

The Development Process of a CRM Course with Computer Based Training Approach

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SUMMARY

This paper describes the development of a Crew Resource Management (CRM) program for a small airline, which did not have human factors experts among its staff, nor the capacity to run seminar sessions with many participants, as the traditional programs call for.

The solution adopted in order to meet the needs of the airline, was a flexible training program with equal weight on a Computer Based Training package and a seminar session designed to work also with few participants.

INTRODUCTION

"Traditional" CRM courses are typically aimed at awareness creation in the pilot population and at the introduction of CRM topics in a company where the majority of the flight crew staff have no previous experience of CRM. Further, they are often developed in large airlines with resources and available staff with strong backgrounds in Human Factors (or willingness to acquire it) to form the base of the development and training team (Byrnes and Black, 1993). This has led to the widespread industry consensus that a CRM course should be highly interactive between participants and between participants and facilitators, with the usual vehicle for the training being seminars centered on the pilots' active participation, group work and the facilitators' ability to guide the participants through the syllabus mainly based on input from the participants.

Such an approach requires a positively participating pilot group of a certain size (normally from 12 upwards of participants to a seminar) and human factors-experienced facilitators with strong abilities to lead an interactive seminar. The facilitators should be taken from the rank of pilots to obtain the feeling of interacting with peers in the participants. Finally, an ample base of training material must be available in the company, in the form of video material, descriptions of CRM-related accidents and incidents and maybe simple tests to quantify certain personality traits in each participant. Altogether, these requirements amount to serious obstacles to a successful introduction of a CRM program within a smaller operator's existing training program.

It should be noted that the simple description above covers only the conduction of seminars, while a comprehensive CRM program also covers many other adjacent areas, such as cultural and management issues. For further a discussion of the problems relating to the creation of a CRM program, see, for instance, (Byrnes and Black, op. cit.) or (Taggart, 1994).

After many years of CRM training in the pioneering airlines, we are now beginning to witness the end of this era. Some airlines have reached the saturation point for their internal CRM programs, meaning that all pilots on staff have been through the training, and only a few newly hired pilots need to go through the training. It is therefore becoming increasingly difficult for the training departments to put valid groups together for a training session, and we can say that the traditional CRM training scheme has come to the end of its life cycle.

Small airline companies which, on the other hand, often still need to get large parts of the staff through the program, are not necessarily interested in simply inheriting the CRM programs from their larger counterparts,

as they often lack the culture or the resources to enter a CRM training program designed along those lines. As a further obstacle, the requirement of 12 to 16 participants to a group may prove prohibitive from an organizational point of view.

Last, recent requirements for the inclusion of CRM in recurrent training, lead to a need for CRM training material and other supporting elements that can easily be integrated into other training.

As a consequence, smaller operators who now are forced to adhere to the regulations, as well as larger operators whose CRM programs have reached maturity, are looking for new ways to approach CRM training. This paper describes the development of a CRM program for Lauda Air Italy, a program suited to the specific needs of the company, which is a small airline, operating mainly long-haul flights in the charter market.

THE DEVELOPMENT PROCESS

The development process followed for the CRM course consists of the following steps:

1. Definition of training methodology
2. Content definition
3. Creation or acquisition of audio and video material
4. Implementation of the CBT
5. Employment of the CBT program
6. Feedback from participants

These steps are described in detail below. It should be noted that, as in any development process, the steps are not necessarily carried out in a strict linear order, but may overlap in time, and even a certain element of iteration must be allowed to refine the product right from the beginning.

Step 1. Definition of training methodology

In order to design a CRM training program suited specifically to the emerging needs discussed in the introduction section, some clear design goals had to be defined. After some initial discussion, the following four design goals were decided:

- a. The course must comply with the new JAR OPS requirements for CRM training.
- b. It must be manageable by a facilitator who is not a human factors expert.
- c. It must be compatible with the company's rostering constraints.
- d. Elements of course should be usable also in recurrent training.

To address these needs, it was decided to base the course on a structure consisting of a CBT program for one day of self-study, a booklet and a one-day seminar for a small group of participants. Each participant can choose freely when to study the CBT package, preferably a few days before the seminar. Further, it was decided that the content of both the CBT and the seminar should be well-structured and grouped into easily identifiable modules.

This construction helps achieving the goals outlined previously in the following way:

1. The use of a CBT for the introductory part, supported by a booklet, gives the course an important phase of awareness-building through a self-paced and video-intensive presentation of CRM problems. The awareness-building is further supported by open questions accompanying certain situations on the flight deck illustrated by video clips, allowing the participant to create and express a personal opinion on the subject.
2. The booklet, which supports the CBT, serves three purposes. First, it provides a short introduction to the CRM course as a whole and to the CBT in particular - including brief technical instructions. Second, it provides a framework for the interaction with the participant, by leaving space for the answers to the questions asked in the CBT. This method has been chosen over keyboard input to the computer in order to ensure anonymity and because it was believed that most participants express themselves more freely with a simple pen rather than through typed text. Third, the booklet provides a useful support for the participants memory when participating to the seminar.
3. The seminar is largely based on group discussions and interaction with the facilitator on subjects and examples presented in the CBT, thus amplifying the awareness-building process from the individual to the group, and through the exchange of opinions and ideas initiating the process of creating a corporate CRM culture with the necessary shared basic understanding of the problem.
4. By organizing the content into well-defined and largely self-contained modules and by providing the basic material as examples in the CBT, the course can be held successfully by facilitators with only a limited previous experience in human factors training.
5. The approach of modularizing the content further supports the objective that the course material be usable also for recurrent training; Each year, a certain CRM aspect, such as "Communication", can be reinforced by including the relevant course material in the scheduled recurrent training.
6. The fact that the CBT (the first day of the course) can be largely freely scheduled reduces dramatically the rostering problems of a small operator, thus eliminating a possibly big obstacle to real management support.

While it was decided to re-think the CRM training methodology without being too restricted by traditional views on how to deliver CRM training, one imperative from existing CRM programs was kept as a leading star: For the awareness-building process to be successful, the participant must go through the mental process of realizing the relevance of the various CRM topics, rather than learning a new subject. The use of the booklet described above is a result of this philosophy, as well as a decision taken not to include any traditional CBT scoring mechanisms, such as multiple choice questions or tests that must be passed.

Step 2. Content definition

Further to the requirement that the course content should conform to the JAR OPS, and to increase the feeling of relevance, an integrated use of accident reconstruction videos was decided. In order to achieve the highest possible level of attention from the participants right from the initial part of the CBT, it was decided to begin the CBT with a series of accidents, well known to the CRM community, where many of the topics addressed by the course are introduced by example. Apart from the attention gained immediately from thought provoking accidents, the relevance of the whole course is also underlined in the first half hour, providing a fertile ground for the rest of the course. Relevant excerpts of the accident reconstruction clips are used throughout the rest of course to further illustrate the connection between a CRM topic and real life accidents. As examples of accidents included, the Guantanamo Bay, 1993, (NTSB, 1994) and Potomac Bridge, 1982, (NTSB, 1982) accidents can be mentioned.

Following the accident, the main body of the content is highly structured, with plain examples and discussions within 4 main areas, becoming modules of the course:

1. Judgment and Decision Making,
2. Communication,
3. Leadership and Personality
4. Perception, Fatigue and Workload

Each of the modules above are divided into sections with specific content, such as "Error chain", "Briefing", "Leadership styles", etc. As the target airline operates only glass cockpit aircraft, it was decided to treat automation, which often is treated in a specific module, detached from the rest of course, as an integral part of the course, and the main focus was put on the Situation Awareness aspects of automation. Hence, the headline "Automation" is found in the module "Judgment and Decision Making".

For each subject, the content was defined by means of storyboards containing illustrations, text, audio, video and animation to carry the message. Particular attention was given to a small video series with cockpit scenes showing a flight crew doing familiar tasks in positive and negative CRM atmospheres to show how the different CRM topics can influence normal working situations. These videos are used both in the CBT as a basis for the open questions mentioned above and (in part) in the seminar to support group discussions. As examples of topics illustrated by video can be mentioned the Inquiry, Advocacy, Conflict Resolution and Critique loop, each of the four topics illustrated with positive and negative situations from the cockpit.

Step 3. Creation or Acquisition of video and audio material

Videos have been introduced as an intensive presentation of CRM problems. Videos are especially developed for introducing human factors and, in particular, the CRM main topics. In the introduction to the CBT, videos on accident reconstruction are proposed to the pilots to create awareness on the link between human factors and accidents. The flight crew is the most frequent cause of accidents where human error is involved.

Each video has two versions: 1) a "negative" one where negative behaviors of the flight crew are underlined and usually these behaviors are perceived as an absence of cooperation between the pilots; 2) a "positive" one where the flight crew behaves as a team where an atmosphere of cooperation is the winning card for managing problems in the best way. Both "negative" and "positive" videos are presented in order to support the comprehension of the differences between one flight crew behavior with respect to the other and to help the pilot to build in the cockpit a positive and relaxed atmosphere. In terms of standardization and development of a shared safety culture in the airline company, suggestions on how to manage a particular situation could be very useful. This is illustrated by the "positive video".

After each video a number of open questions are presented to the pilot. He/she answers these questions in the booklet. The questions will be commented and confronted later during the seminar session. The questions are useful to express a personal opinion and to create an awareness of the problem illustrated by the video.

Accident reconstructions were created based on official accident reports, from which the dialogue was created from the CVR transcripts and maps and drawings etc. were created from those available in the report. An example of such a screen is seen in figure 1, which shows a screen from the reconstruction of the Guantanamo Bay accident. The sound track reproduces the dialogue in the cockpit.

These accident reconstruction sequences have proven to be very popular with the participants and an effective means to get the message across.



Figure 1. A screen from the reconstruction of the Guantanamo Bay accident

Step 4. Implementation of the CBT

As mentioned earlier, the CBT described here is simpler in structure to many traditional CBTs for technical training, as it does not include questions that require precise answers and consequently there is no score for the participant. This design was chosen to ensure that the main goal of the whole program (awareness-building) was not confused by questions and answers that would quite likely be over-simplifying if squeezed into normal CBT schemes such as multiple-choice tests.

Another main concern for the implementation was to give maximum support to the objective of free scheduling for participants signed up for the course. Free scheduling means that pilots, who may even be "synchronized" to exotic time zones (Lauda Air Italy was an exclusively long-haul operator at the time of launch of the program), can sign up for the CBT at any moment of the day, seven days a week, and hence also when no-one is available to solve technical problems or problems related to the use of the package.

Altogether, it was decided to opt for a simple, linear design, with only a few buttons to advance or go backwards and a few content maps for a quick overview of the content. Navigation is free in the material already studied, while the participant must complete a section before he or she can continue in the course.

The software required to implement a CBT with this structure is quite simple, and the whole package was implemented in Macromedia Director™ (Macromedia, 1996-1999), which is well suited for generic multimedia work.

Step 5. Employment of the CBT program

The main concern regarding the employment of the program in the company was the training of the facilitators. For this purpose, a small training program was created, consisting of:

- a. A familiarization phase to get acquainted with CRM terms, topics, objectives and philosophy in general.
- b. Specific training on how to conduct the seminar.
- c. Tutoring for the first seminar sessions.

For the familiarization phase, the facilitators studied the available literature, indicated by the course developers. The familiarization began shortly after the development of the program was initiated.

The training for the seminar was based on the material developed for the seminar, which consisted of slides and videos together with comprehensive notes to the facilitators for each part of the seminar and for each slide and video, in order to help him or her in the conduction of the seminar. Frequent meetings were held with the facilitators in order to clarify doubts and elaborate the material.

Finally, the first few seminar sessions were held by the facilitators in the presence of a human factors expert acting as a tutor to assist the facilitator if problems should arise. At the end of each seminar, a de-briefing session was held with the facilitator to improve his or her conduction of the seminar.

Step 6. Feedback from participants

An important aspect for CBT developers is the characteristics of the users. Pilots are generally a population that is familiar with PCs and their use. However, it was decided to distribute a questionnaire on the CBT to evaluate certain aspects (contents, accidents presented, understanding) and functionality (ease of use, navigation with "map" or "main menu").

The questionnaire consists of open questions where the users are asked to comment on the CBT. A "qualitative" analysis is applied to the answers in order to obtain a general point of view on the CBT by all the pilots of the airline. Another reason to apply a qualitative approach was the small number of pilots in the company when the CRM development program was initiated. This number is now rapidly growing, and a more quantitative approach could be applied.

Another questionnaire on the seminar was created in order to know if the seminar is useful for supporting the CRM contents and if the aims of the seminar to exchange experiences between Captains and First Officers have been fulfilled. This questionnaire is similar to the one on the CBT, and is likewise made up of open questions.

Generally speaking, the comments obtained are positive, except a negative one on the difficulty of reaching an equal number of Captains and First Officers as participants to the seminar. The confrontation between Captains and First Officers by group discussions is one of the main aims of the seminar.

By now, 38% of the pilots have participated to both the CBT and the seminar and filled in the questionnaires.

From the qualitative analysis of the answers to the questionnaire on the CBT, the most significant positive comments can be identified as the following:

- Very meaningful
- Accidents and fatigue are very interesting
- The accidents are useful to clarify the CRM concepts
- Interesting, well presented and very useful analysis

The negative comments to the CBT were mainly as follows:

- Useful and interesting but should be more detailed
- Talk more about visual illusion
- Never used "map" function
- Too much fuss about leadership theory, psychology.

It should be noticed that these results are still preliminary. However, we can conclude from the comments of the participants that they have carefully followed the CBT and that they nearly all express an interest in the contents of the CRM and in the quality of the CBT.

CONCLUSION

The development of a CBT on CRM matters that traditionally have been taught by seminar sessions, proved to be somewhat of a challenge.

The new evolution in the CRM field, where CRM programs are implemented in all airlines, including those without human factors experts among the pilot staff, together with the difficulty in larger airlines with well-established CRM programs to put together valid groups of participants to their seminars calls for new approaches to CRM training.

This paper has described the development of a CRM program largely based on a Computer Based Training package intended to fulfill these emerging needs in the CRM field. The approach described produces a CRM program with the well-established objective of building awareness of CRM subjects in the airline's pilot community; while providing more flexibility in the scheduling of training and depending less on the facilitators' human factors expertise and ability to conduct highly interactive seminars on the subject.

Further, CRM is now a required element of recurrent training, and each module of the CBT package has been conceived also for use in a stand-alone set-up, for this purpose. The package is thus oriented towards a broad use within an airline.

A simple, qualitative analysis of the feedback from the participants show that CRM can be at least partly delivered through CBT with satisfactory results.

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