Integrating Safety and Crew Resource Management (CRM) Aspects in the Recurrent Training of Cabin Crew Members

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Abstract. Recurrent training of cabin crew should include theoretical and practical instruction on safety as well as crew resource management (CRM) issues. The endeavors of Swiss International Air Lines Ltd. and Swiss Aviation Training Ltd. to integrate CRM and safety aspects into a single training module were evaluated. The objective of the integration was to make CRM more tangible and ease acquisition of competencies and transfer of CRM training content to practice by showing its relevance in relation to safety tasks. It was of interest whether the integrated design would be mirrored in a more favorable perception by the trainees as measured with a questionnaire. Participants reacted more positively to the integrated training than to stand-alone CRM training, although the integrated training was judged as being slightly more difficult and less oriented toward instructional design principles. In a range of forced-choice questions, the majority of participants opted for an integrated training format because it was seen as livelier and more interesting and also more practically relevant. For the forthcoming training cycle, a better alignment of training with instructional principles and an even higher degree of training integration by using simulator scenarios are striven for.

Keywords: flight attendants, training evaluation, training design, instructional design principles, evaluation questionnaire, crew resource management training

Safety training and crew resource management (CRM) training are both mandatory parts of the recurrent training of cabin crew members in Europe, as required by the regulations of the European Union (2008), the EU-OPS (former JAR-OPS). Safety training covers actions and drills in normal and emergency procedures and the respective regulations – for example, the safety duties of each cabin crew member and evacuation procedures (Subpart O; European Union, 2008). CRM has been defined as "the use of all available resources – information, equipment, and people – to achieve safe and efficient flight operations" (Lauber, 1984, p. 20). CRM training can be considered as a family of instructional strategies designed to improve individual and team performance by applying well-tested training tools and methods (exercises, simulators, feedback, etc.; Salas, Prince, et al., 1999) to strengthen the knowledge, skills, and attitudes involved in behavioral categories such as situational awareness or assertiveness.

Recurrent training of cabin crew members should include theoretical and practical instruction on safety as well as CRM issues, together with individual practice. The design or duration of recurrent training for cabin crew members is not further specified in the EU-OPS (Subpart O), but is rather left to the discretion of the operator and the national regulator, who has to approve the training program. While for flight crews, it is required to integrate elements of CRM into all parts of recurrent training, including simulator training (Subpart N; European Union, 2008), no such regulation exists for the CRM training of cabin crews. It can be provided as a self-contained stand-alone module, but can also be an integral part of safety training. As technical and nontechnical skills cannot be separated, but are both vital and overlapping areas to achieve safe and efficient operations (Civil Aviation Authority, 2006), scholars such as Maurino (1996), who speaks of the "battle for integration" (p. 101), strongly advocate the integration of CRM and technical training. An integrated approach, producing a more realistic and applied training setting, is also justified from the perspective of the situated cognition movement in instructional design (Wilson & Madsen Myers, 2000), which states that all learning is situated and takes place in a larger context of social interactions and constructed meanings. Past situations and the learning and meaning linked to them serve to interpret and deal with

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immediate situations (Wilson & Madsen Myers, 2000). Training safety procedures and CRM in separated training modules may construct different contexts and situations for both and foster their perception as separate entities. This may promote the perception of CRM knowledge and skills as a mere set of facts and procedures that can be recalled if asked for, but which is not spontaneously used in relevant situations (inert knowledge; see, e.g., The Cognition and Technology Group at Vanderbilt, 1990), instead of the view of CRM as an applicable set of skills valuable in flight operations. Any training design targeted at strengthening CRM competencies of cabin crew should seek to take this into account and interweave safety and CRM aspects in training. This article describes the endeavors of Swiss Aviation Training Ltd. (SAT), the training subsidiary of Swiss International Air Lines Ltd. (Swiss), to put this postulation into practice.

SAT has provided recurrent CRM training for all cabin crew members (currently around 3,500) of Swiss since it became mandatory in 2004. The year 2004 was a transition year, in which safety trainers were instructed to include CRM aspects into their procedure training, but without any further implementation guidelines. From 2005 to 2009, CRM was designed as a stand-alone module within the 2-day recurrent ground course (RGC), which also includes safety and medical training and the license-relevant tests. For the purposes of this report, stand-alone CRM modules are defined as being self-contained and as not making any specific reference to the topics discussed in the safety modules of the RGC.

For 2010, with the start of a new recurrent training cycle, SAT and Swiss decided to realign the stand-alone CRM training more closely to a "near-the-job" setting by interweaving it with safety training and creating an integrated training setting. We define integrated training as being problem-based in the sense that instruction is designed according to incidents, situations, or phenomena that are authentic and relevant to the learners (Merrill, 2002; Reinmann-Rothmeier & Mandl, 1997), and in the sense that these incidents or phenomena are discussed and practiced from a safety as well as from a CRM perspective. The objective was to devise a training setting that eases transfer of CRM training content to the job by showing the relevance, importance, and applicability of CRM directly in relation to a range of challenging safety tasks, and to make CRM a more tangible method to manage all aspects of flight operations. This paper describes the design and realization of the integrated training and the results of a questionnaire-based comparative evaluation of the integrated and the stand-alone format.

Organizational Context

For the cabin crew recurrent training 2010, Dangerous Goods as well as Ditching were set as the safety-related required items. Furthermore, Swiss safety reports and incident analyses evidenced an increase in safety-relevant occurrences involving unruly passengers. This gave us a reason to include Unruly Passengers as a further training item. It was then decided to integrate CRM principles into the Ditching and Unruly Passengers sequences due to the rather technical nature of the Dangerous Goods training requirements. For the first two topics, the overlap between technical and non-technical skills was deemed to be more pronounced than for Dangerous Goods. Due to the ample list of more technical safety aspects that needed to be covered, the integrated CRM-safety sequences had to be tightly timed (total time 3.5 hr). In previous years, the same amount of time was entirely devoted to CRM.

Aim of the Study

When planning the new integrated format, SAT decided to evaluate the new training setup more closely and accepted the initiative of the Research Institute for Organizational Psychology (OPSY) at the University of St. Gallen to perform the evaluation. The aim was twofold: First, participants' subjective reactions to this changed training format, compared with the reactions to the former training format, should be assessed. Even though this cannot be considered a full-scale evaluation of training effectiveness, and some authors (see Salas, Wilson, Burke, & Wightman, 2006; Shuffler, Salas, & Xavier, 2010) point out the limitations of participants' reaction data in the evaluation of CRM, it is nevertheless heuristically meaningful and economically reasonable to analyze the affective responses of trainees toward a training program (Shuffler et al., 2010) before continuing with the new format and launching a more extensive evaluation. When participants deem the training useless or not attractive, they are less likely to apply the learned competencies (Goldstein & Ford, 2002; Shuffler et al., 2010).

Second, it was of interest whether the primarily problem-based and situated instructional design would be mirrored in the trainees' subjective perception of the instructional design or whether further modifications had to be made. Furthermore, possible negative effects of the ambitious training schedule of the integrated training were explored. Integration per se might increase complexity of training, and hence cognitive load (Paas, Renkl, & Sweller, 2003), as interacting information has to be processed. Additionally, time slots to implement important instructional elements such as activation of participants' experiences, practice, or reflective discussions (Merrill, 2002) were shorter in the integrated training. It was assumed that these points might be reflected in trainees' perceptions of the instructional design.

Method

Evaluation Questionnaire

Evaluation dimensions included the reactions of the trainees to the new format, and their appraisal of the new instructional design. The integrated training was compared with the former stand-alone format, and format preferences were surveyed. To this end, a questionnaire was developed consisting of two parts. The first part included items that had already been successfully tested in a prior study assessing SAT's and Swiss's complete portfolio of CRM training (Ritzmann,

Table 1. Overview of the Evaluation Questionnaire Scales

Scale	Description	Sample item	Cronbach's α
Reaction: reported enjoyment	Satisfaction with/enjoyment of the training	I enjoyed the training.	.81
Reaction: perceived usefulness	Usefulness of the training for the job	I feel this training was useful for my job.	.90
Reaction: perceived difficulty	Difficulty of the training (pace, use of technical language, etc.)	The pace of learning was too fast (reverse-coded).	.66
Instructional design: problem-based learning	Are learners engaged in real-world problems or cases?	I was able to work on real-world problems and in this way deepen the discussed topics.	.74
Instructional design: activation	Is existing knowledge activated?	My own previous experience with the topics was taken into account.	.76
Instructional design: demonstration	Is new knowledge demonstrated to the learner?	Topics were illustrated with specific examples.	.75
Instructional design: application	Can the learner apply the new knowledge?	I was able to practice what I had learned.	.81
Instructional design: integration	Can the learner integrate new knowledge into his/her world?	I realized how I, personally, can apply the material to my job.	.74

Kluge, & Hagemann, 2009). Forty items grouped into eight scales (see Table 1) were included, with an answer format ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Three scales measured reactions to training, covering the first level of Kirkpatrick's (1998) taxonomy of training evaluation: *reactions.* The remaining levels *learning and attitudes, behavior,* and *organizational impact* were not covered. In addition, five scales measured the subjective perception of a set of instructional design principles, which were identified by Merrill (2002) as being common to most theories of training design: *Problem-based learning, activation, demonstration, application,* and *integration*.

The second part of the questionnaire was used only in the integrated training setting and contained eight plus one forced-choice questions, one for each of the eight scales described in Table 1 plus a general question. Trainees had to decide whether the scales were better represented in a stand-alone or in an integrated training framework. An example for *instructional design – demonstration* (translated from German) is "objectives and examples seem clearer when CRM topics are trained in a stand-alone module" versus "objectives and examples seem clearer when CRM topics and safety aspects are integrated in training." Furthermore, one additional forced-choice question polled the preference for either format over the other (stand-alone module vs. integrated format) for 2011, and participants were asked to provide a reason for their choice in their own words.

Compared Training Formats

Stand-Alone Training

The main topic was intervention in situations where safety or teamwork is at stake. The training focused on three aspects: When to intervene, how to intervene, and personal barriers impeding interventions. The intervention model FACE[1] (Find out – Alert – Challenge – Emergency) was discussed and trained in the manner with which Swiss flight crews are familiar. The actual training time was 3 hr and 40 min. Of this, 40 min were devoted to practicing FACE with examples provided by the participants. The training took place in a classroom and was conducted by a single CRM trainer. Class size ranged from 12 to 18. All participants were cabin crew members.

Integrated Training

The integrated training (2010) consisted of the Unruly Passenger sequence and the Ditching scenario and took 3 hr and 25 min in total. One CRM and one safety trainer facilitated the training in team teaching. Class size ranged from 20 to 25 and also included 20–30% pilots, although this CRM training was not license-related for the pilots.

The Unruly Passenger sequence took place in a classroom and began with input on the safety-relevant aspects of the topic (passenger disturbance report, restraint devices, legal questions, etc.). This was followed by input highlighting the CRM aspects and focusing on de-escalation and prevention strategies to avert unruly behavior. A role-play situation and videotaped examples were used. The training time was 2 hr and 10 min, with 15 min devoted to practicing de-escalating communication strategies.

The Ditching sequence took place in the cabin mock-up and started with an evacuation in which the crew gave differing orders regarding life jackets. The results (some participants wore life jackets, some did not) and the reasons for these results were debriefed with regard to safety and

[1] FACE is the Swiss/SAT adaptation of the more commonly used model PACE (Besco, 1995; *P* stands for Probing).

CRM aspects. Following this, the group was split in half. One subgroup watched short video sequences of the Hudson River ditching and discussed alternatives and techniques to remain (pro-) active and carry out one's duties (giving correct orders, operation of slide/raft, etc.) even in the face of unexpected, highly critical situations. Meanwhile, the other subgroup discussed all safety procedures associated with the use of the slide/raft (e.g., relocation of slide pack). After 35 min, the subgroups swapped discussion topics. The total training time for the Ditching sequence was 1 hr and 15 min.

The main difference between the two training formats was that the stand-alone training was self-contained and unrelated to the topics discussed in safety training, thus fostering the situational framing of CRM as a separate "add-on." This attitude toward CRM as being less relevant might be reinforced by the fact that regulations advise against the assessment of CRM skills during cabin crew recurrent training (European Union, 2008); trainees might get the impression that what is not tested is not essential, although CRM is license-relevant. The integrated training, on the other hand, did not introduce new topics, but was problem-based and highlighted the trained issues from a safety as well as from a CRM perspective. In so doing, instruction and problem-based methods were combined. Situativity and instruction are not seen as mutually exclusive, but as necessary, complementary elements in training (Reinmann-Rothmeier & Mandl, 1997).

Evaluation Procedure

For both training formats, trainers were asked to distribute questionnaires in three of four courses per week. Data collection of the stand-alone training took place in October and November 2009, resulting in 190 valid questionnaires.

Data collection of the integrated training began in April 2010 and continued until mid-July, resulting in 196 questionnaires from cabin crew members and 84 questionnaires from pilots. To be able to compare the results from the stand-alone and the integrated training, questionnaires from pilots were not included in the following analyses.

In 2010, due to time constraints, participants had to fill out questionnaires overnight and return them the next day. This led to a lower weekly return rate and thus a longer data collection period. Furthermore, a within-group design with the same participants appraising the two training formats could not be realized due to organizational constraints. However, similar between-group cohort designs had been used in other CRM evaluation studies (Salas, Fowlkes, Stout, Milanovich, & Prince, 1999). Such a design is acceptable if it is assumed that there are only minor differences between cohorts and if it is possible to compare the background characteristics of cohorts (Cook & Campbell, 1979). Analyses showed that there was a significant difference in age, $t(341.001) = -6.006$, $p < .001$, between the two cohorts 2009 ($M = 32.9$, $SD = 11.8$) and 2010 ($M = 39.8$, $SD = 9.8$), as well as a significant difference in work experience, $t(333) = -3.842$, $p < .001$, between the cohorts 2009 ($M = 10.4$, $SD = 9.7$) and 2010 ($M = 14.5$, $SD = 9.8$). Analysis of covariance was conducted, but did not show any significant influence of age and work experience; therefore, results without covariates are reported.

Results

Concerning the first part of the questionnaire, the statistical values of the two training formats are given in Table 2.

Both training formats scored high on the reaction scales, with values above 4, and were rated as enjoyable, useful, and easy to follow (a high value on perceived difficulty signifies that the training was *low* in difficulty). The integrated training was rated as being even more enjoyable and useful than the stand-alone training. On the other hand, the integrated training was rated as slightly more difficult to follow.

The five scales measuring subjective perception of the instructional design revealed that the integrated training was rated as being less oriented toward real-world problems compared with the stand-alone training, even though it used a problem-based instructional approach and highlighted topics from both the safety and the CRM perspective. Furthermore, participants felt that their previous knowledge was less activated, content was less well demonstrated, and there were fewer opportunities to integrate the new knowledge into existing expertise. No statistically significant difference was found with regard to application of what had been learned, but both training formats received an equally low rating. This means that in both training formats, there were not enough opportunities to practice.

Table 2. Descriptive statistics and results of statistical analysis for the stand-alone and integrated training

Scale	Stand-alone training *M* (*SD*)	Integrated training *M* (*SD*)	*F*	*p* value
Reaction: reported enjoyment	4.14 (.68)	4.26 (.55)	4.080	< .05
Reaction: perceived usefulness	4.01 (.78)	4.23 (.69)	9.512	< .001
Reaction: perceived difficulty	4.55 (.48)	4.33 (.50)	20.744	< .001
Instructional design: problem-based learning	4.17 (.46)	3.96 (.58)	15.557	< .001
Instructional design: activation	4.04 (.54)	3.74 (.66)	22.691	< .001
Instructional design: demonstration	4.50 (.42)	4.37 (.44)	9.775	< .01
Instructional design: application	3.31 (.71)	3.32 (.82)	0.014	ns
Instructional design: integration	4.07 (.51)	3.82 (.60)	19.826	< .001

Note. Statistical analysis performed was MANOVA. The results for the single ANOVAs are reported. Degrees of freedom were 1,384 for all scales; ns = not significant.

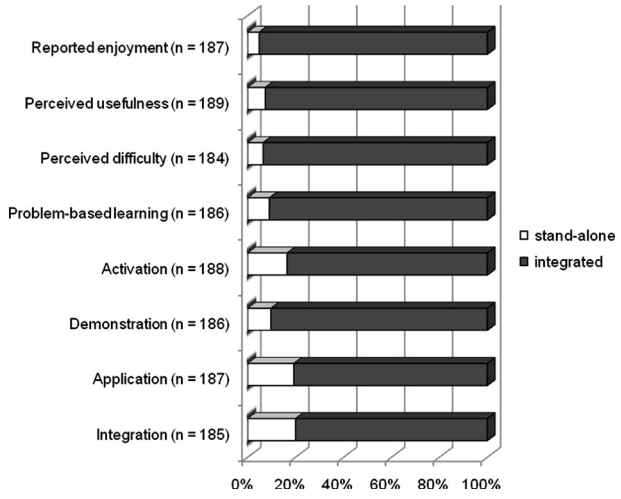

Figure 1. Distribution of answers to the forced-choice questions in percentages (number of total answers in brackets).

Contrary to the results reported above, analysis of the forced-choice questions showed a picture clearly in favor of the integrated format, as can be seen in Figure 1. The integrated training was unequivocally favored on all forced-choice scales. Regarding the training preference, the vast majority of participants opted for an integrated format in 2011 (see Figure 2).

Participants were asked to provide a reason for their choice, which 99 participants (51%) did, and these open answers were categorized. Ninety participants provided a total of 108 reasons they were in favor of the integrated format. The two main reasons were that participants judged the training to be livelier and more interesting (48.1%) and to have a higher practical relevance (35.2%). The third reason, provided by a smaller number of participants, was comprehensibility (5.6%). Of the trainees, 2.8% preferred the integrated format, but underlined the need for more training time (which is not actually a reason, but rather a condition). The remaining reasons (8.3%) could not be grouped into categories. A minority of nine trainees provided a reason they favored the stand-alone CRM format. Five participants stated that there was too much information in too little time in the integrated training, and four indicated that CRM was more concise and comprehensible when discussed separately.

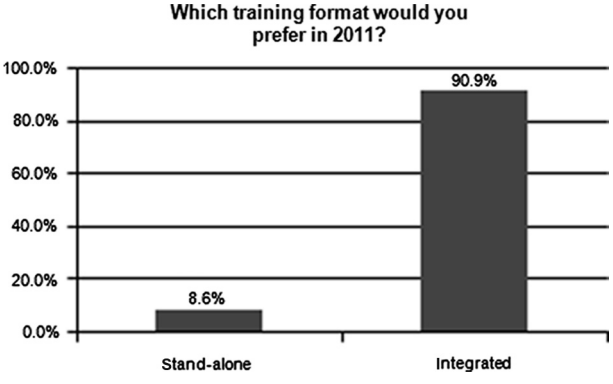

Figure 2. Distribution of answers to the question polling training preferences for 2011 (total number of answers = 185).

Summing up, the integrated training elicited more positive reactions and was preferred by the vast majority of participants due to its liveliness and practical relevance, although it was slightly more difficult and received less positive ratings on the instructional design dimensions than did the stand-alone training. Furthermore, a minority of open answers to the forced-choice question showed that some participants felt that there was not enough training time in the integrated format.

Discussion

The evaluation of the new integrated training format and its comparison with the former stand-alone training had two aims: to compare participants' affective reactions to both training formats and to assess their subjective perception of the instructional design.

The integrated training was rated as being more enjoyable and useful than the stand-alone training. It seems that the problem-based design of the integrated training, connecting CRM and safety aspects and thus reflecting the actual job setting, resulted in a more positive affective reaction, as participants enjoy training programs more when they think they are related to their job (Goldstein & Ford, 2002). Results from the analysis of reasons for the integrated format being preferred point in the same direction: The main reason given was that training was livelier and more interesting. The integrated design also led to a higher perceived usefulness, which was shown to be related to learning and transfer measures in past research (Alliger, Tannenbaum, Bennett, Traver, & Shotland, 1997). This is reflected in the analysis of reasons for the integrated format being preferred, as more than one third of answers outlined the higher practical relevance of the training.

On the other hand, the integrated training received a higher difficulty rating. We assume that the cognitive load was higher (Paas et al., 2003) because participants had to take in more, interactive information per training topic. The open answers of participants preferring the stand-alone training take the same line, stating that the time schedule was too tight in 2010 and the stand-alone format was more concise and comprehensible.

Regarding participants' subjective perception of the instructional design, results were less clear. The integrated training was rated as being less problem-based than the stand-alone training, participants felt that their previous knowledge was less activated, content was less well demonstrated, and there were fewer opportunities to integrate the new knowledge into existing expertise. These results may all have to do with the shorter training time of the integrated format. Fewer opportunities are available to implement important elements of successful training, such as highlighting the CRM perspective, discussion of personal

experiences, or demonstration of essential CRM aspects with examples (Merrill, 2002). One of the participants in favor of the stand-alone format explicitly stated that stand-alone CRM would leave more time for discussion to delve further into topics. A different picture resulted from the forced-choice questions. Here, the majority of participants judged the instructional principles as being better implemented in the integrated training format. It might be possible that these results were biased by the time lag between the two training courses, but open answers show that participants reflected on their choice and saw the overall potential of the integrated approach.

No statistically significant difference was found with regard to the application of what had been learned, but both training formats received an equally low rating. This means that in both training formats, there were not enough opportunities to practice. This was known to the training designers from the beginning, but SAT decided to nevertheless make a first step toward a more integrated format of line-oriented training and realistic simulation of cabin tasks to learn more about the instructional design requirements and organizational as well as infrastructure constraints (e.g., trainer resources, mock-up availability, etc.) requiring further attention so as to optimize the format.

Regarding the limitations of this study, it has to be mentioned that the two training formats not only differed in training design, but also in other variables. The integrated training was taught in larger classes and with team teaching, dealt with different training content, and included pilots as participants. These influences could not be analyzed in isolation. Moreover, CRM and safety procedure aspects might be confounded in the evaluation of the integrated training because of their inherent (and aspired) overlap. However, despite these limitations, the results show that the integrated CRM/safety training approach not only has high face validity, as evidenced in the open answers of the participants, but also showed promising effects from a training perspective: Participants reacted positively to the training and preferred it on all assessed forced-choice dimensions. The results therefore support the approach followed by Swiss and SAT to integrate into training those aspects which can also not be separated in daily operations. Nevertheless, further improvements toward a closer alignment with the instructional principles are still necessary to attenuate the possible negative effects of training integration.

Perspectives

Building on the experiences and the evaluation of the training cycles 2009/2010, the recurrent CRM training and safety scenarios have been merged to an even greater degree for 2011. Over half a day, three line-oriented cabin and flight scenarios are trained in the cabin simulator, inciting the trainees to show evidence of good CRM while performing the necessary safety procedures. Trainees are engaged to not merely reflect on the relevance of well-applied CRM intellectually, but also to observe, practice, and reflect on its effects situated in a challenging setting, thus further fostering the acquisition of competencies instead of inert knowledge (The Cognition and Technology Group at Vanderbilt, 1990). All scenarios are extensively debriefed in terms of safety and CRM aspects. This refined setting will enable problem- and case-based learning through the simulation of real-world scenarios. It will activate participants' knowledge by having them react to the situation based on their prior expertise. In addition, important aspects will be shown in hands-on demonstrations and can subsequently be practiced "near-the-job." This takes into account the fact that opportunities to practice were rated as being scarce in both evaluated training formats. Finally, integration of knowledge will be fostered by debriefings of scenarios. Of course, these assumptions can only be verified in further evaluation efforts. Having said this, the value of scientific cooperation in applied research such as in the presented project cannot be overestimated. The aviation industry has always been a fertile ground for human factors research and should continue to seek scientific support to promote safety and efficiency in daily operations.

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