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Boeing 777X:
Advancing the
World's Most
Efficient, Flexible
Twin-Aisle Family

**New 737 MAX:
Improved
Fuel Efficiency
and Performance**

Creating a
More Effective
Safety Culture

Effects of Alkali
Metal Runway
Deicers on
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An effective safety culture focuses on understanding and addressing safety issues instead of blaming technicians.

Creating a More Effective Safety Culture

Airlines seeking ways to create safety cultures should clearly distinguish between acceptable and unacceptable behavior. A good safety culture facilitates the implementation of a Safety Management System (SMS) through encouraging collaborative participation in event investigation and the reporting of important safety-related information.

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The Boeing Maintenance Human Factors team provides implementation support to customer airlines on a wide array of maintenance human factors safety processes and programs. Operators often ask the team how to promote or facilitate a good safety culture in order to implement these processes and programs.

This article defines a good safety culture in the context of implementing an SMS, outlines the limitations of discipline, provides practical steps on how to establish an effective safety culture, and recommends strategies for dealing with ineffective norms in the workplace.

ESTABLISHING AN SMS

Most civil aviation authorities around the world either already require or will soon require airlines to have an SMS (see Federal Aviation Administration [FAA] Order VS 8000.367A - Aviation Safety (AVS) Safety Management System Requirements). An SMS involves using reactive, proactive, and predictive hazard identification processes.

Reactive. Accidents and serious incidents are investigated based on the belief that organizations should learn from their mistakes, which provide valuable information. An example of a reactive hazard identification process for maintenance is the

Maintenance Error Decision Aid (MEDA) process. (For more information about MEDA, see *AERO* second-quarter 2007.)

Proactive. An organization's activities to identify safety risks are analyzed based on the belief that system failures can be minimized by identifying safety risks within the system before failure occurs. Examples include quality assurance audits and voluntary reporting systems, such as hazard reporting systems and the Aviation Safety Action Program (ASAP).

Predictive. This approach/process captures system performance as it happens in real-time normal operations, based on the belief

Figure 1: Three interrelated aspects of a safety culture



A Three Aspect Approach to Safety Culture (adapted from the U.K. Health and Safety Executive Research Report 367, 2005)

that safety management is best accomplished by aggressively seeking information from a variety of sources that may predict emerging safety risks. Examples of these sources include maintenance reliability programs, airplane health management program, and maintenance line operations safety assessment (LOSA). Maintenance LOSA is a tool for collecting safety data by observing maintenance technician behavior during normal maintenance operations. (For more information about LOSA, see *AERO* second-quarter 2012.)

An SMS is much more effective when it is implemented within an appropriate safety culture. The European Aviation Safety Agency first promoted “Culture of Safety” in its basic regulation (EDC 216/2008) that reporting of incidents and other safety occurrences should be facilitated by the establishment of a non-punitive environment in order to encourage reporting of safety information. A U.K. Health and Safety Executive Research Report reviewed safety culture and safety climate literature and identified three interrelated aspects of safety culture (see fig. 1). The International Civil Aviation Organization discusses “non-punitive reporting systems” in its SMS training. “Non-punitive” means that

employees should not be disciplined for reporting bad news (e.g., incidents and safety hazards).

DEFINING A GOOD SAFETY CULTURE

In the 1997 book *Managing the Risks of Organizational Accidents*, James T. Reason wrote that a good safety culture comprises five elements:

- **Informed Culture.** Those who manage and operate the system have current knowledge about the human, technical, organizational, and environmental factors that determine the safety of the system as a whole.
- **Reporting Culture.** People are willing to report errors and near misses.
- **Learning Culture.** People have the willingness and competence to draw the right conclusions from their safety information system and the will to implement major reforms when the need is indicated.
- **Flexible Culture.** Organizational flexibility is typically characterized as shifting from the conventional hierarchical structure to a flatter professional structure.

- **Just Culture.** An atmosphere of trust is present and people are encouraged or even rewarded for providing essential safety-related information, but there is also a clear line between acceptable and unacceptable behavior.

Of these elements, Just Culture is critical and lays the foundation for the other elements. Just Culture refers to how a company deals with the issue of discipline and is not equivalent to an absence of disciplinary action.

A Just Culture emphasizes shared accountability between the organization and its employees. In the Just Culture, an individual employee is not held accountable for system failures over which he or she has no control, but it does not tolerate conscious disregard of rules, reckless behavior, or gross misconduct. In a Just Culture, event investigation looks beyond the “who” and searches for the “why” so that system issues that lead to errors and violations can be fixed. A Just Culture recognizes that a large proportion of unsafe acts are honest errors, and there is not much corrective or preventative benefit from discipline. According to Reason, only about 10 to 20 percent of actions

Developing an effective safety culture

According to Heather Baldwin in the article “Remove Your Roadblocks” published by *Aviation Week & Space* in 2012, the following three principles are essential to fundamentally change a company culture and make the transition to a more positive and effective Just Culture:

Integrity. Consistency and predictability help build trust. If employees know that a safety policy/procedure applies to every person in the company, and that it will be enforced fairly, the consequence of violating this policy/procedure is then 100 percent predictable. The compliance to the safety policy/procedure will be

improved, and consequently safety performance will be improved.

Commitment. Commitment-based safety is more proactive than compliance-based safety because employees willingly participate in the former. To encourage frontline employees (e.g., maintenance technicians) to be more actively involved, they need to be empowered and given more control. For example, they can participate in activities to improve work processes. When frontline employees feel that their voices are heard and valued by management, they will become more motivated and proactive.

Transparency. Establish a mechanism that allows employees to express their opinions without fear. If there is no such mechanism or it’s impossible to have such a mechanism, find the root cause. Sometimes there is a mechanism established, but it doesn’t function, such as an unused suggestion box or managers who collect employee feedback as a formality but don’t actually listen to what employees have to say.

contributing to bad events are due to individual issues (e.g., complacency) while the remaining 80 to 90 percent are system issues, such as poor training, inadequate equipment and/or hangar facilities, misleading or incorrect maintenance task information, design issues, inadequate task handover process, task interruption, and time pressure. If 80 to 90 percent of actions leading to an unsafe event are caused by system issues, then discipline is not warranted in a majority of the events.

A Just Culture doesn’t completely eliminate discipline; instead, it draws a clear line between acceptable and unacceptable behavior while specifying potential discipline for committing unacceptable behaviors. In general, a Just Culture should lead to an overall reduction in the use of discipline. Management must also ensure that the discipline is carried out consistently for any member of the company who commits unacceptable behaviors. These acceptable and unacceptable behaviors need to be made known to all employees through a clearly written, easily accessible policy and training.

For example, a company can specify that “it is unacceptable to purposefully skip an operational check at the end of a maintenance task.” If a technician deliberately chooses to bypass the operational check disregarding the consequence, there will be some form of discipline. On the other hand, if a technician over-torques a bolt because the torque wrench is out of calibration, then he or she should *not* be disciplined. Also, companies should base discipline on the behavior and not on the outcome of an event caused by the behavior.

THE DRAWBACKS OF DISCIPLINE

According to studies cited by psychologists Carole Wade and Carol Tavris in their 2010 book *Psychology*, using discipline as a control method for behaviors has a number of limitations:

- Discipline is often administered inappropriately.
- People are so mad that they may make decisions based on emotion instead of facts. Discipline may be applied in haste without detailed, deliberate fact gathering.
- The person being disciplined often responds with anxiety, fear, or anger.

- The effects of discipline can be temporary and can depend on whether the person who carried out the discipline is present. People only learn “not to get caught.”
- Discipline often provides little information. It may tell the person what not to do, but it doesn’t usually tell the person what he or she should do.

From a psychological perspective, the effect of discipline is much less useful than the effect of reinforcement. Disciplining employees teaches them what not to do (or not to get caught) but doesn’t teach them about expected behaviors. Because each employee can’t be watched and monitored constantly, the ultimate goal is to have employees perform good, expected behaviors on their own. Discipline often causes employees to hide problems and mistakes.

For example, one organization formerly gave a monthly “no mistake” bonus that constituted an important portion of employees’ monthly income: without this bonus, their daily living would be affected. As a result, all of the maintenance technicians in the company reached an unspoken agreement that nobody would disclose a mistake or problem in maintenance operations. When a part was damaged during

Key behaviors

A “Key Behaviors Initiative” is part of an airline’s overall effort to reduce technician errors in airplane maintenance. Key behaviors are specific maintenance behaviors intended to minimize the frequency and impact of maintenance errors that could affect flight safety and reliability. One airline’s program included the following key behaviors:

1. When performing critical systems or principal structures maintenance, review the current maintenance instructions before beginning a task.
2. Document all additional disassemblies not specified in the task instructions.
3. Document job status at the end of a shift or when moving to a new task.
4. Flag all disassemblies that might be inconspicuous to anyone closing the work area.
5. Confirm the integrity of each adjacent connection after installation of any line replaceable unit.
6. Complete all required checks and tests.
7. When closing a panel, conduct a brief visual scan for safety-related errors.

a remove-and-replace task, the technicians would not report it so they would not be disciplined — losing the “no mistake” bonus. They waited for the pilots to discover any problems during a revenue flight.

EVOLVEMENT OF SAFETY CULTURE IN THE UNITED STATES

Since the mid-1990s, aviation safety culture has evolved through three stages for airlines operating in the United States:

Stage 1. Companies adopted event investigation tools such as MEDA to systematically investigate maintenance-caused events. Previously, airlines tended to blame individual technicians for making errors. Airline management worried that they would lose the ability to discipline people if they committed to MEDA investigations. Gradually through systematic investigations using MEDA, airlines began looking into factors that contributed to the technicians’ errors that caused the events. Organizations started to realize that in most cases the errors were due to system issues rather

than individual factors like complacency. Disciplining technicians without fixing those system issues would do nothing to reduce the likelihood that the same error would occur in the future.

Stage 2. The FAA had the insight to realize that if they disciplined technicians through letters of investigation and certificate action, then technicians would not voluntarily report important safety-related information. The FAA encouraged airlines to establish an ASAP (see Advisory Circulars 120-66 and 120-66B), a joint program sponsored by the FAA, company management, and labor. An ASAP encourages employees to report safety issues (e.g., incorrectly performed maintenance, near misses, safety concerns, and hazards) at work. If a report is accepted by the Event Review Committee (composed of three members representing the FAA, airline management, and labor), regardless of the size of the event or its financial impact, the FAA promises no certificate enforcement action against the technician in exchange for information that otherwise may remain unknown.

Stage 3. Airlines promoted and implemented a Just Culture.

Note that the above stages are not sequential or mutually exclusive. They often overlap with one another and evolve together.

CREATING AN EFFECTIVE SAFETY CULTURE

An airline culture that heavily emphasizes punitive actions is not compatible with SMS because discipline deters people from voluntarily reporting safety events and concerns, makes them less forthcoming with information when they participate in event investigations, and alters their usual performance to model expected behavior when they are observed during normal operations.

To establish and maintain a good safety culture, management must consider taking the following specific actions:

- Tell employees what are acceptable behaviors and what are unacceptable behaviors. (See “Key behaviors” on this page.)



- Obtain commitment from the employees that they agree with and will comply with these key behaviors.
- Obtain commitment from management that they will not tell technicians to break any of the key behaviors.
- Ensure that leads and supervisors monitor frontline employees to make sure they comply with the company's safety policy (i.e., exhibit key behaviors and do not engage in unacceptable behaviors).
- If an employee doesn't perform key behaviors or commits unacceptable behavior, there must be consequences (e.g., coaching or a verbal warning). However, a gray area exists between unacceptable behavior and blameless unsafe acts, where the discipline has to be decided on a case-by-case basis.

Ultimately, the active involvement of executive management is essential for establishing and maintaining a good safety culture. Major safety improvements are possible only if they are driven down from the top. (See "Developing an effective safety culture" on page 15.) SMS emphasizes that the company chief executive officer, not the

safety or quality director/manager, is the accountable manager for safety.

DEALING WITH INEFFECTIVE NORMS IN THE WORKPLACE

Ineffective norms (e.g., "everybody does it") should be considered a system problem, not an individual problem. Ineffective norms are the result of unacceptable behaviors going uncorrected and, therefore, being perceived as condoned.

Management also needs to act as a role model for key acceptable behaviors and face the same consequences as frontline employees if they violate them. Otherwise, employees will get the erroneous impression that requirements don't necessarily have to be followed. For example, if a company requires everybody to wear safety glasses and hearing protection in the hangar, then management needs to wear safety glasses and hearing protection in the hangar — and monitor and correct employees' use of this personal protective equipment. It's also critical to provide safety glasses and ear plugs in the hangar and line maintenance area so that technicians have easy access to them.

SUMMARY

About 80 to 90 percent of actions leading to safety events are caused by system issues. Focus on correcting system issues instead of blaming individuals. An effective safety culture is one that clearly states acceptable and unacceptable behaviors while specifying potential disciplinary actions for committing unacceptable behaviors. It encourages employees to maintain professional accountability and voluntarily disclose safety-related information, such as errors, safety concerns, and hazards. It focuses on understanding and addressing safety issues instead of blaming the technicians who were involved. In this self-reporting environment, safety concerns (e.g., hazards) tend to get resolved, which improves morale.

Boeing provides implementation support to customer airlines on a wide array of maintenance human factors safety processes and programs.

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