

SAFETY CULTURES: MISSING THE MARK

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Introduction

A great deal has been written in recent years about the importance of transforming aviation organizational cultures into “safety cultures” in an effort to promote greater operational safety. Much of the literature places considerable emphasis on two foundational elements pivotal to the successful development of organizational safety cultures: upper management support for the effort and the active involvement of frontline workers in reducing error potentials. In efforts to develop safety cultures at their organizations, numerous aviation companies have structured safety initiatives aimed at providing these important elements. Unfortunately, most of these efforts have had little or limited success at transforming their organizational cultures into safety cultures. In light of their efforts to provide for these two critical elements, one is left to wonder why their initiatives failed to engender safety as a driving force within their organizational cultures.

Purdue University researchers have worked closely with several aviation organizations which have expended considerable effort and resources to promote safety as an organizational goal. Each has taken great pains to communicate the commitment of upper management to the importance of safety within the organization. These companies have also provided safety and/or human factors training for frontline employees in an effort to provide them with a greater understanding of how to identify unsafe conditions and prevent errors. In each case, the organizations experienced an initial improvement in safety. This was mostly attributable to the individual efforts of frontline workers and grass-root initiatives. In a few cases, organizational efforts spawned local safety groups or teams which developed a variety of safety programs that had initial significant success. In all cases, however, the momentum was soon lost and safety gains began to decline. Most of these efforts soon began to be referred to as another in a series of the company’s “flavor of the month” organizational efforts.

Concerned about the failed efforts of these companies to successfully institutionalize safety as a fundamental value of the organization, Purdue researchers initiated an assessment of their various techniques and sought to identify where each initiative had failed. In each case, the organizations had successfully communicated upper management’s stated commitment to safety as well as successfully educated a significant portion of their workforce in human factors principles or safety training. Universally, however, these efforts failed to provide long-term effects in safety improvement. What, then, was missing in the safety equation of the organizations that caused the demise of these well-intended efforts.

In each organization, upper management had set appropriate safety goals and provided and communicated a commitment to safety improvement. In many cases this included a commitment to providing safety and human factors training for workers. In most cases frontline workers demonstrated a renewed dedication to promoting safety in their individual work efforts and throughout their workplaces. In many instances, workers banded together to develop and implement safety strategies and programs. What each organization failed to do was prepare

middle and frontline management to assume their critical roles in the promotion of safety in the workplace and to clearly define and hold them accountable for their responsibilities in worker and operational safety.

Safety Initiatives Meeting a Dead End

In each of the organizations studied, numerous individuals or safety teams and groups formed at the organization's grassroots level had taken the corporate initiatives seriously and diligently sought out unsafe conditions and formulated innovative interventions and programs. The seriousness and dedication of these individuals and groups was undeniable. In numerous cases, these initiatives were very successful at solving localized safety problems, developing and delivering safety training, establishing peer safety review panels and fostering both formal and informal safety coaching of workers. Encouraged by their successes, these entities sought new venues and challenges in an effort to expand their impact on unsafe conditions and acts.

Unfortunately, empowered frontline workers bent on improving safety in the workplace soon ran headlong into the limitations of such employee driven initiatives. Worker based initiatives share common and often fatal limitations to the successful longevity of their initiatives. Because grass-root initiatives are structured around the efforts of hourly workers, these groups and programs soon become self-limited in their effect because this nucleus of individuals have neither the power base nor resources to support their activities. These facts limit such groups to the performance of safety improvements that require neither operational decisions nor financial or manpower resources. There is a very narrow scope of potential safety initiatives and solutions which lend themselves to the confines of these limitations. Energetic, resourceful, and dedicated safety groups will quickly venture into areas where they exceed their power base or resources or both. Confronted with the inability to make the necessary changes or the lack of resources to implement effective solutions, these groups will rapidly become frustrated and disheartened. In short order, these formerly energetic and effective groups become inactive and frustrated due to the perceived futility of trying to make a difference in operational and workplace safety.

As an example consider the circumstances confronted by one such safety team observed by the researchers. The team consisted of frontline worker representatives from the various career fields of the air carrier. In addition to their duties of observing and coaching employees, ferreting out safety problems and creating successful safety interventions and programs, the safety team also fielded safety suggestions and concerns submitted by fellow workers. A safety concern was forwarded to the team by a customer service agent regarding the lack of adequate emergency lighting in the VIP passenger waiting area. The report related that during a recent power outage on the airport, the passengers were left in total darkness. When power was not restored within ten or fifteen minutes, the customer service agents formed the passengers into a line and had them hold on to each other while they descended two flights of stairs to the concourse and enough lighting to be safe. After investigating the incident, the safety team proposed a two-phase solution for the concern. The safety team recognized that the installation of permanent safety lighting in the area would take several months to complete. For the short-term, the safety team wanted to purchase several flashlights to be placed throughout the waiting area for use by customer service agents in the event of a future electrical failure before a permanent solution could be implemented. Since the safety team didn't even have the limited resources to purchase flashlights, members took their proposal for solving the unsafe condition to the manager responsible for the waiting area. Upon presenting their well thought out phased solution, they were devastated by the manager's response when he said, "I'm not

buying flashlights...they have legs!” Unable to force an immediate solution and faced with a four to five month delay before a permanent solution could be performed, the safety team became very frustrated. This small issue became a milestone in the changing attitudes of the team members. Over time, the futility of trying to promote safety changes within the constraining venue of an employee empowered team and not being able to affect a solution for this and other small issues lead to the demise of the team. Thus a critical force in safety for the organization was lost.

Safety Roles and Responsibilities

At the core of the failure of each of the observed corporations to move dramatically toward transforming their organizations into safety cultures is a pervasive lack of clarity of the safety roles and responsibilities of each individual within the context of daily work and operational environments. This is especially true of middle and frontline manager positions. Most corporations include phrases in frontline worker job descriptions or promote posters in work environments that emphasized the expectation that frontline workers will perform their duties in the safest possible manner and will do everything they can to ensure the safety of flight. Stated in such broad and ambiguous terms, each worker is left to his or her own interpretation of the meaning of the term “safest” and unsure of their span of control and the boundaries of their powers to control their environment and other workers. Lacking in both power base and resources, workers are most often left to what is generally perceived to be “devious” ways to promote or ensure safety in their workplaces. More commonly, frustrated by an apparent inability to affect the level of safety in their workplace, they take little action to ensure their personal safety or the safety of others.

A review of manager job descriptions in each of the organizations demonstrated that little attention was paid to establishing and defining safety roles for middle and frontline managers. The very best circumstances found companies’ managerial job descriptions expounding on the position’s safety roles and responsibilities only in very general and ambiguous ways. Phrases like: “provide for the safety of workers”, “promote safety in the workplace” and “ensure a safe work environment” were as definitive as any of the job descriptions became in exploring the responsibility or role of the manager in workplace safety. Researchers were curious as to whether or not managers received any training in how to promote safety or safety accountability in their work environments. An evaluation of materials and programs utilized by the organizations to prepare managers to assume their new positions found them devoid of material for defining their new safety roles and responsibilities, exploring safety techniques or processes, or preparing them to monitor and trend workplace safety levels. In fact, it was found that in most cases managers did not even have the rudimentary human factors and safety training provided to frontline workers. Furthermore, while researchers found repeated reference to workplace safety in management meetings attended by these middle and frontline managers, in no case could the researchers find instruction in safety techniques or suggestions on how to promote safety or foster worker accountability as a part of such meetings. Instead, these meetings generally focused on gross safety measures, the acceptability or unacceptability of current safety levels, and the setting of new target safety levels for the next fiscal period.

Failing to Monitor and Track Safety

Setting safety goals and measuring success through the use of gross safety measures like accidents, incidents, aircraft ground damage, and personal injury rates provides little real measure of safety levels within work settings or operational environments. All too often, the

difference between these serious negative outcomes and minor or non-events is purely serendipitous. Chance may be a better dictator of the outcome for such measures than are the efforts of new safety initiatives or programs. Accurate assessment of changes in safety levels depends heavily on accurate and robust safety reporting and trending systems that measure more closely the risky behaviors of workers. Not surprisingly, managers who have dedicated considerable effort and resources to safety initiatives or programs only to have chance dictate steady or increasing negative safety outcomes on gross safety measures often become discouraged or feel that nothing they do will alter the outcome.

Although a great deal of debate and attention has been given to the topic of safety measurements, there remains little pragmatic utility of safety event and incident measures within the air carrier industry. The industry has become accustomed to the a posteriori method of analysis of accidents as the principal method for evaluating and assessing causation. This conventional approach is rooted in the traditional post-accident analysis of major aviation accidents. Historically, this approach has proven to be an effective way to identify and correct aircraft design and engineering faults as well as industry procedural shortcomings. It was natural, therefore, for the industry to continue down these traditional lines when faced with identifying and correcting human errors which contribute to accidents and incidents. Unfortunately, this has proven to be a much more difficult task due to the richness of variables surrounding the performance of the less structured ground related tasks and procedures and the widely varying conditions affecting human technicians performing those duties. While the industry has focused increasing effort on the task of accumulating operational safety event data, using the data to identify and define sources of operational accidents and incidents and formulating interventions to reduce such occurrences has been slow to develop. This is due in large part to the fact that such accidents and incidents have origins with more elusive and less definitive causation.

Recognizing the need for more effective evaluation and tracking of safety levels in the workplace, Purdue researchers developed a proactive safety assessment strategy for measuring and trending unsafe acts within aviation operational environments. The technique identifies the most common risky behaviors performed by workers in various work groups and develops a checklist for scoring daily behaviors. Trained observers utilize the checklist during periodic observations of workers performing their duties during normal periods. The observers record each occurrence of any of the identified "at-risk" behaviors. Observers can also interview the worker to help identify underlying issues or causes of their behavior. Observations are summarized using a specially designed computer program and occurrence rates for the risky behaviors as well as trend data are periodically provided to workplace managers. This information provides managers with a better understanding of the types of behaviors being performed by workers in their areas of responsibility which often lead to bad outcomes. Armed with this knowledge, managers could alert workers to risky behaviors, correct unsafe conditions, monitor the work environment for unsafe acts, and modify worker behaviors to safer actions. This tool has proven very successful at defining heightened error potentials and predicting future accidents and incidents. One organization using the tool predicted nine accidents and safety events during one six month period.

Successful use of the tool was predicated on the assumption by researchers that managers would know how to read and interpret the trending information and intrinsically recognize the intervention needed to correct the aberrant conditions or worker's unsafe act. This proved to be a gross overestimation of the majority of managers' willingness and preparedness to use and understand the periodic reports. Despite what appeared to researchers to be self-evident

problems and straightforward interventions, most managers failed to utilize the trend data to address unsafe work site conditions or procedures and at-risk worker behaviors. For example, at one carrier, company policy and ramp painted markings defined an “aircraft envelope” at each gate. Operational policy dictated that the envelope should be free of any vehicles or obstructions before any aircraft was received into the gate or dispatched from it. Safety observers repeatedly observed workers accepting aircraft into or dispatching aircraft from gate envelopes with vehicles or objects in the envelope which posed a threat for damaging the aircraft. It seemed evident to researchers and safety team members that stricter enforcement of the company policy concerning unobstructed gate envelopes during these operations would help alleviate future damage to aircraft. It was puzzling to the researchers, therefore when managers of the work area failed to initiate any action to change this unsafe condition.

Not My Job

In an effort to identify why trending data on unsafe conditions and worker behaviors was not being utilized by frontline managers to enhance workplace safety and correct unsafe acts, researchers held numerous focus group discussions with frontline and middle managers. These efforts soon lead to the discovery that most managers failed to perceive themselves as playing an active role in safety efforts. Consistent throughout our research with numerous air carriers has been the observed failure of middle and frontline managers to understand their role or responsibility in engendering safety within the operation and workplace of the organization. The researchers were curious to discover what managers perceived their role to be. Most managers perceive themselves to be the preeminent source of technical information and knowledge for the work environment. They also fancy themselves to be the ultimate work related “troubleshooter” and like fireman, many sit in their offices waiting for a call for assistance. When pressed about their roll as managers, most related that they were responsible for staffing and productivity. Exploring the issue of holding workers accountable for safety and productivity, most related that they were responsible for discipline but very few viewed their role as extending beyond discipline to any form of education, corrective action, or coaching aimed at changing worker behaviors.

When it came to safety issues, most managers reported that they consider workers to be self-directed and totally responsible for safety in the workplace. Both frontline and middle managers indicated that they felt workers were solely responsible to perform their work in a safe manner. They also stated that it was their expectation that workers would hold themselves and others (even those from other career fields) accountable for safety in their work environments. The managers regarded the trending data as nothing more than measures of how workers were doing in meeting safety goals passed down from upper management. They therefore treated them in the same way that they did the corporate safety goals; they simply passed them along to workers and expected them to do whatever was necessary to achieve the goals. They were unprepared to accept the observation data as anything other than another form of safety outcome measures to be passed on to workers. Most admitted that they paid little attention to reports and had not tried to understand their meaning. When pressed to explain their role in safety management, most related that safety was “not my job” but rather the job of corporate safety departments or union safety representatives.

In further discussions with middle and frontline managers it was learned that they had never considered that corporate safety departments and union safety representatives could not effect change in their workplaces since they did not have the power base or control of resources to make changes to specific work areas. These entities could not change working conditions,

address aberrant operational processes, control staffing levels, monitor and address worker behaviors, or provide the resources to correct unsafe conditions and fix damaged or out of service equipment. Instead, these entities provide systemic safety monitoring and act in an advisory capacity for addressing corporate and worker safety concerns.

An example of the generalized failure of middle and frontline managers to realize that they play an important and active role in promoting safety in the workplace was a recent accident at one of the carriers working with the researchers. The terminal area where the accident occurred had a limited number of tow-tractors. One of the tow-tractors was reported to have weak brakes and was removed from service. The tractor remained out of service for three weeks waiting for the area manager to process the paperwork to send the tractor for repair. During an unusually heavy day caused by weather-induced schedule shifts, tow-tractors were heavily used and shuttled from gate to gate to meet departure schedules. One particular aircraft's departure was being delayed because of the unavailability of a tow-tractor. The supervisor for the area went to the out-of-service tractor and tested the brakes. He removed the out-of-service tag from the steering wheel and instructed a worker to use the tug to dispatch the aircraft. The supervisor related to the worker that "the breaks are weak, but you should be OK if you're careful." The worker dispatched the narrow-body aircraft being delayed without incident and parked the tow-tractor. Other personnel, unaware that the tug was not fully serviceable, started to use the tug. While dispatching a later wide-body aircraft, the aircraft began to coast down the slight incline of the ramp. The driver applied the brakes and found that they could not hold the aircraft which subsequently rolled into another aircraft. Clearly, the failure of the area manager to process the repair in a timely way and the actions of the supervisor contributed to the accident.

Perceived Transfer of Safety Responsibility

Over the course of five years of research with numerous airlines, Purdue researchers have repeatedly noticed a curious phenomenon associated with attempts to develop and implement company safety strategies. This was especially true in cases of local or worker driven safety initiatives. During these initiatives, a natural by-product of the process was often the development of a work environment safety team or the designation of a safety representative to facilitate the program. In interviews with researchers, several managers proudly reported that they had fostered such initiatives in order to "fix" safety problems in their work areas. Unfortunately, these managers conveyed their belief that the creation of such safety designees or programs relieved them totally of any role or responsibility in operational or worker safety.

In all of the organizations observed by the researchers, the roles and activities of these entities were not clearly defined or communicated to other workers and departments. When researchers explored the roles and responsibilities of these entities with the safety groups or representatives, none possessed a clear understanding of their roles, responsibilities, powers, span of control, or even function. In most cases, each had been left to their own devices to define their purpose and function. An assessment of these various safety groups or individuals determined that, in most cases, they were not provided with a power base that allowed them to make decisions or institute corrective measures or the resources to effectively promote safety in the workplace. In each instance, managers had abdicated, at least in their minds, their safety roles and responsibilities to others without providing them the resources or means to adequately fulfill their mission. In all cases, managers retained critical roles to play and were the only option for providing the resources necessary to effect solutions.

Consider the example of a recent incident involving significant damage to an aircraft caused by a passenger loading bridge strike. The management at this particular station had developed a station safety team comprised of frontline worker representatives from several career fields. The team met periodically to address safety issues and concerns of the station. It also provided trained observers to make daily observations of worker behaviors in order to identify unsafe acts or behaviors that might be placing operational or worker safety at risk. During the course of their daily observations, safety team representatives observed one particular customer service agent who appeared to consistently not follow the procedures for moving the passenger loading bridge. In addition, the individual also seemed to have a “hurry-up and get it done” attitude which resulted in rapid and erratic movements of the bridge. In several instances the individual moved the bridge toward the aircraft before it had come to a complete stop during gating activities.

During the first two observations, safety team members discussed their concerns with the employee. Safety team members reported that the individual projected an “attitude” during their attempts to coach them out of their unsafe behaviors. On the third occurrence, safety team members reported their concerns directly to the individual’s supervisor with recommendations that the individual be restricted from operating the bridge until they could be retrained and re-certified on the equipment. Safety team members observed the same individual operating the bridge in a hazardous manner one week later. When they discussed the problem again with the supervisor, they were told “I’m looking into it”. Safety team members continued to observe the worker performing unsafe acts and decided to report their concerns using company email to both the worker’s supervisor and the station’s customer service manager. Approximately five months after the original observation of the at risk behavior, the worker ripped a long hole in an aircraft by contacting the aircraft before it had stopped moving during an arrival at the gate. Safety team members were called on the carpet and asked “How could this happen when we have dedicated so many resources to developing and implementing a station safety team?”

Later discussions with the managers involved in the incident revealed that they expected the safety team to do whatever was required to correct the problem. In their minds, they had totally transferred their managerial safety roles and responsibilities to the safety team. They no longer felt they played any active role in safety. Researchers explored with them the fact that team members had no authority to change the work status of employees, schedule them for training, or require them to re-certify on equipment. In fact, they had no influence beyond appealing to errant individuals intellectually through coaching type activities. Management held all the power and resources to effect changes in worker behaviors.

Consistency

Burdened by the belief that most workers do not come to work with intentions to do poorly or to have an accident, researchers were puzzled at the frequency with which workers are reported to fail to meet the expectations of their managers and supervisors. As a part of the safety assessment strategy, researchers perform a process assessment to determine the typical steps and tasks involved in each phase of the operation. This “process map” is utilized to identify risk exposures caused by inadequate or incorrect policies or procedures and process steps with shortcomings in coordination and communication among worker groups. Working with managers and workers to delineate each process step and determine the order and importance of each, researchers soon found that no two individuals possessed the same concept of how the operation progressed and the relative importance of each facet of the process. It also became apparent that little emphasis was placed on coordination between work groups or

effective communication. Focus group discussions with workers uncovered a deep-seated frustration concerning the inconsistencies of the operation and the changing expectations of managers. Workers were quick to relate that these frustrations soon caused workers to become disgruntled and made it difficult for them to anticipate how to support the operational safety and productivity goals.

Workers also reported a generalized lack of consistency in the way they were treated by managers and supervisors. In some cases, workers reported that they were encouraged or required to strictly follow policies, procedures, and safe practices during most operations but that supervisors or managers would occasionally suggest or require them to deviate from established policies and procedures or perform unsafe acts in order to meet performance goals. Workers used statements like: "Safety is great as long as the airplane's on-time" or "Safety is our #1 priority until it stands in the way of performance." These mixed messages erode safe practices and cause workers to question the importance of safety as an organizational goal.

Unclear Expectations

Researchers looked to two sources for guidance on what was expected of workers and managers; the job descriptions for each position and the directions and guidance provided to workers and managers by their superiors concerning job expectations. When researchers sought to gain a clear understanding of each job by referring to the organization's job descriptions, they were surprised to find that many jobs did not have a defined description. Some were not even contained in the job listing of the organization. The job descriptions that did exist were written in only the most general of terms and failed to clearly define the worker's role or responsibilities within the context of the operation. In no case did the researchers find operational performance or safety expectations which were clearly stated or which related specific outcomes or goals. When organizational representatives were questioned concerning the completeness of the job descriptions, researchers most often received a reply similar to "Well, everybody knows what a ___ does!"

Recognizing that some jobs may be fluid and require further clarification by superiors, researchers reviewed numerous memorandums and directives concerning various jobs. Generally these memorandums could be grouped into two general categories with reference to job performance. The first category could be characterized as being directive, that is, stating changes in operational policies or procedures. The second category could be construed to be punitive in nature and generally reflected some form of reprimand of the subordinate. When the various memorandums for a particular individual or job were compared, there were often conflicting information or themes among the various documents. Taken within the context of the moment, these memorandums communicated a particular message. The memorandums taken collectively within the context of one job description, however, often engendered confusion and projected unclear expectations.

Interviews with workers and managers alike related that inadequately defined job descriptions and mixed messages from superiors left them with no clear idea of what was expected of them. This often manifested itself in wide variations of work processes leaving workers without much clarity of what to expect from fellow workers or how to anticipate what was/should be happening in the workplace. Not only did this lead to worker and manager frustration but this state of not knowing what should be happening in the operation and what fellow workers might be doing next generates a work environment rich in error and accident potentials.

Accountability

A universal theme emerged from research efforts with all of the organizations; lack of accountability. When researchers explored the concept of accountability with workers and managers, all but a few of the individuals equated accountability to punishment. In their view, to be accountable was to be the focus of “blame.” Even when researchers tried to change the respondent’s perspective by using the term “answerable”, they most often continued to relate that their perception was that of a correlation with punitive action or the affixing of blame. This was a telling indicator of the mistrust and animosity shared by many within the workforce. When the topic of accountability was pursued further, many workers related that they felt that only frontline workers were held accountable and that managers often shifted blame or shirked responsibility for unsafe conditions or accidents so as not to be the focus of punitive actions. When managers and supervisors were asked about safety accountability, most indicated that frontline workers were accountable since they were the ones who were in control of the safety of their actions.

Safety accountability has been the focus of numerous discussions, papers, and conferences in recent years. So who *is* answerable for safety? The fact is that all employees at all levels have a safety contribution. However, to determine who is “answerable” or accountable for safety requires clearly defining the safety roles and responsibilities of all workers at all levels of the operation. Clearly, workers feel that they are being held accountable for circumstances and actions beyond their control. It is also clear that managers and supervisors do not clearly understand their roles and responsibilities in the safety equation and that organizations have done little to clarify either. It is not surprising, therefore, that without such clarification there is a tendency to not hold individuals accountable when their roles and responsibilities are not fully understood. Thus it is common that the direct correlation of an individual’s roles and responsibilities to the consequences of their actions is often lost.

Changing Worker Behaviors

Changing worker behaviors is a central facet of engendering safety in the workplace and providing for the long-term reduction of errors, accidents, and incidents. It was generally observed by the researchers that most frontline and middle managers know very little about effectively changing worker behaviors. When asked how they would alter their workers undesirable behaviors, many saw threats, intimidation, and discipline as their only options for controlling the behaviors of their workforce. While much has been written about changing the behaviors of workers, care must be taken to isolate the ramblings of pseudo-science and pop-psychology from scientifically proven techniques. Many companies enthusiastically venture into the quagmire of incentive and reward programs rationalizing that money and gifts are a more effective way to change worker behaviors. Research suggests that such programs are frequently ill conceived and often counter productive. Take, for example, the common practice of rewarding a work group for x-hours of injury free performance or x-months of activity without any aircraft damage. The closer the group gets to the designated reward point the greater the pressure on each individual to not report small injuries or to hide damage which would probably go undiscovered or could be passed-off to another work group or station. This often hides important accident and incident causation and exposes workers and operations to expanded risks.

What surprised the researchers was that none of the organizations they worked with were familiar with or had considered using scientifically proven techniques such as behavior

shaping. Based on Skinner's research in psychology, behavior shaping has become the foundation of many highly effective safety strategies and programs (Krause, 1997). The DuPont "STOP" program and the widely used strategy of "Behavioral Based Safety" (BBS) are examples of successful strategies based on the pragmatic application of the principles of behavior shaping (McSween, 1995). The strategy is relatively simple to understand and use and the technique has as its core components many of the attributes which researchers found missing in the organizations studied (Geller, 1998). Another facet of the technique which could promote its consideration by managers is the fact that the strategy is equally as effective at promoting productivity improvements as it is engendering safety (Braksick, 2000). This fact can be used by safety program advocates who constantly struggle to convince managers that instituting safety initiatives does not have to be at the sacrifice of worker productivity.

Fundamentally, the technique revolves around a model commonly referred to as the ABC model. The **ABCs** stand for Antecedent, Behavior and Consequences. The strategy promotes the clear communication of the desired and expected behavior (the Antecedent to the behavior), the monitoring of worker Behavior to see how well it matches the desired behavior, and a direct Consequence for their behavior in the form of positive or corrective feedback. Research has demonstrated that if Antecedents are clearly stated (clearly communicating expectations), Behaviors are closely monitored (measuring and tracking unsafe acts), and Consequences are certain (consistency of treatment), immediate, and constructive (positive as well as corrective) that the impact on worker performance and behaviors is dramatic. The experience of the researchers demonstrated that these attributes do not generally exist in aviation operational environments. Clearly, middle and frontline managers could benefit from safety programs aimed at providing them training in how to effectively use techniques like behavior shaping to change unsafe worker behaviors and promote greater levels of worker and operational safety.

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