INSTRUCTOR DEBRIEF TRAINING IN SPOT

Lynne Martin
National Research Council/NASA Ames Research Center
Moffett Field, California

Judith Orasanu
NASA Ames Research Center

Eric Villeda
San Jose State University/NASA Ames Research Center

One way to enhance the effectiveness of Special Purpose Operational Training[1] (SPOT) debriefing sessions may be for instructors to make explicit connections between the Crew Resource Management (CRM) concepts a carrier advocates and the behaviors displayed by the crew in question. A tool listing key behaviors from the scenario was devised, accompanied by an instructors' training session in which links were made between the behaviors and the underlying CRM processes they reflect. The aim of the tool is to assist instructors to focus the debriefing on the key SPOT/ CRM issues, in this case on planning. A second tool suggested ways to facilitate the discussion.

Fourteen instructors at a major U.S. carrier took part in the training session and used the toolkit in their subsequent debriefs. Pre- and post- training debriefing samples from each instructor were compared to assess whether there were any changes in instructors' approaches to discussions in terms of the topics they covered and how they raised the points.

CRM DEBRIEFING

CRM has prompted a 'growth spurt' in flight training over the last 20 years. Like most new concepts, developers and airlines have progressed through cycles of testing and reworking to refine their CRM training into an effective package whose effectiveness will be borne out through an increase in safe behaviors in flight. Helmreich (1996) suggests that CRM has now entered its fourth phase of development. In practical terms, this means that most U.S. airlines have an initial awareness/training package in place in their fleets. Also, their crews have attended a number of recurrent

[1] SPOT is one of three types of Line Operational Simulation (LOS) defined by the FAA (1990). SPOT, like LOFT (Line Oriented Flight Training), focuses on crew training.

training sessions. Hence, all the key CRM skills identified by the airline have been 'refreshed' (Flin & Martin, 1998). Airlines are now looking for evidence that their training is transferring to line operations. While awareness of CRM is high, some would argue (Komich, 1997) that these skills are not transferring to the line. A theme of this fourth phase of development has become to increase the effectiveness of CRM recurrent training, that is, to encourage this transfer of skills.

Debriefing of crew performance in Line Oriented Flight Training (LOFT) has been identified as a key opportunity for promoting the transfer of CRM skill (Helmreich & Foushee, 1993). Through their active participation and discussion of CRM concepts in the simulator scenario they just flew, crews learn how they themselves perform CRM and how they might enhance their techniques. The content of recurrent training is predominantly in operationalizing concepts rather than learning new ones (Smith, 1994). However, Dismukes, Jobe and McDonnell (1997) found that crew participation, and hence the transfer of training, may not be as 'simple' as exposing crews to CRM concepts and a variety of relevant practice sessions. Dismukes et al. identified the process of debriefing rather than the session content as a central problem at U.S. carriers. Instructors and crews may be unsure how to discuss CRM concepts embedded in scenario events in a way that helps the crew to operationalize and apply them to their own behavior.

The difficulties found with CRM debriefing suggest that both instructors and crews may benefit from tools that explicitly make the connection between CRM concepts and behaviors in a recurrent training program. Each event in the scenario involves a multitude of behaviors. Some of these will serve purely technical

purposes while others will have a straightforward connection to CRM. The high workload of the recurrent may make it difficult for all those involved to sift out the most appropriate behavioral examples for discussion (Tourville, 1997). Therefore a list of key behaviors may assist debriefing participants in their discussion of CRM.

Another route to achieve operationalization of CRM concepts is to draw on the strengths of adult learning. Adults engage in participative learning; they like to 'do', or try out, what they are learning (Cornwell, 1979). LOFT capitalizes on this by focusing on a simulated flight (Smith, 1994). This participation should extend into the debriefing session, ideally with the crew discussing their flight and the instructor acting as a facilitator (Lauber & Foushee, 1981). Dismukes et al. (1997) found that instructors and crews were not confident or clear about what was involved in facilitation. To this end, McDonnell, Jobe and Dismukes (1997) produced guidelines for facilitation that pragmatically address some of the issues arising from their research. Once again, instructors may benefit from specific examples of facilitation strategies they can use for the scenario they are debriefing. Also, by hearing how the instructor facilitates, crews may develop a clearer understanding of the issues they should raise when they are self-debriefing (Butler, 1993).

From the review by McDonnell et al. (1997), it appears that CRM is an area where crews and instructors not only have to deal with concepts that are still relatively new to them and which they are trying to operationalize, but they are also debriefing the CRM training events using unfamiliar methods. Thus the SPOT debrief is a double learning event for crews.

Below we describe preliminary findings from a study exploring methods and tools for increasing the operationalization of CRM concepts in LOFT training. The analysis reported here focused on the degree to which a suite of tools designed to meet the needs identified above had an impact on CRM SPOT debriefings for one fleet of a major U.S. carrier.

METHOD

A SPOT toolkit was developed during the initial phase of this study (see Villeda, Martin & Orasanu, in press, for details). Two of the tools in the kit were designed to support LOFT instructors: an observation-debriefing guide which noted event items with CRM significance, and a strategies list which provided questions and tips

to encourage a facilitated style of discussion. A third tool was directed toward the pilots: a self-debrief form containing the same items as the observation/debriefing guide developed for the instructors. The toolkit and how it could be used to support debriefings was presented to instructors in a group training session. A pre-post within-subjects design was used. Baseline SPOT debriefings were observed before the toolkit was introduced, essentially providing a control condition. The study condition consisted of SPOT debriefings after the toolkit was introduced for the instructors' use.

The study population included instructors and crews from one fleet at the participating airline. A random sample of 92 recurrent debriefings was collected, involving 33 instructors and 184 pilots. Fifty-one were baseline or control sessions and 41 were post-training or study sessions. For the purpose of a preliminary analysis, a sub-sample of 14 instructors was selected. One baseline and one post-training debriefing session from each of the selected instructors served as the data source for this initial analysis (28 sessions). Hand-held tape recorders were used to obtain audiotape recordings of the SPOT debriefs.

The study tapped into current SPOT training practices at the participating airline. Thus, the recurrent training package was not changed for participants in the study. Recurrent training at the participating airline consists of a three-day program. A ground-school session on the first day includes review of the CRM concepts to be practiced in the SPOT. The SPOT flight and debriefing occur on the second day, the focus of our study. They are separated by a two-hour maneuvers validation session. The third day involves proficiency check rides (Line Operational Evaluation).

RESULTS

The 28 audiotapes were partially transcribed and, for this preliminary analysis, coded according to the content, or topics, of discussion and who raised them.

Overall Content of Debriefs

Three hundred and twenty nine topics were raised during the debriefings under study ($X=11.75$ per debrief). These topics cluster into 73 themes. On average 1.7 more topics were discussed in the study condition than during the baseline debriefs ($X_{baseline}=10.9$, $X_{toolkit}=12.6$, see Table 1). The distribution of the discussion in terms of content was also different between the two conditions. In the baseline condition, participants spent 36.1% of their

discussion talking about technical issues; after the training session this proportion reduced to 30.5%. As a balance, the proportion of CRM talk increased after the training session from 55.3% to 62.7%. Although these differences are not significant, due perhaps to the small preliminary sample size, they are in the desired direction. CRM discussion increased to replace the decrease in technical discussion. Particularly interesting are the results from the planning subcategory, as this was the focus of the SPOT being observed. Table 1 illustrates that half of the increase in CRM discussion is accounted for by an increase in planning talk.

Mention of Specific Observation Tool Items

References to the behaviors identified on the observation tool were collected from the partial transcripts. Comparisons were made between the baseline and post-training conditions. On average, 5.9 behaviors from the observation tool were discussed in the baseline debriefs; 8.7 behaviors were raised in the toolkit condition on average, an increase of nearly 3 behaviors per debrief (see Figure 1 for the number of items discussed in each of the 28 debriefs). In particular, the proactive and reactive planning behaviors were compared (planning was the training focus this year). Mentions of proactive planning items increased from an average of 1.7 in the baseline to 3.2 in the toolkit condition. Mentions of reactive planning items increased from an average of 0.8 in the baseline to 1.9 in the toolkit condition. Thus, for both types of planning items, the discussions approximately doubled after the toolkit was introduced).

Topic Initiation

Additional analyses revealed who was talking during the debriefings (see Table 2). Of 152 topics raised across the 14 baseline debriefings, 147 were initiated by the instructor and 5 by the participating crew. In the toolkit condition, the instructor initiated 160 of the 177 topics, with 17 initiated by the participating crew. This constitutes a three-fold increase in the discussions initiated by the crews after introduction of the toolkit. These frequencies were compared through a Chi-Square test, which gave an X^2 value significant at the p<.025 level (X^2=5.227, df=1). Another post-training increase was the number of discussions in which the instructor prompted the crew to talk about an event within the scenario that they thought was significant on a CRM-related parameter (e.g. difficult or stressful). The number of discussions in which the crew selected

the topic increased from two in the baseline condition to 13 in the post-training condition.

TOOL ENHANCEMENT OF DEBRIEFINGS

Each of the analyses reported above directly addresses one of the needs identified earlier in this paper. One aim was to increase the amount of CRM talk in SPOT debriefings, so participants would be making explicit CRM-behavior connections.

Structuring the content of the 28 debriefs showed that the number of topics discussed increased only slightly, but that the content of the discussions had shifted. The proportion of topics devoted to CRM increased on average. Planning, the focus of these SPOT sessions, accounted for half of this increase. Technical talk showed a corresponding reduction in the proportion of the debrief it occupied.

These results suggest that the toolkit helped instructors to focus their debriefings on the CRM aspects of the SPOT, thereby discussing the impact of the crews' CRM behaviors (e.g., planning, workload, communication, etc.) on the events. The training benefit of this increase in CRM-talk is that more of the behaviors crews performed in the simulator will be actively linked to CRM concepts. More instances of crews' real-world experiences will be coupled with terms and ideas of resource management as examples of how they practice CRM.

It is not possible to specify which items in the toolkit were most influential in shifting the focus and structure of the debriefing discussions. It is possible that the training session reminded the instructors of the purpose of the training; that the observation tool prompted instructors to talk more about behaviors with specific CRM content; or that instructors used more effective strategies for eliciting crew participation. It is also possible that the observation tool acted as a memory aid for the instructors, reminding them of behaviors they saw during the SPOT that had noteworthy CRM content. Most likely, these influences worked in combination.

One of the methods which may have promoted the increased CRM discussion was the use of the observation tool by the instructors. Mention of the behavioral items, each of which was selected for the tool because of its important CRM content, increased by an average of 2.8 items per debrief. The 11 planning items accounted for the majority of this increase (81%). The introduction of the toolkit

therefore led to a greater amount of planning discussion during the debriefs. In particular, this planning discussion reinforced the link between planning concepts and planning actions through mention of the key behaviors from the observation tool.

For example, reactive planning, necessary when unexpected events occur, received little discussion time in the baseline debriefs. In nearly half (6), there was no mention of reactive planning in any form. The modal number of reactive planning items increased to two post-training. Only two of the post-training debriefings contained no mention of any of the reactive planning items from the observation tool. It is possible that instructors found reactive planning a particularly hard concept to address and that the observation tool provided a way for them to raise reactive planning behaviors.

Another aim of the toolkit was to encourage greater crew participation. Through conducting mini self-debriefs with instructor guidance, crews can learn how to debrief an entire facilitated session. One of the measures of greater participation is the number of discussion topics that are initiated by the crew. The crews in the baseline condition (Table 2) initiated around 3% of the topics raised, while crews in the post-training condition initiated three times as many conversations (just under 10% of the topics). This increase approximates the proportions found when topics that the instructor prompted with an open-ended question are included (e.g., "Tell me about an event you found difficult"). In these latter cases, the crew chose both the event and the focus of the discussion (e.g., why they found it difficult). Increases in the number of crew-selected topics reflect the instructors' use of facilitation skills to encourage the crew to debrief themselves. These kinds of prompts are included in the debrief strategy tool that was part of the toolkit. Therefore, these instances reflect instructor use of the toolkit as well as indicate an increase in crew participation.

The greater initiation of topics by crews in the study condition may also reflect the influence of the crew self-debrief tool. The self-debrief tool may have helped crews follow the instructor's line of questioning and may have helped them recall the events from the SPOT. Dismukes et al. (in press) note that crew members in their interviews mentioned difficulty remembering a SPOT scenario which has occurred a number of hours earlier and is followed by other simulator training exercises. The carrier participating in the present study runs all the recurrent simulator training at one time and debriefs all the sessions afterwards, so the crews we observed may have experienced similar memory problems.

CONCLUSIONS

These preliminary findings suggest the toolkit improved SPOT debriefings on a number of levels, providing assistance to both the crews and to the instructors. They suggest that the toolkit helped instructors to refocus the topics they raised onto behaviors with a CRM content and in particular to provide reminders about key planning behaviors. These connections may help crews to operationalize the CRM concepts. The toolkit may also have had an effect by providing the instructors with some simple strategies (forms of questioning) they could use to prompt crews to begin to take the lead in debriefing themselves. By using these strategies the instructors were also beginning to train the crews in self-debriefing methods.

The findings suggest that the toolkit also provided a memory aid for the crew, reminding them of issues that they wanted to raise and increasing the learning value of the SPOT. Having remembered their actions in an event, a discussion of relevant CRM issues provides crews with a closure of the learning cycle. Crews, by discussing their actions, are engaging in participative learning. Their discussion links the theoretical concepts covered in ground-school to actions that they performed, providing the crew with examples of the way *they* communicate or manage their workload.

Confirmation of these findings awaits a complete analysis of the full data set, which is currently underway. This analysis will provide more detail on how the debriefing tools influence the structure and content of SPOT debriefs.

The results regarding the content, the initiators of debrief topics, and the references to key behaviors support the aims of the toolkit. These were to increase the amount of CRM talk during the debrief sessions, particularly about planning, and to increase the amount of crew participation in the session. All the aspects of the debriefs we studied increased after the toolkit was introduced to the instructors at the participating airline. The training benefit of these changes to the debriefings may be to increase the degree to which crews reflect on their own actions in CRM terms and to prepare them for self-debriefing. The ultimate goal is for self-reflection and analysis to carry over to the line.

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