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Dated : July, 2009

Dear All,

FLIGHT STANDARDS INFORMATION BULLETIN

1. Enclosed is a briefing note suggesting ways to improve the decision-making process.
2. This information is being provided in the continued effort of improving upon our skills to decision-making.

Happy Landing and Safe Flying.

Yours Sincerely,

(Handwritten signature)
21/07/09

(CAPT. NAVEED AHMED AZIZ)
Director Flight Standards

Encl: **As Stated**

See distribution list overleaf

INFORMATION BULLETIN

DECISION-MAKING



FLIGHT STANDARDS DIRECTORATE

GUIDE TO HUMAN FACTORS IN AVIATION TRAINING

Decision-Making Training

This note discusses ways to improve the decision-making process. Decision making is the cognitive process of selecting a course of action from among multiple alternatives. Decision making in an aeronautical environment involves any pertinent decision a pilot must make during the conduct of a flight. This can be called as Aeronautical Decision Making (ADM).

A systematic approach to the mental process used by aircraft pilots to consistently determine the best course of action in response to a given set of circumstances.

Human decision making is a complex process that is strongly dependent on the environment in which the decision must be made. We all make decisions every day. Although there is no sure way to train someone to make the best decision, there are methods that improve decision making by helping aviation professionals understand the processes underlying effective decision making.

Since aviation is a complex, safety-critical endeavor, decisions made while flying can have extra ordinary safety and economic consequences. Thus, adding training on how to make quality decisions is important for flight safety.

Improving the Decision-Making Process

Decision-making training can greatly improve decision-making skills. Good decision-making training helps a pilot to understand the fundamentals of sound decision making and how to properly use decision aids in a wide range of situations.

Decision-making training

Decision-making education and training should be based on the behavioral and cognitive differences between novices and experts as well as on the principles of group and team dynamics. Using this paradigm permits an analysis of why the decision making of experts is superior to that of novices and leads to a determination of how novices can quickly, surely and safely become experts.

The main differences between experts and novices include:

- The quantity and the quality of information obtained by experts is better than that collected by novices.
- Experts communicate more effectively and with more relevant sources than novices.
- Experts are able to categorize and organize information in a more efficient manner. They are better able to recognize typical and meaningful patterns in information and to react effectively to these patterns.
- Experts deal differently with situation assessment and the recognition of similar situations. Experts create categories that are more dependent on the context and circumstances that surrounded specific situations.

- Experts have a better understanding of the situation and are therefore less stressed.

From these differences, training programs can attempt to improve decision making by:

- Giving decision makers a large number of examples to choose from. Having a large choice of samples in memory (a large library of known situations) is an excellent way to support decisions in new situations.
- Defining the scope of new sample acquisitions in terms of relevance and validity to the decision maker's task. Instructors can use their experience to enrich new knowledge with operational data and any relevant unusual use conditions. They can guide the decision maker in how to seek and apply information as well as in how to determine information that is insignificant and should be ignored.
- Emphasizing the three essential elements for acquiring decision making skills in an aviation setting; dynamics of the operational situation, time pressure and risk. Decision makers need to be trained under conditions in which they must face these constraints. High-fidelity simulation and actual operations are the best environments in which to train for context-based comprehension and deciding on choices of action.

The accumulation of relevant experience is a core goal of decision-making training. It increases the decision-maker's library of samples and fosters the development of appropriate cognitive processes for using those samples under operational conditions. The acquisition of appropriate cognitive processes can be oriented in two different ways by training. These are:

- Generalized decision making that can be applied in any professional field and is transferable from one field to another. For example, a game simulator can be used to develop some aviation decision-making abilities.
- Specific decision-making training focuses on improving the decision-making process for particular situations. With this type of training, it is important for the decision maker to be trained for as many situations as possible.

Recent studies on decision-making training suggest that the specific training approach may be most efficient when the decision maker has had previous experience with similar situations. Attempting to cover the gamut of aviation decision-making contexts in a generalized manner is less efficient and may be less effective when decisions are time critical. Thus, it would appear as if it is important to emphasize context-based experiences in decision-making training.

Aviation knowledge acquired through training and experience is essential for proper crew decision making. **The crew is required to be knowledgeable concerning hundreds of rules, SOPs and techniques in order to make sound "rule-based decisions". Clear, concise SOPs are essential for good rule-based decision making.**

Decision making training and CRM training

Decision-making training is a natural adjunct to CRM training. CRM focuses on how a crew works together, and decision making in a team environment is a natural part of team building. Most CRM courses already touch on the principles of decision making but often address it in the context of error avoidance. By focusing on decision-making theory and principles, as discussed CRM training can provide flight crews with an improved theoretical grounding in the subject and broaden their understanding. In particular, it is important that aviation professionals understand that successful decision making does not always involve the choice of the optimum solution. Often, given extreme time pressures and uncertain conditions, success is making a choice that is sufficient to ensure safety and minimize, rather than eliminate, economic and public relations consequences.

The decision to divert a flight due to weather or other adverse flying conditions always involves economic consequences and upset passengers. Failing to divert, however, can be catastrophic. If a diversion is warranted and made, a crew has exercised proper decision making even though there may be some residual consequences because they selected the safe alternative.

Decision aids

Decision aids are intended to support the decision maker and avoid errors. They are particularly beneficial in time-critical and stressful situations. One useful decision aid is “the five Ps”.

Prior Planning Prevents Poor Performance

The five Ps emphasize that pre -planning and briefing combine to create a common understanding by the crew of planned actions, limits, required callouts, corrections or changes of plans.

Decision aids have generally been developed from ergonomics and human factors research. Operational experience has shown that the best ways to support human decisions in complex environments are not necessarily obvious. Several accidents involving modern aircraft illustrate that the intuitive solution can be problematic. Thus, the design of decision aids needs to be both research-based and “**user-centered**”. This will help ensure that the limitations of humans to process information in complex environments and the ways in which information is processed are taken into account in the design process.

It is possible to develop decision aids that are either advisory or prescriptive. Advisory or descriptive aids can enumerate alternatives along with their strengths and weaknesses. The decision maker can then compare his or her solution with the recommendations. Using these aids, however, necessitates the availability of sufficient decision- making time to weigh the proposed alternatives.

Prescriptive decision -making aids match a single decision to a particular situation. The ultimate prescriptive aid is an automated system response. Prescriptive aids are only viable if they have the complete confidence of the decision maker. This confidence is best established over time from actual experience.

Another way to support the decision maker is not to be prescriptive or propose alternative solutions but, rather, to supplement human capabilities to maintain high performance levels. This is best accomplished by enhancing perception and memory, which are both required for optimizing risk and managing time pressure. Some of these types of decision aids include:

- Context-sensitive information filters
- Context-sensitive risk estimates
- Decision countdown “clocks” to indicate the remaining time before a decision must be made
- Task schedulers based on task priority

Human factors training course

A comprehensive way to improve the decision-making process is through the use of a human factors training course that emphasizes the topic of decision making. By covering decision making within the broader context of other major human-factors issues, a good awareness of the strengths and the weaknesses of human decision making can be developed. This can help structure attitudes and, most importantly, behavior in operational situations.

Key Points

The following are key points with respect to **aviation-decision-making** training:

- ADM takes place in a complex environment and requires situational awareness, relevant skills and experience.
- Decision making must be considered in broad human factors and operational contexts.
- ADM in commercial aviation is a team process. Therefore, team dynamics can play a strong positive or negative role.
- Decision-making training is a natural adjunct to CRM.
- ADM can be improved through training, decision aids and a basic understanding of the strengths and weaknesses of human decision making.

***Happy Landings
&
Safe Flying***

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