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FORUM

ERAU: CRM VECTORS 2007

Ted Beneigh

Last February, Embry-Riddle Aeronautical University, Bombardier, and Frasca co-hosted a Symposium titled "ERAU: CRM Vectors 2007." CRM leaders and participants in the military, academe, government, and industry were invited. The Symposium was comprised of 80 participants, including representatives from many foreign governments, military flight operations, general aviation, flag air carriers, and several non-aviation industries using CRM techniques and theories. The objective of the Symposium was to identify where CRM is and, more importantly, where CRM is going.

The Symposium was conducted in a rather unusual format. The first day was a plenary session, the intent of which was to allow experts in the field of CRM state where CRM is now, and where they envision it going. The second day, however, each attendee had the opportunity to convene a 60-75 minute session on a CRM-related field THEY felt was important. Proposed sessions were posted on a large board, and attendees could place their name in the session they wanted to attend. ERAU faculty and staff served as facilitators to help ensure the conveners stayed on track, and accomplished their goals.

There were a total of 13 audience-presented sessions on the second day of the Symposium. Since the audience was allowed to select any CRM-related topic that they felt was important, it is interesting to note what topics areas *they* selected. Here is a summary:

Training and Evaluation.....	5 Sessions
Error Management.....	2 Sessions
Is CRM Working.....	2 Sessions
Airplane/Automation.....	2 Sessions
Single-Pilot Resource Management.....	1 Session
Perceived Command Erosion.....	1 Session

I will discuss each group's opinions, conclusions, and recommendations on each of the above six topics.

Training and Evaluation

Transforming Theory into Classroom Design – A learning environment must be created that encourages group-work and the sharing of ideas. The standard classroom arrangement of all-forward facing desks is ineffective. Classroom design must be configured as to the appropriate mode that conveys what is being taught, to include usage of video, scenario re-enactments, group exercises, teamwork exercises, role-reversal exercises, learn-by-doing/sharing experiences, and corporate or school policies which encourage cross-departmental sharing of training

experiences, procedures, and sharing of both effective and ineffective training tools.

Training for Regulatory Requirements for Parts 91/135/142 – The one Part in which training tools are well-defined is Part 121. An industry-wide effort needs to be made to define CRM training and develop these tools in 91, 135, and 142 operations. While this is being done by most operators, the extent to which the training is conducted, the tools being used, and the basis of evaluation vary widely across the industry. A good method to accomplish this would be a solicitation letter from the Aviation Rulemaking Committee (ARC) to industry-users for their suggestions on how they accomplish their CRM training. From this, an ARC team can be formed to begin a formal rule-making "Part 121-type" effort that would be driven by industry. Emphasis should be placed on the non-technical (Notech) skills.

Teaching/Learning Strategies for Collegiate Aviation CRM Courses – University program should encourage and develop the following strengths:

- Encourage and foster the students to keep open minds
- Maintain a flexible curriculum
- Do not allow the training program to be "FAA driven", other than what is required for practical test standards for pilot certification.
- Have the students in various CRM-related courses for at least two years of a four-year program.
- Emphasize education – not just training.

To accomplish these, universities must share ideas and resources, not only between schools, but with industry, as well. A central informational, web-based "clearinghouse" should be available for access by *all* members of the industry. Applied CRM research should be encouraged, and CRM thesis and dissertation research should be encouraged at the Masters and Doctoral degree

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level. Universities need to encourage higher skill levels of the students, including the application, analysis, and synthesis of ideas.

When Should we Introduce CRM into the Training Process?

– It should be introduced from a human factors standpoint on the first day of training and made regulatory at all levels. The following emphasis should be made:

- Private Pilot - the emphasis should be on individual error management.
- Commercial Pilot - the emphasis should be on crew concepts.
- Airline Transport Pilot – the training should be tailored to the organization.

In addition, a program should be developed to catch older pilots who have never had formal CRM training and give them the opportunity to take an FAA-approved class on CRM to “catch them up” with current CRM trends and theories. Behavioral markers can be used to evaluate effectiveness of the training.

Using Human factors to define CRM and Enhance data Sharing Across the Industry – To accomplish this, this group makes the following recommendations:

- Standardize CRM taxonomy by standardizing terminology internally so researchers can identify trends for future training adaptations.
- CRM training for the trainer should be accredited, or come from a certified program.
- CRM programs should be continuously modified as necessary to meet its company’s needs and targeted towards industry-wide problem areas. FOQA provides a good tool to accomplish this.
- Mandate a formal debriefing immediately after a flight.

Error Management

How can CRM and MRM (Maintenance Resource Management) Work Together to Improve Communication and Control the Precursors to Human Error? – This area was discussed by 14 attendees. They made the following conclusions:

- Ideally, both pilots and maintenance personnel would be trained together using a curriculum that would emphasize cross-communication, trust, risk management, unique threats, and teamwork.
- Build scenarios using video taping. Model a cockpit debrief on logbook issues. Protocol behavior when the flight crew is going through their preflight checks.
- Invite contract maintenance personnel from firms that are outsourced to CRM/MRM programs, or deliver the programs at their location.

Owning Your Errors: Personal Professional Development

– Corporations must develop a philosophy that includes a self-monitoring of errors, provide organizational support to the individual, if needed, and develop a culture that encourages activity debriefs both personal and crew. This group felt that error assessment and error correction is the next evolution of CRM.

Is CRM Working?

How do we Prove CRM Works? – While the group recognizes it is difficult to prove that it is working (how can you document accidents that did *not* happen), it felt that there is a need for new measuring techniques. In addition, Operational Resource Management (ORM) which represents the philosophy of the organization must be conducive to CRM to encourage it to flourish. The group proposed these four steps to allow CRM to work:

- Require mission debriefs at the conclusion of a flight.
- Mandate formal CRM training for *all* pilots at *all* levels.
- Develop measuring devices based around individual mission-types and not the hours-experience of the pilot.
- Provide pilot training with actual CRM mishaps in their organization.

How do we measure CRM training success in a way that encourages improvement while measuring their performance? – We are currently measuring success by a lack of failure. This negative concept has established a paradigm that needs to be broken. Also, current methods of measuring success are predominantly subjective tools such as Advanced Qualification Programs (AQP), check rides, and grade sheets. The items that are measured are typically attitude and behavioral outcomes. Tools need to be developed using more quantitative measures, (such as FOQA) to validate and support the qualitative evaluations. Many of these tools do exist in the European CAA CAP 737 document. Next year’s CRM Symposium will center on this document, as it has a great deal of valuable CRM information.

Airplane/Automation

Airplane Design for CRM – The current level of technically advanced aircraft now coming on to the market need to allow the pilot to choose the level of automation he/she desires. In addition, the Flight Management Computer must be more “user-friendly”, and be simple and quick to reprogram when ATC clearance changes need to be made during critical phases of flight. Effective training methods of the vertical navigation modes need to be developed, and successful methods shared across the industry. Automation indications, especially functions and commands, need to be made very clear and visible to the pilots.

Coordination of Split-Cockpit During Emergencies – This is an area that has caused accidents in the past. The Captain needs to have proper protocols in place to designate workload during abnormal and emergency procedures. To accomplish this, this group makes the following recommendations:

- Standard operating procedures should encourage the First Officer as the pilot flying during emergencies.
- The Captain should handle communications with the flight attendants and dispatch.
- Flight attendants should be trained to ask six key questions during emergencies, including:
 - ❖ What is the nature of the problem?
 - ❖ Where are we landing?
 - ❖ How much time do I have?
 - ❖ Will we be performing an emergency evacuation?
 - ❖ Will you be making a passenger announcement?
 - ❖ Any other items we need to know?
- Captains and first officers should be trained in a standardized situational briefing that they can give each other when both pilots return their attention to flying.
- There should be a common industry-wide problem solving model for dealing with flight anomalies.

Single Pilot Resource Management (SRM)

Using CRM Principles to Develop SRM – This is a complex issue due to the vast diversity of aircraft being flown single-pilot, from the low-powered single-engine airplane to a complex fighter aircraft and the new very light jet (VLJ). This group discussed the issues at length, and came up with the following recommendations:

- Train in mental attitude, diligence and risk assessment.
- Provide incentives for CRM training, such as insurance discounts and/or safety accreditations.
- Have manufacturers address the addition of

advanced technology to assist the pilot in the operation of the equipment.

- Define, teach, and emphasize non-technical skills.
- Improve risk awareness training to include identification of mental attitudes that may compromise safety.

Perceived Captain Command Erosion

Is There a Problem with Command Erosion? If so, how and why does this Occur, and What Can be Done to Correct the Problem? – The group felt that there has, in fact, been an erosion of command authority of the Captain. Some of the factors leading to this are:

- Leadership is not assigned; it is earned
- Values must be determined in one's self, and then compared to the company's values to see if they match.
- A horizontal organizational gradient can also lead to command erosion. A vertical authority structure is important with a flight crew, as well as organizational-wide.

To solve these issues, limits of authority should be made clear to all individuals making decisions concerning a flight, both on the ground and in the air. The Captain's authority must be made clear to all individuals. CRM works well on all levels. While weak leadership pulls down all crew interactions, strong leadership will raise the performance of all individuals.

Summary

Overall, the attendees thought the Symposium was a very good meeting to share others' ideas about where we are, and where we are going. Many unanswered questions were asked, and food for thought was imprinted on nearly all attendees. We plan on having another conference next year. Please consider all the issues discussed above, and plan on attending the Vectors 2008 Symposium so you can be the architect of CRM for the 21st century. →

Ted Beneigh is a professor of aeronautical science at Embry-Riddle Aeronautical University. Ted has held several positions at ERAU during his 30 year employment there. He has worked the line as a flight instructor, was the director of flight standards, and became actively involved in the academic side 10 years ago. He has been very active in CRM, developing the first CRM course at ERAU in a twin Cessna, which has evolved into the capstone flight course in the CRJ at ERAU. He has also attended several airline CRM training programs. His doctoral dissertation was done in conjunction with Korean Air on the effectiveness of CRM training in culturally-mixed flight crews.

