GroundEffects

Reporting Maintenance and Groundcrew Error Reduction Efforts

> "We will achieve a national goal of reducing the aircraft accident rate by 80% within 10 years"
>
> President Clinton
> February 12, 1997

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Delta Air Lines Team Resource Management

by Lou Cabrera, Delta Air Lines

Introduction

"All ramp personnel involved in the pushback process should receive initial and continuing human factors training to develop attitudes, behaviors, techniques, and communication skills that promote operational safety through a team concept and the use of all available resources." This was one of the recommendations made in the wake of ground damage cases investigated by Delta Air Lines' Corporate Safety and Compliance department in 1995. It was the beginning of the ground operations human factors program at Delta. This article is the first in a series describing our human factors program. It will provide an overview of our program and describe the steps that have placed us in our present position. Subsequent articles will detail each of the components of our Team Resource Management (TRM) program.

Background

First, some pertinent

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Maintenance and Ramp Safety Society (MARSS)

MARSS is a new, non-profit society dedicated to reducing errors for aviation maintenance and ramp personnel through education, training and communication.

We believe there is a lack of awareness of the importance of human error reduction for maintenance and ramp personnel. MARSS is changing this by producing excellent human error posters, videos and workshops for maintenance and ground crew personnel. For example, MARSS produces the "Dirty Dozen" posters showing twelve common human errors in maintenance. On the positive side, we are producing a poster series called "The Magnificent Seven" showing how to do it right. Our new video is a reenactment of a major crash involving maintenance error. Finally, our workshops are available to introduce your people to the world of human factors.

For information or membership call (604) 207-9100, email at marss@marss.org, or write to 5750 Cedarbridge Way, Richmond BC V6X 2A7 Canada.

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Blind Obedience Equals Disaster

by Wayne Glover

Recent studies on risk taking in baseball and pedestrian safety highlight some important issues for system safety and may help us with our 'new' problem of human error at work. Ultimately, you be the judge. Hidden in these examples may be several important system safety issues applicable to all industries. Some areas to consider are: Is awareness of risk more important than strict compliance with procedures? Can an overly restrictive system lead to blind system compliance which actually reduces safety because of complacency? How does personal accountability effect worker actions, especially those dangerous actions you wish to control? An answer to the first two questions is suggested by a study on pedestrian fatalities in U.S. cities. The third question connects with a study on batters hit by the pitch in baseball.

Now, what are the possible similarities between pedestrian safety and maintenance safety? The connections are not as obtuse as it may seem because each system is

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Discipline: Why Process Is More Important than Outcome

David Marx, Safety Consultant

If you aren't there already, put yourself in the shoes of a technician on the floor. Assume that you are walking across makeshift floorboards in the cabin of a 737 in major check, when accidentally you step on a flight control cable, busting a flight control pulley. Decision time. Do you keep on walking, knowing that the discrepancy will be picked up by inspection or functional test, or do you raise your hand and suffer the uncertain wrath of your corporate disciplinary policy?

To avoid this very dilemma, in recent years many of the world's foremost safety experts have been calling for the creation of "blame free" or "non-punitive" human error reporting and investigative systems. By removing the threat of any disciplinary action, safety specialists hope to entice erring individuals to promptly and truthfully report their errors.

So what does this call for action really say about today's typical disciplinary approach? Does the fascination with "blame-free" reporting systems suggest that today's disciplinary systems are far too punitive? Or is it fear of an uncertain disciplinary system that would cause an employee to keep walking?

I, for one, do not think that the majority of today's employee disciplinary systems are too punitive. I have spoken with many technicians who believe that the modern social trend in the US of not holding people accountable for their actions has unfortunately moved into the corporate world. Whether it be the human factors philosophy that one's actions are a product of one's environment, or the complexity of employment laws that make taking disciplinary action so difficult – many employees believe that non-performing peers get off far too easily in today's corporate culture.

Many employees at the bottom of the corporate food chain believe that disciplinary decisions are not made through a fair and equitable process, but through the likes and dislikes of management. There is strong evidence

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that humans in the disciplinary decision making chain rely more on gut feel and emotional reactions to the mishap than structured disciplinary processes. For example, if the wife of the CEO were on the flight that experienced an air turnback because of your error, you are more than likely to get a few days off without pay. As a result of a seemingly arbitrary process, employees hide not only their own mistakes but the mistakes of favored peers, while at the same time, they openly gripe about those ineffective employees who for some reason seem to avoid truly warranted disciplinary action. Especially in the context of post-mishap review, many employees view the typical disciplinary system as too emotional, too lenient, and too arbitrary.

Enter the "blame-free" mishap reporting culture. It is a construct of safety experts designed primarily, if not solely, to get people to report their procedural violations or to report their involvement in a mishap. Rather than a reflection of the moral, ethical, or safety beliefs of line managers and their employees, the "blame-free" approach is merely the means to an end for those in the safety community. The system works through a theory of risk minimization. The employee, having violated a rule or caused a mishap through his error, must make a decision as to whether or not to report. By offering immunity, and often anonymity, the disciplinary threat simply disappears. For the safety experts this system seems to work well, but for those on the floor and in the offices of management, blanket immunity is often viewed as a price too high to pay for the safety data collected.

Consider what we really want from a mishap disciplinary system. To support human factors learning, we desire to create a culture that encourages erring employees to come forward. Yet many, including me, feel that we must do this without using blanket immunity or creating the blame-free culture. To use "blame-free" to get around the uncertainty of discipline is, to use an old phrase, to throw the baby out with the bath water. Quite simply, some errors represent such a high degree of culpability that the interest of individual deterrence far outweighs the gains offered in human factors learning.

We must create a culture that encourages people to come forward but still retains a line, which if crossed, will result in disciplinary action against the employee involved. To encourage reporting, we must put the erring employee between the horns of a dilemma – to hide his mistake and risk possible punitive sanction if eventually caught, or to come forward and risk punitive sanction if found reckless (or culpably across the line). It is admittedly asking a lot of an employee. Nevertheless, it is what should be required of the aviation professional with whom we trust the lives of our friends and families.

In order to get an employee to come forward without having to offer immunity, it is necessary for the employee to feel that coming forward is of less risk than hiding his mistake. How can this be achieved? First, we must demand that employees report their involvement in a mishap. To lie or to actively hide a mistake is to suffer the wrath of the disciplinary system. Secondly, we must ensure that each employee knows where the line is drawn so that those employees who merely make mistakes will know that their conduct will not result in disciplinary action. Lastly, the employee must have faith that the process will be fair and that the position of the line will not waiver. It is at this juncture

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TRM *(continued from pg 1)*

background information about Delta's organizational structure. Ground operations personnel are part of the Airport Customer Service (ACS) division. ACS, which is non-union, is responsible for all ground operations, including aircraft pushback. Aircraft Maintenance technicians and Technical Operations personnel are part of another division. A Maintenance Resource Management program is currently under development by Technical Operations

What we needed

Several things were needed for TRM to be successful. The first was corporate support, from both Corporate Safety and ACS Administration. Support from Corporate Safety came in two forms, the recommendations made in the ground damage investigations, and from key members of Corporate Safety. We were fortunate in this regard due to the level of human factors expertise within our own company. Our Vice President of Corporate Safety was Dr. John Lauber. Dr. Lauber is recognized as a leader in aviation human factors. (Dr. Lauber has since left Delta to join Airbus Industries.) Our Manager of Corporate Human Factors is Dr. Steve Predmore. Steve's contributions to TRM have been invaluable. He is the human factors subject matter expert and an ongoing adviser to the implementation of TRM.

The next necessary element was a change in management style from the traditional corporate top-down style to the team concept. Fortunately, this change was already underway at Delta. We also needed human factors concepts written into policy. We, in training, do not set policy; we train it. This is where the support from ACS Administration came in. Human factors concepts are now included in the first chapter of our Ground Operations Manual, which defines the approved policies and procedures. Additionally, we needed support for the training itself. Without it, we would not have been able to develop this course.

The next thing we needed was a project definition. This was necessary to establish the desired outcomes of the training and the desired performance of the ground personnel after training. The specifics of the project definition we arrived at are as follows:

- Awareness: Provide awareness of the concepts and behaviors related to human factors that result in accidents and incidents.
- Skills Training: Provide skills training in resource management that supports a reduction in, and better management of, human error in operations.
- Reinforcement: Participate in an ongoing, coordinated effort with ACS Operations to ensure that resource management skills are consistently reinforced and evaluated during operations.
- Feedback/Responsiveness: With ACS Operations, develop and implement a feedback strategy for ensuring that human factors concerns and problems in operations are continuously identified and addressed in the training programs.

Our program

Our terminal objectives are to achieve a change in behavior and performance, and ultimately, a sustained reduction in our damage and injury costs. In order to meet these objectives, we developed a complete and coordinated system wherein each component complements, builds, and reinforces human factors concepts. The following is a synopsis of our TRM program.

- **Basic Operations Services - Ramp:** This course is designed to familiarize new agents with ramp/operations procedures. It has been rewritten to include human factors concepts in order to provide an awareness level understanding of human factors.
- **TRM - Classroom:** This course is the cornerstone of our human factors program. It addresses the need for awareness and skills training and is delivered to all personnel involved with ramp operations (including managers and front line supervisors). The components of the class include: Introduction, Communication, Crew Coordination, Workload Management, Planning, Decision Making, Situational Awareness, and Customer Service.
  The focus of this course is twofold. First, to build the necessary skills for agents to identify and maximize available resources. Second, to demonstrate to the students that damage and injuries are preventable, and most importantly, how to recognize the at-risk behaviors that are the up-stream indicators to the down-stream damage or injury. Traditionally, we have viewed safety as an individual component, so it was necessary for us to redefine it. Our new definition of safety is, "Safety is the result of your individual actions." Keeping with this definition, the class centers around individual behavior and emphasizes the importance of maximizing resources for the benefit of improved safety and efficiency. We conclude each course component with a case study from our own operation, giving students the opportunity to identify the up-stream indicators. Then, they identify ways to prevent the incident from occurring again, based on the skills they just learned.

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- **TRM - OJT:** The On-The-Job Training (OJT) component of TRM is designed to provide reinforcement. It is performed by qualified local instructors who are selected on the basis of their communication skills, experience, and their ability to be effective role models. The benefits of on-the-job training are that you are able to show the agents, in their workplace, that the skills learned in the classroom are both practical and beneficial to the operation. Instructors demonstrate the desired behaviors and use coaching and counseling to provide positive reinforcement and corrective feedback. An additional benefit is that there is no lost productivity because coaching and feedback are conducted during the operation and during periods of low workload.

- **TRM - Measurement/ Evaluation:** The goal of TRM - Measurement/Evaluation is to measure the effectiveness of TRM training using a four level evaluation process. Level I is accomplished by using student course assessments and has been extremely beneficial in the early stages of implementing TRM. Level II is accomplished in two ways: successful completion of the case studies and a written test. Level III is accomplished by measuring the desired TRM skills in three stages, pre-training, post-training and follow-up. Pre-training measurement is used to establish the baseline performance for each station and work area. Post-training measures will indicate the level of skill application, and the follow-up measurement will determine the retention rate of the skills and to determine the central theme of TRM - Recurrent. Level IV will be accomplished by comparing the damage and injury rate pre-training vs. post training.

- **TRM - Recurrent:** The goal of TRM - Recurrent is to provide ongoing reinforcement. By using the results of the follow-up evaluation, we will be able to determine the agents weakest TRM skills. Those skills will then be the central theme of recurrent training.

Testing The Training Program

We are in the process of testing the program in one of our non-hub stations. This station was chosen for three reasons. First, they needed it. In FY 1997 (July 96-June 97) they were damaging an aircraft on the average of once every 17 days. Second, there are several things that made them a perfect living laboratory: they are a medium size operation, a culturally diverse workforce, and a very congested ramp area. Finally, TRM fit in well with a comprehensive safety initiative that was already slated for the same station.

The test launched in May 1997 and is extremely successful. Reaction to the class has been overwhelmingly positive from both management and agents. Our ramp operations agents have not experienced an aircraft damage incident since program inception. Post-training measurement has not yet been completed so all we have is anecdotal evidence of its impact on agents. Many students have commented that this type of training is long overdue and some have mentioned a noticeable change in attitude among peers. They see more agents paying close attention to the individual actions that will determine safety in the workplace.

Challenges

We have overcome many challenges. The most significant of which was a lack of similar programs to benchmark. CRM and MRM programs have been around for years, but to our knowledge, there aren't any existing ramp operations human factors programs at the scale we desired, leading to a long development process. During this time, we had to determine which human factors subjects would be most applicable and beneficial to the ramp agent.

Lessons learned

We've learned many lessons from developing this program. Hindsight being what it is, what follows is a list of the good and the bad for anyone developing a similar program.

Tough lessons learned

- A corporate safety department is a valuable resource. They should be consulted early and often.
- There is a wealth of information from both inside and outside the aviation industry. Broaden your research to include information available from other domains including universities, the FAA, and other industries.

Good lessons learned

- Develop a systemic training program, not just a one-shot inoculation.
- Start the training process with management and front line supervision. Their support is critical to your success. Assuaging their concerns first will ensure their support of the program when implementing to front line agents.
- Expect and prepare for concerns about the program. The concepts are probably new to them. The most helpful tool here is to explain the 'why' behind the program.

Conclusion

Human factors training has

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been successful with flight crews and maintenance technicians. The time is right for expanding human

factors training to ramp operations. A reduction in human errors that lead to damage and injuries will benefit ramp agents, airlines, and most importantly, our customers.

Lou Cabrera is the developer of the Team Resource Management project at Delta Air Lines. Lou is a developer/ trainer with Delta Air Lines Airport Customer Service Training and Support.

Discipline

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that process does become more important than outcome. It is fairness and knowledge of the process that defines our perception of justice, not whether technicians ever get disciplined under the system. The truth is that factors such as an ability to be heard, impartial decision-makers, and knowledge of the standards of conduct are more important to the decision to come forward than is whether a peer was actually disciplined.

A disciplinary system can be "just" while still supporting the human factors effort. To do so, an organization must focus on creating a structured process that can be embraced by the work force. Employees must come to know that they will be treated fairly, consistently, and in accordance with the policies provided. Employees do not keep a disciplinary scorecard to weigh their desire to report based upon the odds of disciplinary action. Instead, most aviation professionals desire to help improve aviation safety through their mishap reporting and only ask that they can understand and rely upon a just and equitable disciplinary process.

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Pedestrians

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designed to: Accomplish a task (crossing the street/maintain and airplane); improve safety of the people involved (pedestrians/flying public); provide rules and balances (traffic laws/FARs); each system is subject to local enforcement (local police/PMI) and, most significantly, local norms play a major role in the results.

Is it safer for a pedestrian to cross the street in Boston, MA or Seattle, WA and how does the respective pedestrian system safety effect these results? Recent data show a dramatic difference in pedestrian deaths in these cities. Is the difference attributable to different pedestrian safety systems, population groups, or compliance methods for pedestrians in each city? Anyone familiar with pedestrian actions in both cities would immediately assume that Seattle was safer (fewer pedestrian fatalities). Seattle pedestrians are far more compliant with the pedestrian laws, including crossing in the cross walk and waiting for the pedestrian walk light. Surprisingly, recent data show the pedestrian fatality rate in Seattle is more than twice that of Boston (1.9 versus .8 per 100,000 population). In fact, if you consider that Seattle has only one half the walking commuters of Boston (3.3% versus 6.5%) the effective pedestrian fatality rate is closer to quadruple[1]! Why the dramatic variation in pedestrian fatalities? There are no obvious dissimilarities between the population age which could account for these differences (older pedestrians are twice as likely to be killed[1]). Nor would the written pedestrian rules account for the variation – both cities have identical pedestrian systems: Pedestrians must cross in the cross walk; when it is safe to cross, pedestrians receive visual cues (walk/don't walk lights); written instructions (placard on sign post) explain the system; and, often aural cues are used from the walk/ don't walk lights. Obviously, other systemic factors are at play creating the fatality differences. I suggest the major cause is the 'pedestrian culture', analogous to company culture, developed in these two cities. For pedestrians, the difference is demonstrated in the methods pedestrians choose to cross the street.

Boston and Seattle are as far apart geographically as they are in pedestrian culture. Having lived in both cities for many years, I have noted the dramatic differences in pedestrian styles. In Seattle, there is near complete compliance with the pedestrian safety system: waiting for pedestrian walk signals and crossing in the crosswalks. However, this leads the pedestrians to have too much faith in the system. Watching pedestrians cross the street in Seattle is a lesson in blind obedience to rules. When the walk light illuminates, the pedestrians immediately start walking with little attention paid to traffic. Pedestrians assume the drivers are playing by the same rules, and will stop for pedestrians. However, the pedestrian fatality rate (Boston was the second safest city in the country with Seattle being the 11th) suggests this pedestrian crossing system is not very effective. I suggest it is because the pedestrian place too much faith in the system – they are not actively involved in crossing the street.

For Boston pedestrians, the approach is completely different. These intrepid pedestrians do not depend on the pedestrian safety system. For them, pedestrian signals are suggestions and crosswalks are always too far away. Boston pedestrians cross the street where they choose without regard to the walk lights or cross walks. However, understanding their actions have removed the safety nets, Boston pedestrians are very active participants in the safety

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Pedestrians

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system in that they are very aware of the traffic around them and recognize they are responsible for their own safety. In short, Boston pedestrians assume something will go wrong and they are actively looking for this problem. The result is fewer safety nets, but a much more aware "workforce". Thus, although the Boston pedestrian is less system compliant, they are more aware of the risks and much more participative in the system safety and their individual safety. This focus on individual safety is certainly the key factor in the different fatality rates.

This certainly does not mean that disregard of the rules is the key to success. However, it does suggest that blind obedience is not the solution either. Worker attentiveness, good system design, and safety nets, in the correct proportions, will likely give us the safest system.

Another anecdotal indication of the importance of individual responsibility was provided by Mr. Kurt Herwald, President and CEO of Stevens Aviation in Greenville, SC. Mr. Herwald told me he saw an increase in maintenance errors when he increased inspectors in his shops. He believes they began to depend on the inspectors to find their mistakes rather than double checking themselves. He has shifted back to the focus of mechanics policing themselves with limited inspection for critical work.

This issue also highlights another important issue which has received much press – personal responsibility. Who is responsible to ensure you safely cross the street or install the hydraulic pump correctly: you or the system. One school of thought is to provide specific guidance for performing a task (e.g. crossing the street). Using well marked crosswalks, pedestrians crossing signals, and strongly enforcing (through police actions) the requirement to walk with the walk light and only in the cross walk. This is analogous to providing a system with rigid rules, and double checking to ensure safety and efficiency.

This certainly does not mean that disregard of the rules is the key to success. However, it does suggest that blind obedience is not the solution either. Worker attentiveness, good system design, and safety nets, in the correct proportions, will likely give the safest system.

Another significant issue in a safety system design is the issue of discipline versus immunity. There are several real-world examples, from insurance to baseball, that suggest that removing personal responsibility, may increase the undesired behavior. Economists refer to this as the "moral hazard" which is the tendency of a person who will not have to bear the full responsibility for their actions to commit these actions more frequently. Insurance companies recognize this with people who have property insurance and those that don't. Insurance companies have long noted those with insurance are more careless than those without. Perhaps Seattle pedestrians feel they have 'insurance' and thus take more risks than their Boston counterparts who recognize they bear the responsibility for safely crossing the street.

In baseball, a recent study in the *Economic Inquiry* suggests that the designator hitter rule in the American League may have the unintended consequence of more batters being hit by the pitch. The researchers, Mr. Brian Goff, Mr. William Shugrt II, and Mr. Robert Tollison, reviewed the number of batters hit by a pitch in each league before and after the designated hitter rule was implemented in the American League in 1973. The theory was that removing the responsibility of the American League (but not National League) pitchers to come to bat and face the possibility of being hit by a pitch, that American League pitchers would be more likely to hit batters. That is what the researchers found. Prior to the rule change the number of hit batters was roughly the same in both leagues. However, since the change, American League batter have been hit by a pitch 10% to 15% more often than their National League colleagues[2]. This suggests that American League pitchers, without the requirement to accept personal responsibility by facing the possibility of being hit by a pitch, are more likely to take more chances with their pitches, and hit more batters, than their National League pitchers who must enter the batters box and face the opposing pitcher.

Certainly the best system incorporates the 'you're on your own' approach of the Boston pedestrian with the more careful, but less participative, approach of the Seattle pedestrian. We need good support systems and involved mechanics to optimize the safety system. Developing this balance is a challenge; however, without proper balance your safety system will not be optimized.

[1] *Seattle Post Intelligencer*, Seattle, WA, August 12, 1997
[2] *Business Week*, August 25, 1997

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