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Decision making in the cockpit.

The interactive dynamics of hierarchy, division of labor, and gender
in a technical complex work setting

Abridged report of results

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Preliminary note

This abstract summarizes the results of a research project on the processes and mechanisms of decision making communication in the cockpit which was funded by the Akademie für Flug- und Reisemedizin (Frankfurt/M.) in 2004 and 2005.

The analytical findings are based on a conversation analytical study on decision-making communication in the cockpit and will be presented here as succinctly as possible in the form of brief statements. For reasons of data protection, the empirical material on which our analyses are based cannot be published.

Further information about this research project can be found on the internet under the following URL: <http://www.uni-bielefeld.de/soz/personen/bergmann/cockpit/index.htm>.

Summary

1. In practice as well as in research, the decision making process is often treated as a purely logical and / or mental operation. Thereby, however, the social and communicative dimensions of this process are ignored. Since these dimensions are included in every decision making process in the cockpit, they become safety-relevant within the aviation context.
2. The process of decision making in the cockpit is crucial for aviation safety, especially in situations when the crew is facing technical problems. Our analyses focused on the communicative dynamics of decision making, with particular attention being paid to the examination of gender-specific differences.
 - 2.1 Processes of decision making can only be observed and analyzed in their actual genesis if decisions are conceived as socially accomplished processes of conciliation which are brought about through communication. The research question as to whether and in what ways decision making in the cockpit is influenced by social factors such as hierarchy, division of labor and gender, and thus by the social roles as captain and copilot, pilot flying and pilot not flying, woman and man respectively, can only be answered by means of a careful analysis of real decision making communication.
 - 2.2 When working with qualitative research methods, the validity of the results is not demonstrated by numerical-statistic indications but exclusively by means of following and verifying the analysts' interpretation on the basis of the presented empirical data material. Therefore, testing the plausibility and validity of the results presented here requires reading the full final report.
 - 2.3 The value of conducting this kind of detailed analysis of naturally occurring interactions consists in discovering the inherent structure and dynamics of professional work practice. This practice can be understood as a kind of sedimented professional experience that materializes even in the most inconspicuous elements of the participants' actions and which, although being taken into account by them, can hardly be observed or reflected upon by the participants during the accomplishment of their actions. Therefore, interviews cannot be considered an adequate method of inquiry in this context. As a methodical precondition the analytical focus on the logics of well-established and routinized professional practices and competence systems requires that the researchers abstain from normative conceptions about „good“ and „bad“ crews. A data basis of all in all over 100 hours of video recordings of flight simulator trainings is sufficient in volume and variation to permit generalizable conclusions.

- 3 The decision making communication, which aims at resolving a problem, typically does not start immediately after the occurrence of this problem. Before entering the actual decision making communication the crew is concerned with two other activity complexes.
 - 3.1 On the one hand, the occurrence of a technical trouble that disrupts the projected course of the flight has to be communicatively transformed from a merely individual perception into an event that is commonly perceived by both crew members, thereby marking this event as a relevant matter that demands the crew's attention and becomes the object of decisions and actions. Different communicative means are employed to mark the existing irritation as a trouble which is then ratified by the other colleague. The combination of trouble marking and ratification is a precondition for the subsequent decision making communication.
 - 3.2 On the other hand, before engaging in the actual decision making communication the crew first has to deal with the acute and possibly dangerous circumstances brought about by the technical problem. With the activity „interim stabilization“ the crew reaches a shared understanding of the situation and synchronizes the division of labor in view of the tasks that have to be accomplished.
 - 3.3 The interim stabilization is characterized by activities of resuming and reassuring and does not only work on the technical but also on the social and affective level. As preparation and part of the decision making sequence the interim stabilization is indispensable and it can be initiated and demanded by each crew member.
4. Decision making processes in the cockpit feature two different decision styles, the deliberative and the argumentative style of decision making.
 - 4.1 Decision making communication has to be initiated, and the form of this decision initiation already determines which decision style the crew will employ.
 - 4.2 The deliberative decision style is characterized by a team-oriented, egalitarian consulting phase, in the course of which the crew members gradually move from jointly dismissed options towards the option they finally choose. The outcome of this “options consulting” remains open for a long time, and when the decision is finally taken, it is always secured through a double ratification; only then the participants consider the decision process as being closed.
 - 4.3 The argumentative decision style is inherently more adversative; however, the crew members generally do not produce their arguments against one another but cooperatively argue for or against an option. Preferences are clearly expressed and are accounted for during the decision finding process, alternative options are dismissed via arguments. At the end of argumentative decision sequences the

crew members make sure that their respective views and perspectives correspond with one another. The argumentative decision finding is then concluded by ratifying the execution of the decision.

- 4.4 Decision making processes can display a mix between the deliberative and the argumentative decision style, and divergences between the crew members – in style as well as in content – can lead to a prolongation of the decision finding process.
 - 4.4.1 As a general rule CM1 determines which style is used for the decision making communication. However, in the course of the decision finding process both crew members can introduce elements of the two clearly distinguishable decision making styles, which then leads to the (temporary) adoption of the respective style. Thus the decision styles introduced by the crew members mutually affect each other.
 - 4.4.2 Cockpit communication is characterized by hierarchy-orientation and a preference for consensus. Therefore, objections are rare and only occur in argumentative decision making communication. They constitute a dispreferred activity and have little chances of success.
- 4.5 Contrary to literature reports about differences between male and female communication styles, we could not detect gender specific preferences with respect to the choice of decision making styles in our data material.
- 5 In the decision making communication in the cockpit, the crew members can orient towards categories of (1.) status and hierarchy (CM1 / CM2), (2.) role and labor division (pilot flying / pilot not flying) and (3.) gender. From an analytical point of view, the communicative meaning and impact of these categories can only be asserted if one can show that the participants themselves construct these categories in communication and make them locally recognizable. Since this is often accomplished in a very subtle way, showing the relevance of a category also can only be done indirectly, by excluding alternative possibilities of interpretation. In this context, this especially holds true for the gender category.
 - 5.1 In decision making communication, the crew members' orientation towards categories as points of reference can be empirically observed with respect to leadership activities, for example. In order to act as a team leader, the crew members use above all the resources of labor division, conversational leadership, and experience. In general, there is some variation in the captains' use of leadership practices, which shows, for example, in varying degrees of steepness of the hierarchy axis. Again, differences between male and female team leaders cannot be observed.
 - 5.2 The relative importance of the different roles, i.e. categories as points of reference, which the crew members use, does not remain constant over time; rather, these categories interact with one another, thus creating a dynamics of categorical references with varying relevance. The combination of these

categorical positions (as CM1 / CM2, pilot flying / pilot not flying, veteran or novice) leads to complex forms of interaction.

- 5.2.1 In the role of the pilot flying, first officers – regardless whether they are male or female – participate in structuring the decision making process on an equal footing with the captain under certain circumstances, while at the same time acknowledging the higher hierarchical status of the captain. In this case, the coordination of participation resources can be achieved without phenomena of competition.
- 5.2.2 Not every crew succeeds in smoothly coordinating the different roles and the associated concerns and preferences as to the way of proceeding. The disturbances have to be dealt with on a metacommunicative level.
- 5.2.3 Instances of competition are rare and can usually only be observed among crew members of the same status. When they occur, both crew members take part in the efforts limiting the scope of competition by restoring and acknowledging the local hierarchy as CM1 and CM2.
- 5.2.4 Repeated instances of communicative disturbances such as disregarding hierarchy, competing for leadership, and insisting can only be observed in one particular constellation, with a female captain as CM1 and a male first officer as CM2. Through excluding other possible explanations it can be concluded that male copilots – and only them – sometimes compete with female captains and find it difficult to unreservedly acknowledge their superior status.
- 5.3 Explicit references to gender rarely occur among the crew members. However, the recurrent phenomenon of competence references is conspicuous in this respect. Our data analyses show that competence references produce embarrassment in mixed gender crews, in contrast to all-male crews.
 - 5.3.1 Not associating gender (women) and doubts about competence requires a degree of reservation and, generally speaking, a particular form of self-disciplining from all crew members. They have to elide gender-specific differences, and this communicative neutralizing of gender as a social category is an ongoing achievement which absorbs attention. The crew members have to do “topic dissembling” work which entails continuous communicative costs, for example by creating face-threatening situations that require the initiation of particular correction measures.
 - 5.3.2 With regard to male crew members, competence references are accounted for by subject-related reasons, whereas with regard to female crew members competences are implicitly or explicitly associated with the category of gender.
 - 5.3.3 Although women and men are indistinguishable with respect to their communicative behavior, they do not always treat each other as equal. Based on professional standards alone, the recognition of women’s flight competence goes without saying. However, as far as the actual situation in the cockpit is

concerned, their recognition still cannot be taken for granted. The decision making communication in the cockpit is burdened with this contradiction and the resulting paradoxes.

- 6 The results of this research project are valuable in terms of professional self-education since they provide practitioners with the opportunity to learn something about themselves and their ways of communicating in the cockpit, and they can be used in many ways for training and coaching.