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**REFLECTIVE JUDGMENT AND ASSERTIVE
BEHAVIOR IN CREW RESOURCE MANAGEMENT:
A THEORETICAL APPROACH**

Jeffrey A. Johnson

The recurring theme of pilot error in aircraft accidents provides no startling revelation to aviation professionals and researchers. In an effort to reduce pilot error, which is a major contributor to aircraft accidents, the Federal Aviation Administration (FAA) has mandated that all U.S. airlines incorporate an approved Crew Resource Management (CRM) program into their training curriculums. In a recent rash of accidents involving U.S. airlines, a disturbing question has re-emerged: How can CRM training be maximized effectively? The intent of this article is to examine the concept of reflective judgment and the effects of assertive behavior from a theoretical application to CRM at an early stage of development (the collegiate aviation level), with implications to airline initial and recurrency training.

INTRODUCTION

Flight officers piloting modern-day aircraft often have a difficult time interacting with one another. This problem manifests itself from the first hour a student logs as a pilot in a multi-crew environment and continues through the professional level. The flight environment is inherently foreign, occasionally hostile, and nonconductive to effective communication. Although the physical environment cannot be altered to alleviate its unpleasantness, effective social interaction by flight crews can be enhanced.

The Alverno College faculty has defined *effective social interaction* as "interpersonal ability in one-to-one situations, and ability in task-oriented situations" (1992, p. 34). Effective social interaction is the primary focus of CRM programs from the collegiate aviation level to the professional level. The importance of effective social interaction needs to be much more ingrained during the initial development of the student's flight skills at the collegiate aviation level.

THE REFLECTIVE JUDGMENT MODEL AND CRM

To enhance effective social interaction in CRM curriculums, the Reflective Judgment Model is presented as a viable alternative. The Reflective Judgment Model was developed by Patricia King and Karen Kitchener; it "describes a sequence of changes in thinking that affects the ways students justify their beliefs and make

judgments" (Kitchener & King, as cited in King, 1992, p. 4). The model posits a sequence of stages that define a set of assumptions that individuals hold about the nature of truth and how one defends one's beliefs concerning ill-structured problems or, in other words, epistemic cognition development (King & Kitchener, 1994).

The Reflective Judgment Model has been used not only in the social sciences and humanities, but in the sciences as well. In Finster's (1992) work, the Reflective Judgment Model was integrated into the study of chemistry. An aviation application can be derived from the research developed from the social sciences and the humanities as well as from the other physical sciences. Table 1 illustrates the seven stages in King's and Kitchener's Reflective Judgment Model.

King and Kitchener (1994) stated that "reflective thinking requires the continual evaluation of beliefs, assumptions, and hypotheses against existing data and against other plausible interpretations of the data" (p. 7). Can reflective thinking be assimilated into pilot judgment? According to Jensen and Benel (1977), pilot judgment and decision-making are qualities that can be taught and evaluated. Such a paradigm was evident in a recent study conducted by Smith (1994) on the performance of 80 private pilots at Embry-Riddle Aeronautical University. Using PC-based simulators, a role-playing scenario was developed in which the subjects

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Table 1

Pre-Reflective Thinking (Stages 1, 2, and 3)

Stage 1

View of Knowledge: Knowledge is assumed to exist absolutely and concretely; it is not understood as an abstraction. It can be obtained with certainty by direct observation.

Concept of Justification: Beliefs need no justification since there is assumed to be an absolute correspondence between what is believed to be true and what is true. Alternate beliefs are not perceived.

"I know what I have seen."

Stage 2

View of Knowledge: Knowledge is assumed to be absolutely certain or certain but not immediately available. Knowledge can be obtained directly through the senses (as in direct observation) or via authority figures.

Concept of Justification: Beliefs are unexamined and unjustified or justified by their correspondence with the beliefs of an authority figure (such as a teacher or parent). Most issues are assumed to have a right answer, so there is little or no conflict in making decisions about disputed issues.

"If it is on the news, it has to be true."

Stage 3

View of Knowledge: Knowledge is assumed to be absolutely certain or temporarily uncertain. In areas of temporary uncertainty, only personal beliefs can be known until absolute knowledge is obtained. In areas of absolute certainty, knowledge is obtained from authorities.

Concept of Justification: In areas in which certain answers exist, beliefs are justified by reference to authorities' views. In areas in which answers do not exist, beliefs are defended as personal opinion since the link between evidence and beliefs is unclear.

"When there is evidence that people can give to convince everybody one way or another, then it will be knowledge; until then, it's just a guess."

Quasi-Reflective Thinking (Stages 4 and 5)

Stage 4

View of Knowledge: Knowledge is uncertain and knowledge claims are idiosyncratic to the individual since situational variables (such as incorrect reporting of data, data lost over time, or disparities in access to information) dictate that knowing always involves an element of ambiguity.

Concept of Justification: Beliefs are justified by giving reasons and using evidence, but the arguments and choice of evidence are idiosyncratic (for example, choosing evidence that fits an established belief).

"I'd be more inclined to believe if they had proof."

It's just like the pyramids: I don't think we'll ever know. Who are you going to ask? No one was there."

Stage 5

View of Knowledge: Knowledge is contextual and subjective since it is filtered through a person's perceptions and criteria for judgement. Only interpretations of evidence, events, or issues may be known.

Concept of Justification: Beliefs are justified within a particular context by means of the rules of inquiry for that context and by context-specific interpretations of evidence. Specific beliefs are assumed to be context specific or are balanced against other interpretations, which complicates (and sometimes delays) conclusions.

*"People think differently and so they attack the problem differently.
Other theories could be as true as my own, but based on different evidence."*

Table 1, continued

Reflective Thinking (Stages 6 and 7)

Stage 6

View of Knowledge: Knowledge is constructed into individual conclusions about ill-structured problems on the basis of information from a variety of sources. Interpretations that are based on evaluations of evidence across contexts and on the evaluated opinions of reputable others can be known.

Concept of Justification: Beliefs are justified by comparing evidence and opinion from different perspectives on an issue or across different contexts and by constructing solutions that are evaluated by criteria such as the weight of the evidence, the utility of the solution, or the pragmatic need for action.

*"It's very difficult in this life to be sure. There are degrees of sureness.
You come to a point at which you are sure enough for a personal stance on the issue."*

Stage 7

View of Knowledge: Knowledge is the outcome of a process of reasonable inquiry in which solutions to ill-structured problems are constructed. The adequacy of those solutions is evaluated in terms of what is most reasonable or probable according to the current evidence, and it is reevaluated when relevant new evidence, perspectives, or tools of inquiry become available.

Concept of Justification: Beliefs are justified probabilistically on the basis of a variety of interpretive considerations, such as the weight of the evidence, the explanatory value of the interpretations, the risk of erroneous conclusions, consequences of alternative judgements, and the interrelationships of these factors. Conclusions are defended as representing the most complete, plausible, or compelling understanding of an issue on the basis of the available evidence.

"One can judge an argument by how well thought-out the positions are, what kinds of reasoning and evidence are used to support it, and how consistent the way one argues on this topic is as compared with other topics."

Source: *Developing Reflective Judgment: Understanding and Promoting Intellectual Growth and Critical Thinking in Adolescents and Adults* by P.M. King and K.S. Kitchener, 1994, San Francisco: Jossey-Bass.

assumed a First Officer (FO) position on a "pre-scripted trip" with a Captain and Flight Engineer (FE) portrayed by researchers. The subjects were led to believe that the captain and the FE also were subjects with no previous knowledge of the event.

Before the simulations were conducted, half of the subjects were given assertiveness training. Assertiveness is an integral part of CRM and is defined by Northwest Airlines in the context of their CRM program titled *CRM: Change is Inevitable, Growth is Optional* (1991) as the assurance that your input is heard and understood rather than hinting or silently watching as perceived mistakes are about to be made. The "confederate captain" in Smith's (1994) study tested the FO's assertiveness by intentionally making mistakes in the "leader-dominant" climate and the "teamwork-

oriented" climate. In the leader-dominant role, the captain did not consider the FO or FE as an integral part of the decision-making process throughout the flight, thereby eliminating them from the communication loop. Smith (1994) discovered that the performance of the subjects with no assertiveness training was significantly less effective in a leader-dominant climate than subjects exposed to assertiveness training.

With respect to the Reflective Judgment Model, King and Kitchener (1994) discovered from their research that most matriculating college students hold Stage 2-3 assumptions while seniors hold Stage 3-4 assumptions. The subjects in Smith's experiment having no previous assertiveness training appeared to have exhibited rudimentary attributes from Stage 1 and 2 (Pre-Reflective Thinking). In Stage 1, "I know what I have seen"

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translates to "I know what I have seen as a student pilot," while Stage 2, "if it is on the news, it has to be true," translates to "if my flight instructor taught me that way, it has to be true and to question decisions from an authority figure is unacceptable," which offers no alternative to the preconception that the captain must not be reckoned with in any fashion.

Dewey's early exposition of reflective thinking (1933, 1938) revealed that true reflective thinking is initiated only after there is a recognition that a real problem exists. For example, a crew flying a corporate jet from an airport surrounded by mountainous terrain faces the following ill-structured problem: The weather is reported as 200 feet ceiling and 1 mile visibility, the temperature is 30 degrees and the dew point is 25 degrees, and the aircraft is at maximum gross take-off weight. The airplane was manufactured in 1967 and has no thrust reversers. The crew elects to use engine and airframe anti-ice for the departure. The FO makes a comment to the captain that the minimum final segment climb gradient of 1.2 percent (Falcon 20 Reference Handbook, 1988) can be easily maintained, but is concerned that the minimum prescribed climb gradient stated in the applicable approach plate to clear mountainous terrain (which represents a higher climb gradient in this case) can only be maintained with no added margin of safety. Now the inevitable question arises: If an engine failure occurs at V_1 (take-off decision speed) during the take-off run, will the airplane in reality be able to maintain the minimum final segment climb gradient for obstacle clearance?

The Pilot's Operating Handbook (POH) shows

that the flight can be accomplished safely, but the FO (in this scenario) exhibits attributes from Stage 6 (reflective thinking) in the Reflective Judgment Model by stating, "It is very difficult to be sure that a disaster could be averted if an engine failure occurred at V_1 and we continued the take-off. The information contained in the POH is accurate for an airplane newly manufactured and flown by a test pilot." As a result (with proper assertiveness training in a CRM curriculum), the FO assertively, confidently, and in a respectful manner disagrees with the captain's decision to depart under those conditions by positively identifying an ill-structured problem.

CONCLUSION

The Reflective Judgment Model combined with assertive behavior has been presented as a viable option for CRM curriculums. Educators and researchers need to place more emphasis on the importance of *determining how* flight officers determine their beliefs and arrive at the nature of truth in order to assist them in their attempt to solve ill-structured problems in a CRM environment. Unquestionably, new knowledge, better-defined concepts and effective curriculum models can markedly improve the safety performance (Bowen, 1994) in the aviation/aerospace industry. It is also essential that effective CRM training begins not at the major, regional, or commuter airlines, but at the collegiate aviation level. It is also imperative that a stronger relationship between collegiate aviation and industry be developed so that CRM can be ingrained early in a pilot's career. As educators, effective CRM training is not something we merely owe to our students, but to the flying public as well. □

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