public.navy.mil/navsafecen/Pages/CWS/index.aspx.

[26] Dave Quessenberry and Spike Boyer, "Culture Workshops," *Approach* 49, no. 2 (March/April 2004): 3, http://search.proquest.com/docview/274520329?accountid=14746.

[27] Commandant of the Marine Corps, *Marine Corps Safety Program*, MCO 5100.29B, 3-6.

[28] Commandant of the Marine Corps, *Marine Corps Safety Program*, MCO 5100.29B, 2.

[29] Commandant of the Marine Corps, *CMC Policy Directive 1-05*.

[30] Nathaniel Early, Aviation Safety Officer, Marine Aviation Weapons and Tactics Squadron One, personal email to author, December 29, 2015.

[31] Nathaniel Early, personal email.

[32] Commandant of the Marine Corps, *Marine Corps Aviation Weapons and Tactics Training Program*, MCO 3500.109, January 16, 2007, 7. http://www.marines.mil/News/Publications/ELECTRONICLIBRARY/ElectronicLibraryDisplay/tabid/13082/Article/126225/mco-3500109.aspx.

[33] Commandant of the Marine Corps, *Marine Corps Safety Program*, MCO 5100.29A, July 1, 2004, 1, http://www.google.com/url?q=http://www.quantico.usmc.mil/download.aspx%3FPath%3D./Uploads/Files/Safety_MCO%25205100.29A.pdf&sa=U&ved=0ahUKEwjck7HBgZbKAhUJWT4KHTxfDEkQFggUMAA&sig2=ulaeXMxrGSiAg70ru17a2w&usg=AFQjCNF7UdZyUgS3WRsoZXLXg3WvyKQ2AQ; and Commandant of the Marine Corps, *Marine Corps Safety Program*, MCO 5100.29B, 3-1.

[34] Department of the Navy, *Naval Air Training and Operating Procedures Standardization General Flight and Operating Instructions*, OPNAVINST 3710.7U, November 29, 2009, 1-6, https://doni.daps.dla.mil/.

[35] Department of the Navy, *Naval Aviation Safety Management System*, 2.

[36] Robert Hahn, School of Aviation Safety, telephone conversation with the author, January 6, 2016.

[37] Commandant of the Marine Corps, *Marine Corps Safety Program*, MCO 5100.29B, 3-1.

[38] Commandant of the Marine Corps, *Marine Corps Safety Program*, MCO 5100.29B, 3-2.

[39] Commandant of the Marine Corps, *Marine Corps Safety Program*, MCO 5100.29B, 3-1, 3-3.

[40] Commanding General, 2d Marine Aircraft Wing, *Standing Operating Procedures for Safety and Standardization*, Wing Order 5100.29B, September 29, 2010, 1-5.

[41] Commanding General, 3d Marine Aircraft Wing, *Aviation Safety and Standardization Program*, Wing Order P3750.17C, June 24, 2009, 10. The author was unable to obtain 1st Marine Aircraft Wing's policy.

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[44] International Civil Aviation Organization, *Safety Management Manual*, 3rd ed. (Montreal, Quebec: International Civil Aviation Organization, 2013), 2-1.

[45] *Warfighting, 89.*

[46] C.C. Krulak, forward to *Warfighting*, MCDP 1 (Washington, DC: Headquarters US Marine Corps, June 20, 1997).

[47] *Warfighting*, 92.

Appendix

The table below lists USMC Class A aviation mishaps from FY2005 – FY2015 involving human error causal factors (unmanned aircraft mishaps are included). This data was provided by the Naval Aviation Safety Center via the Freedom of Information Act.

YEAR	Class A Mishaps	Human Factor Class A Mishaps
FY 05	10	9
FY 06	7	7
FY 07	9	9
FY 08	7	7
FY 09	5	5
FY 10	5	2
FY 11	12	10
FY 12	7	5
FY 13	8	8
FY 14	6	4
FY 15	7	5
FY 16 thu 2/11/16	3	
Total	**86**	**71**
Note: Some may be still under investigation		

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