

Wright State University

CORE Scholar

---

International Symposium on Aviation  
Psychology - 2009

International Symposium on Aviation  
Psychology

---

2009

## Air Traffic Control Crew Resource Management: to Find Truth and Facilitate Change

Skip Grieser M.Ed.

Follow this and additional works at: [https://corescholar.libraries.wright.edu/isap\\_2009](https://corescholar.libraries.wright.edu/isap_2009)



Part of the [Other Psychiatry and Psychology Commons](#)

---

### Repository Citation

Grieser, S. (2009). Air Traffic Control Crew Resource Management: to Find Truth and Facilitate Change. *2009 International Symposium on Aviation Psychology*, 329-335.  
[https://corescholar.libraries.wright.edu/isap\\_2009/60](https://corescholar.libraries.wright.edu/isap_2009/60)

This Article is brought to you for free and open access by the International Symposium on Aviation Psychology at CORE Scholar. It has been accepted for inclusion in International Symposium on Aviation Psychology - 2009 by an authorized administrator of CORE Scholar. For more information, please contact [library-corescholar@wright.edu](mailto:library-corescholar@wright.edu).

## AIR TRAFFIC CONTROL CREW RESOURCE MANAGEMENT: TO FIND TRUTH AND FACILITATE CHANGE

Skip Grieser, M.Ed.  
Subsystem Technologies  
Denver, Colorado, USA

The Federal Aviation Administration's Air Traffic Organization Office of Safety sponsors a comprehensive and ongoing program of Crew Resource Management (CRM), Human Factors in Air Traffic Control (ATC). CRM begins with a one-day workshop for all field ATC personnel, including management, staff, supervisors, and air traffic controllers. Facilitators present principles and methods in teamwork, individual performance, and Threat and Error Management, and participants discuss and record how they can use those principles and methods in their air traffic operations and safety cultures. Participants identify local safety issues and record their own recommendations, which then are compiled from all the workshops in each facility, and the data is delivered to local management for follow-up action. This is *proactive* data, intended to improve individual, team, and system performance *before* errors and accidents occur. To avoid the regression effect, reinforcement includes recurrent training, team debriefs, periodic articles and publications, DVDs, and CRM posters.

### Introduction

In *Megatrends* (1982), John Naisbitt described one major trend as "High Tech, High Touch." Along with improvements in technology and technical standards, people in all fields are searching for ways to address the needs and potentials of their workers, and to improve human performance.

Most every field has its technical side and its human side. On the technical side in aviation, we have better aircraft design, construction, and maintenance. We have better weather detection and avoidance equipment, and we have better navigation and ATC equipment.

After these safety gains in technology, human and system factors now cause or contribute to up to 80 percent of all aviation accidents, and almost all air traffic controller operational errors (losses of required separation), which jeopardize safety. Human factors, and system factors which are created and managed by humans, are the biggest safety gap remaining to be closed.

### Background

In 1979, after several fatal airline accidents were caused or contributed to by breakdowns in human and system factors, the National Aeronautics and Space Administration (NASA) sponsored a conference, Resource Management on the Flightdeck. In 1981, United Airlines was the first airline to start CRM training, and the International Civil Aviation Organization now requires all of the world's commercial airlines to deliver CRM training to flight crews.

In 1985, the Seattle Air Route Traffic Control Center developed Controller Awareness and Resource Training, an excellent three-day workshop with fourteen major subjects. Known as CART, it was the first well-known grassroots ATC human factors course. In 1992, with CART as the forerunner, the Federal Aviation Administration (FAA), the National Air Traffic Controllers' Association (NATCA), and consultants from Human Technology, Inc. developed Air Traffic Teamwork Enhancement (ATTE), the FAA's first national ATC human factors course.

ATTE was a three-day workshop that was delivered, over ten years, to only an estimated one-third of the FAA's ATC workforce. Budget and staffing restrictions were obstacles to more complete delivery and, even more so, to recurrent training.

In 1997, the National Research Council of the National Academy of Sciences published *Flight to the Future: Human Factors in Air Traffic Control*, in which a panel of human factors experts raised seven concerns about ATTE. Two of the concerns were that "the program does not demonstrate organizational commitment to the concepts by being budgeted and mandated at the national level and integrated into ongoing training and evaluation activities," and that "the training is designed as a single-event program without provision for annual recurrent training." The panel recommended that the FAA "initiate a systematic effort to reinforce the value of teamwork within its organizational culture," and require an "improved ... centrally funded program" which provides "recurrent training, hands-on practice, and reinforcement" at all air traffic facilities.

In 1999, Denver controllers and supervisors – following these recommendations in another grassroots effort – developed ATC CRM. These one-day CRM workshops were delivered to Colorado facilities in 2000, and then CRM grew to a regional program when workshops were delivered to Seattle and Salt Lake City air traffic facilities in 2002 and 2003. In 2004, the FAA Air Traffic Organization's Office of Safety – when it was looking for a one-day human factors workshop that was more deliverable than the three-day ATTE course – discovered the Denver program, and began sponsoring it nationally in 2005.

The CRM program described in this paper is an evolution of the Denver program that has been field-tested, revised, and refined many times. The shorter length of the CRM workshop is only one difference from ATTE. The CRM workshop's content is more ATC-oriented, and more specific to each facility's own operations and culture. It generates more active engagement of participants in determining how they can use the principles and methods in their own operations and culture. Importantly, proactive data is identified by the workforce on local safety issues, and their recorded recommendations are used for taking follow-up action. Finally, there are systematic, ongoing reinforcements designed to avoid the regression effect that commonly follows one-time, "flavor of the month" training events. The training field calls one-time events "spray and pray." Spray it on, and pray that it sticks. It doesn't.

## CRM Workshop Content

CRM, as defined in the workshops, is the intentional use of effective human factors principles and methods to improve team, individual, and system performance, and to reduce errors and accidents. As it is in airline CRM, Threat and Error Management (TEM) is the cornerstone of ATC CRM, and one of the three major subjects in the workshop. And because controllers – like members of flight crews, surgical teams, bands, orchestras, and sports teams – operate simultaneously as individuals and as members of a team, teamwork and individual performance are the other two major subjects.

### *Improving Teamwork*

Teamwork is the first of the major subjects in the workshop, so that defense mechanisms are a little more relaxed among wary participants, who may come in wondering whether they are there to be “fixed” – in terms of their individual performance and their actual or potential errors. It’s easier for them to first talk about their team. By the time they have done that, and they have seen the non-threatening approach and format of the workshop, then they are ready to consider their individual performance, and threat and error management. The teamwork lesson is divided into four main subtopics, as follows.

#### *CRM Behaviors in an Operational Safety Culture*

Six CRM behaviors, adapted from Dr. Robert Helmreich and the University of Texas Human Factors Research Project, are presented. The behaviors are: 1) provide active operational leadership and support, 2) effectively distribute workload and tasks, 3) clearly communicate all operational plans to everyone, 4) make “safety-first” decisions and review them to reinforce safety, 5) brief and plan for known safety risks and threats, and 6) maintain safety culture vigilance, speak up, and listen.

Using definitions of these six behaviors, small groups discuss and record what they already do in these areas – good and not so well – and what they start doing, or could do better. Small group reports to the large group then generate further discussions and ideas.

#### *Organizational Dynamics*

Productive organizational change is discussed in terms of supporters, fence-sitters, and resisters. Working for change in areas where you already have influence, or can start having influence, is discussed. The point is made that any group, facility, or team is going to be *exactly* what the people who are in it, make it.

#### *Best Practices*

In small group discussions, participants identify “best practice feeds” for delivering a good product to the next controller, in their own local operations. Again, small group reports to the large group generate more discussion and sharing of best practices.

## *Team Debriefs*

The value of having teams debrief after operational ATC sessions is discussed, and debriefs are encouraged to support and reinforce the use of CRM behaviors and best practices. Teams that debrief routinely communicate better, understand each other's expectations, and do improve individual and team performance.

## *Improving Individual Performance*

Because controllers operate simultaneously as individuals and as members of a team, improving individual performance is also addressed. A central focus of this lesson is that everyone, at any level, can perform better if they learn from experts, who develop higher abilities in two critical skills: their abilities to maintain situational awareness and to develop, revise, and execute their plan. Situational awareness and executing the plan are discussed after two supporting tools are presented – a formula for consistency, and a formula for improving commitment, confidence, and control. The lesson concludes with a formula to remove the ambiguities in the goal conflict between protection and production, or, in ATC terms, between safety and capacity.

## *Consistency*

Former football coach George Allen said, “Consistency is the truest measure of success. It requires concentration, determination, and repetition.” A group puzzle, solved by the whole class as a fill-in-the-blank guessing game, reveals “the secret to ATC” consistency – “Do the right thing, with every aircraft, at the right time, every time, no matter how many aircraft you have. And if you need help to do that, call for it in time.”

## *Commitment, Confidence, and Control*

Dr. Robert Kriegel and Dr. Marilyn Harris Kriegel developed *The C Zone* to improve peak performance under pressure. Attitude is critical, because it leads to commitment, confidence, and control. Raising any one of these will automatically raise the other two, and methods to raise each are presented. Control can be raised by using “CAN-DOs” – specific actions that will help, can be done now, and are in your control. Managing both overloads and underloads are discussed as significant human factors challenges, and workshop participants explore using C Zone methods to maintain a reasonably comfortable balance between challenge and mastery.

## *Maintain Situational Awareness*

Dr. Mica Endsley identified the three major components of situational awareness as perception (what we see and hear), comprehension (what we understand), and projection (what we plan to do). Expert controllers develop higher abilities to maintain situational awareness. Individual and team CAN-Dos – to maintain situational awareness and to raise it back up when it falls – are identified, discussed, and recorded in a large group brainstorming session.

### *Develop, Revise, and Execute the Plan*

For any ATC position, in any tower cab or radar room, with any type of air traffic volume and complexity, in any weather or airport configuration, expert controllers develop higher abilities to develop, revise, and execute their plan. By focusing on this skill, along with situational awareness, anyone at any level can learn from the experts' examples and get better. Novices can become intermediates sooner, intermediates can become experts, and experts can be more consistent. Participants explore developing, revising, and executing the plan in small group discussions that identify and record best practices for working their own positions.

Best practice feeds (from the teamwork lesson) are about "what's good for the next controller." Best practices for working your own position are about "what's good for you." Again, small group discussions are followed by reports to the large group, with discussions and sharing of ideas.

### *Protection versus Production*

Dr. James Reason has maintained that people in hazardous technologies, where people's lives are at stake, must effectively manage the inherent goal conflicts between protection and production. It is inarguable that people have sometimes died when production has been valued over protection. In ATC, "protection means safety" and "production means capacity."

NASA Ames Chief Scientist for Human Factors, Dr. R. Key Dismukes, maintains that the protection versus production goal conflict creates ambiguities in people's minds, especially when under pressure. The resolution is to "disambiguate" that goal conflict. It is not a matter of keeping the goals in balance, which leads toward ambiguity. It's a matter of prioritizing them, keeping safety first, always. Although capacity remains a goal, it is a secondary goal. "Every thing you do to enhance capacity must be safe, or you wouldn't do that thing."

### *Threat and Error Management*

Keeping safety first provides a bridge to the cornerstone and "grand finale" of the workshop, Threat and Error Management (TEM). A model is explored in which workshop participants systematically identify the unsafe acts of individuals and teams, and the local workplace factors that sometimes put them in error-prone conditions.

### *The Risk Denial Syndrome*

Adapted from Dr. Robert Besco, the "risk denial syndrome" makes us vulnerable to error when we circumvent standard procedures and make risky decisions, while thinking that we're gaining an operational advantage, achieving worthy goals, and that "it won't matter." The resolution is to catch ourselves thinking, "it won't matter," and then "do the right thing, with every aircraft, at the right time, every time ..."

### *Internal Risks and External Threats*

Internal risks are within the facility. They include quick turnaround schedules, outdated airspace and procedures, and control room distractions. External threats are from outside the facility, and include weather, airline schedules, and problems with adjacent facilities. In a large group brainstorming session, these are explored in terms of identifying local vulnerabilities, ways to eliminate them, and how to countermeasure those that are not, or cannot be, eliminated.

### *CRM Error Types*

Exploring specific local error types is another segment adapted from Dr. Robert Helmreich and the University of Texas Human Factors Research Project. Again, in small groups, workshop participants identify, discuss, and record actual and potential errors from their own operations of five types: procedural, intentional noncompliance, communications, proficiency, and decision-making. For each actual or potential error, participants identify and record ways to prevent them, and to catch and correct them if they still occur. Again, small group reports to the large group generate further discussions and sharing of ideas.

### Conclusion: Find Truth, Facilitate Change

“Find Truth, Facilitate Change” is a slogan adopted from Hank Krakowski, the FAA Air Traffic Organization’s Chief Operating Officer. The overarching goal of CRM is to promote open and honest dialogues and processes that will empower individuals and teams to take ownership of their local safety cultures, identify local issues and solutions, and take local actions to improve them.

There is a wide range of CRM success stories about resolved safety and separation issues, operational and workload issues, and systems and process issues. They include airspace and procedure revisions, the use of best practices and more regular team debriefs of operational sessions, and the local development of supplemental training and action planning processes.

### References

- Besco, R. analyzing and preventing knowledge deficiencies in flight crew proficiency and skilled team performance, *The Journal of Aviation Psychology*, January 1992, Vol. 2, Issue 1, 53-74.
- Dismukes, R., Berman, B., Loukopoulos, L. (2007). *The limits of expertise: Rethinking pilot error and the causes of airline accidents*. London: Ashgate Publishing Company.
- Endsley, M. (2001). Training for situational awareness. Presentation to the Royal Aeronautical Society. (<http://www.raes-hfg.com/reports/22may01-SitAssessment/220501-endsley.pdf>)

- Helmreich, R. L., Butler, R. E., Taggart, W. R., & Wilhelm, J. A. (1994). The NASA/University of Texas/FAA Line/LOS Checklist: A behavioral marker-based checklist for CRM skills assessment. NASA/UT/FAA Technical Report 94-02. Revised 12/8/95. Austin, TX: The University of Texas.
- Helmreich, R. Musson, D. (2000). The University of Texas Threat and Error Management Model: (<http://homepage.psy.utexas.edu/homepage/group/HelmreichLAB/publications/pubfiles/Pub248.pdf>)
- Kriegel, R., Kriegel, M. (1984). *The C Zone: Peak performance under pressure*. New York: Anchor Press-Doubleday.
- Naisbitt, J. (1982). From forced technology to high tech/high touch. *Megatrends: Ten new directions transforming our lives*. (39-53). New York: Warner Books, Inc.
- National Research Council. (1997). *Flight to the future: Human factors in air traffic control*. Washington, D.C.: National Academy Press.
- Reason, J. (1997). *Managing the risks of organizational accidents*. London: Ashgate Publishing Company.