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CREW RESOURCE MANAGEMENT TRAINING

1. PURPOSE

This Egyptian Advisory Circular (EAC) presents guidelines for developing, implementing, reinforcing, and assessing Crew Resource Management (CRM) training programs for cockpit crewmembers and other flight safety personnel. These programs are designed to become an integral part of training and operations.

Guidelines are for those operators subject to Part 121 of the Egyptian Civil Aviation Regulations (ECARs). All Part 121 operators are required by ECAR 121.402 to provide CRM training for their pilots, flight engineers, cabin crews and dispatchers.

This EAC provides guidance for the development and implementation of CRM training. CRM is specialized training that focus on situational awareness, communication skills, teamwork, task allocation, and decision-making.

2. DEFINITIONS

Human Factors: A multidisciplinary field that optimizes human performance and reduces human error by incorporating the methods and principles of behavioral and social sciences, engineering, and physiology. It studies people working together in concert with machines and defines variables that influence both individual and team/crew performance.

Crew Resource Management Training: The effective use and management of all resources available to the cockpit crew including equipment, technical/procedural skills, and the contributions of crewmembers and others. The objective of CRM training is straightforward: to use all available resources to ensure safe and efficient flight operations .CRM addresses the challenge of optimizing the human/machine interface and accompanying interpersonal activities. These activities include team building, information transfer, problem solving, decision-making, situational awareness, and effective use of automated systems.

CRM training is comprised of three components: initial indoctrination, recurrent practice/feedback, and continual reinforcement.

3. BACKGROUND

60-80 percent of all air carrier accidents and incidents are caused by human error. Research has demonstrated that these events share common characteristics. Many problems encountered by cockpit crews have very little to do with the technical aspects of operating in a multi-person cockpit or cabin. Instead, problems are associated with poor group decision-making, ineffective communication, inadequate leadership, and poor task or resource management.

Pilot training programs have historically focused on the technical aspects of flying and on an individual's performance. Crew management issues that are also fundamental to flight safety were largely ignored.

There is an overwhelming consensus in both industry and government that CRM training programs should place emphasis on the factors that influence crew coordination and the management of crew resources. The need for additional training in communication between cockpit crewmembers and cabin crew has been specifically identified.

Continuing analysis of CRM training indicates that after initial indoctrination, significant improvement in attitude occurs regarding crew coordination and cockpit/cabin crew management. This analysis also discovered that significant changes occurred in cockpit crew performance during actual flight and Line Oriented Flight Training (LOFT). Crews that received CRM training functioned as a team and were able to cope more effectively with non-routine situations. When there is no effective reinforcement of CRM concepts by yearly recurrent training, improvements in attitudes observed after initial indoctrination tend to disappear and an individual's attitude reverts to former levels.

Given that there have been different training approaches applied to CRM, it is useful to look at what CRM is and what it is not.

CRM is the following:

- A comprehensive system for improving crew performance
- Addresses the training needs of the total crew population
- A system which can be extended to all forms of crewmember training
- Focuses on crewmember attitudes/behaviors and their effect on safety
- An opportunity for individuals to examine their behavior and make individual decisions on how to best improve cockpit teamwork
- Uses the crew, not the individual, as the unit of training
- Active training where the participants experience and participate
- Operational focus on safety improvement

CRM is NOT the following:

- A quick fix that can be implanted overnight
- A system that occurs independent of other training
- A system where crews are provided a specific prescription on how to interact with others
- A passive lecture-style course
- An attempt by company management to dictate and control cockpit behavior

4. CRM TRAINING MISSION

CRM training has been developed to prevent aviation accidents by improving crew performance and coordination.

5. BASIC CONCEPTS OF CRM

CRM training is based on an awareness that a high degree of technical proficiency is essential for safe and efficient operations. Demonstrated mastery of CRM concepts cannot overcome a lack of proficiency. Similarly, high technical proficiency cannot guarantee safe operations in the absence of effective crew coordination.

Experience has shown that lasting behavioral changes in any environment cannot be achieved in a short time, even with well designed training. Students need awareness, practice/feedback, and continuing reinforcement to learn attitudes and behaviors that will endure. In order to be effective, CRM concepts must be permanently integrated into all aspects of training and operations.

6. ESSENTIAL TRAINING ELEMENTS

- CRM training should focus on the functioning of crewmembers as teams, not as a collection of technically competent individuals.
- Crewmembers should be instructed on how to behave in a manner that fosters crew effectiveness.
- CRM training should provide opportunities for crewmembers to practice the skills necessary to be effective team leaders and team members.
- Curriculum exercises should include all crewmembers functioning in the same role (captain, first officer, flight engineer, cabin crewmember) that they normally perform in flight.
- CRM training should include effective team behaviors during normal and emergency operations.

Note: Normal operations training has a strong and positive effect on how well individuals function during times of high workload stress. During emergency situations, it is unlikely that a crewmember would take the time to reflect upon past CRM training in order to choose the appropriate behavior. However, practice of desirable behavior during times of low stress increases the likelihood that emergencies will be handled effectively.

7. CHARACTERISTICS OF EFFECTIVE CRM

- Identification and discussion of various attitudes and behaviors and their impact on safety.
- Training situations where the entire crew participates and functions as a unit.
- Opportunity for crewmembers to examine their own behavior and the effect it has on teamwork.

- Inclusion of LOFT simulator periods.
- Audiovisual feedback during debriefings (Permits individuals to assess their CRM skills).
- Group problem-solving and role-playing.
- Written tests for attitude and personality assessment.
- Highly trained and experienced instructors.
- Annual recurrent training.

8. FUNDAMENTALS OF CRM TRAINING IMPLEMENTATION

Research programs and airline operational experience suggest that the greatest benefits are achieved by adhering to the following practices:

Organization Assessment: It is important to evaluate how widely CRM concepts are understood and practiced before designing specific training. Surveys of crewmembers, management, and training/standards personnel, as well as,

in-flight crew observations and analysis of incident/accident reports can provide important data for program designers.

Management Commitment: CRM programs are positively received when senior management, flight operations managers, and flight standards officers support CRM concepts and provide the necessary resources for training.

Communication is essential. All levels of management must support a safety culture in which communication is promoted by encouraging appropriate questions without fear of repercussions. This is especially important when one crewmember questions the decision or action of another.

Specialized Curriculum: Utilizing information from the organization assessment, priorities should be established for course content that includes a discussion of special issues, such as, the effects of mergers and acquisitions, the introduction of advanced technology aircraft, air taxi operations, international operations and night operations.

Program Scope and Implementation Plan: Operators should develop specialized CRM training for their CRM Team (check airmen, pilot/cabin supervisors, pilot/cabin instructors) before providing training to crewmembers. A long term strategy for follow-up and recurrent training should also be established.

Obtain Feedback: Training Departments should provide instructors and flight standards personnel with a preview of the initial/recurrent training programs and request suggestions or comments.

Develop Quality Control Procedures: Training classes should be consistently monitored to determine areas where training should be modified or strengthened. Students should be provided with an assessment form at the conclusion of training in order to further enhance the quality control process.

9. COMPONENTS OF CRM TRAINING

Initial Indoctrination

This training module typically consists of classroom presentations and focuses on communications, decision-making, interpersonal relationships, crew coordination, and leadership techniques. Appropriate concepts related to the safety of line operations are defined and discussed. A common conceptual framework and vocabulary is provided for identifying crew coordination problems.

Indoctrination can be accomplished by a combination of training methods including: lectures, audiovisual presentations, discussion groups, role-playing exercises, and computer-based instruction.

The curriculum should address CRM skills that have been demonstrated to influence crew performance and relate them to operational issues that crews will normally encounter.

It is important to recognize that classroom instruction alone does not fundamentally alter crewmember attitudes over the long term. Indoctrination training should be regarded as a necessary first step towards effective crew performance training.

Recurrent Training and Feedback

CRM training must be included as a regular part of the recurrent training requirement.

Recurrent CRM training should include classroom refresher training to review and amplify CRM techniques, followed by practice and feedback exercises, such as a LOFT. It is imperative that LOFT exercises take place with a full cockpit crew, each member operating in their normal crew position.

Recurrent training with performance feedback allows participants to practice newly improved CRM skills and receive feedback on their effectiveness. Feedback has its greatest impact when it comes from self-critique and one's peers.

Practice and feedback are best accomplished by the use of simulators, training devices and videotape. Taped feedback is particularly effective because it allows participants to view themselves from a third person perspective. This view is especially compelling in that strengths and weaknesses are captured on tape and vividly displayed. Stop action, replay, and slow motion are some of the playback features available during debriefing. Behavioral patterns and individual work styles are easily seen and appropriate adjustments are often self-evident.

Continuing Reinforcement

Even with a well developed curriculum, a one-time exposure to CRM is not sufficient. The attitudes and norms that contribute to ineffective crew coordination may have developed over a crewmember's lifetime. It is unrealistic to expect a short training program to reverse years of habits.

There is a common tendency to think of CRM as training only for PIC's. This notion misses the real meaning of the CRM training mission, prevention of crew-related accidents.

Instruction works best in the context of an entire crew working and learning together. In the past, much of the cockpit crew training has been segmented by crew position. This segmentation has been effective for meeting certain training needs, such as seat dependent task training and upgrade training, but segmentation is not appropriate for CRM training.

10. SUGGESTED CURRICULUM TOPICS

The following topics are included in many current CRM programs. Specific content of training and organization of topics should reflect an organization's unique culture and specific needs.

Communications Processes

This topic includes external and internal influences on interpersonal communications. External factors include communication barriers, such as, rank, age, gender, and organizational culture. Internal factors include speaking/listening skills, decision-making, conflict resolution techniques, and the use of appropriate assertiveness skills. The importance of clear and unambiguous communication must be stressed in all training activities involving pilots, flight attendants, and aircraft dispatchers. The following related items can be included as sub-topics:

Briefings: Training should address both operational and interpersonal issues, including appropriate methods to establish and maintain open communications.

Crew Self-Critique: One of the best techniques for reinforcing effective human factors practices is careful and detailed debriefing of activities.

Additionally, it is essential that each crewmember develop the ability to recognize and demonstrate appropriate and effective team behavior.

Conflict Resolution: Techniques to resolve disagreements among crewmembers in interpreting information or proposing courses of action. Crewmembers should understand that they must maintain open lines of communications, even while dealing with conflict.

Communications and Decision-Making: Identifying effective techniques to obtain and evaluate pertinent information. Discussion of the influence of biases and other cognitive factors on decision quality

Team Building

Effective leadership techniques and interpersonal relationships are key concepts to be stressed. Subtopics should include:

Leadership Techniques: Identify the necessity to maintain a proper balance between

respecting authority and practicing assertiveness. Leaders remain centered on the goals of safe and efficient operations.

Interpersonal Relationships: Demonstrate the usefulness of displaying sensitivity to other crewmembers' personalities and styles. Emphasis should be placed on the value of maintaining a friendly, relaxed, and supportive atmosphere while remaining task oriented. The importance of recognizing symptoms of fatigue/stress and taking appropriate action to reduce their effects.

Fatigue/Stress Recognition: Realization and awareness of the symptoms of fatigue and stress and appropriate actions to lessen their effects.

Workload Management and Situational Awareness: Discuss the importance of maintaining awareness of the operational environment and anticipating contingencies. Instruction may address practices (for example, vigilance, planning and time management, prioritizing tasks, and avoiding distractions) that result in higher levels of situational awareness. The following operational practices should be included:

Preparation/Planning/Vigilance: Issues include methods to improve monitoring and accomplishing required tasks, asking for and responding to new information, and preparing in advance for required activities.

Workload Distribution/Distraction Avoidance: Issues involve proper allocation of tasks to individuals, avoidance of work overloads, task prioritization during periods of high workload, and preventing attention distractions while performing critical tasks.

Individual Factors/Stress Reduction

This topic includes a description and demonstration of individual characteristics that can influence crew effectiveness. Research has shown that many crewmembers are unfamiliar with the negative effects of stress and fatigue on individual cognitive functions and team performance. Training may include a review of scientific evidence on fatigue and stress and their effects on performance. The content may include specific effects of fatigue and stress in potential emergency situations. The effects of personal and interpersonal problems and the increased importance of effective interpersonal communications under stressful conditions may also be addressed. Training may also include familiarization with various countermeasures for coping with stress. Additional curriculum topics may include examination of personality and motivation characteristics, self-assessment of personal style, and identifying cognitive factors that influence perception and decision-making.

11. SPECIALIZED TRAINING IN CRM CONCEPTS

As CRM programs have matured, some organizations have found it beneficial to develop and implement additional courses dealing with issues specific to their operations.

After all current crewmembers have completed the Initial Indoctrination component of CRM training, arrangements are needed to provide newly hired crewmembers with the same material. Many organizations have modified their original CRM initial courses and included them as part of the initial training and qualification for new hire crewmembers.

Captain upgrade curriculum provides an opportunity for specialized training that addresses the human factors aspects of command.

Training involving communications and the use of automation can be developed for crews operating or transitioning to aircraft with advanced technology cockpits and complex cabins.

12. ASSESSMENT OF CRM TRAINING PROGRAMS

It is vital that each program be assessed to determine if it is achieving its goals. Each organization should have a systematic assessment program. Assessment should track the effects of the training program so that critical topics for recurrent training may be identified and continuous improvements may be made in all other respects. Assessment of the training program should include observation of the training process by program administrators and self-reports by participants using standard survey methods.

The emphasis during assessments should be on crew performance. The essential areas of CRM assessments include communications processes, decision-making, team building, workload management, and situational awareness. An additional function of such

assessment is to determine the impact of CRM training and organization-wide trends in crew performance.

Reinforcement and feedback are essential to effective CRM training programs. Crewmembers must receive continual reinforcement to sustain CRM concepts. Effective reinforcement depends upon usable feedback to crewmembers on their CRM practices and technical performance. This can be accomplished by instructors and check airmen during simulator training and line checks.

Usable feedback requires consistent assessment. Crewmembers and those involved in training and evaluation should be able to recognize effective and ineffective CRM behaviors.

CRM concepts should be critiqued during briefing/debriefing phases of all training and checking events.

13. CHECK AIRMEN AND INSTRUCTOR ROLES

The success of any CRM training program ultimately depends on the skills of those who administer the training and measure its effects.

The CRM Team must be skilled in all areas related to the practice and assessment of CRM. These skills comprise an additional level to those associated with traditional flight instruction and checking.

Gaining proficiency and confidence in CRM instruction, observation, and measurement requires special training for the CRM Team. This training would include standardization, role-playing simulations, systematic crew observation, debrief and critique skills, administering LOFT programs, and providing usable feedback to crews.

The CRM Team should use every available opportunity to emphasize the importance of crew coordination skills. The best results occur when the crews examine their own behavior with the assistance of a trained instructor who can point out both positive and negative CRM performance. Whenever effective examples of crew coordination are observed, it is vital that these positive behaviors are discussed and reinforced.

14. Summary

Effective instruction in Crew Resource Management begins with initial training; is strengthened by recurrent practice and feedback; and it is sustained by a continuing reinforcement that is an integral part of the corporate culture and embedded in every stage of training.