

CIVIL AVIATION AUTHORITY, PAKISTAN

Air Navigation Order

No. : 91.0014

Date : 16th May, 1999

Issue : One

CREW RESOURCE MANAGEMENT TRAINING

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1. Authority

This Air Navigation Order (ANO) is issued by the Director-General of the Civil Aviation Authority in pursuance of the powers vested in him under Rule 4 of the Civil Aviation Rules (CARs) 1994.

2. Scope

2.1. This ANO relates to the training of RPT and charter operators in Crew Resource Management (CRM).

2.2. The instructions contained in this ANO shall be complied with by all operators who hold an Air Operator Certificate and applicants for an AOC for RPT or Charter operations.

3. Effective Date

This ANO shall come into effective on 16th May, 1999.

4. Purpose

This ANO presents guidelines for developing, implementing, reinforcing and assessing Crew Resource Management (CRM) training programs for flight crewmembers, cabin crewmembers and other personnel essential to flight safety. These programs are designed to become an integral part of training programs and operations. We recommend applicants/operators study this ANO and implement the material, which is applicable to your organisation. The primary purpose of the ANO is to increase CRM efficiency, with which flight personnel perform by focusing on communication skills, teamwork, task allocation, and decision making.

5. Background

Investigations into the causes of air carrier accidents have shown that human error is a contributing factor in 60 to 80 percent of all air carrier incidents and accidents. Long term Safety Foundation research has demonstrated that these events are common characteristics. Many problems encountered by flight crews have very little to do with the technical aspects of operating in a multi-person cockpit. Instead, problems are associated with poor group

decision making, ineffective communication, inadequate leadership, and poor task or resource management. Pilot training programs historically focused almost exclusively on the technical aspects of flying and on an individual pilot's performance; they did not effectively address crew management issues that are so fundamental to safe flight.

These observations have led to a consensus in industry and government that training programs should place emphasis on the factors, which influence crew co-ordination and the management of crew resources. The need for additional training in communications between cockpit crewmember's and flight attendants has been specifically identified.

Research also suggests that when there is no effective reinforcement of CRM concepts by way of recurrent training, improvements in attitudes observed after initial indoctrination may tend to disappear, and individuals' attitudes may tend to revert to former levels.

6. Definitions

6.1 Human Factors.

Human factor is a multidisciplinary field devoted to optimising human performance and reducing human error. It incorporates the methods and principles of the behavioural and social sciences, engineering, and physiology. Human factor is the applied science, which studies people working together in concert with machines. Human factors embraces variables that influence individual performance and variables that influence team or crew performance.

6.2. It is recognised that inadequate system design or inadequate operator training can contribute to individual human error that leads to system performance degradation. Further, it is recognised that inadequate design and management of crew tasks can contribute to group errors that lead to system performance degradation.

6.3 Crew Resource Management (CRM) is the application of team management concepts in the flight deck environment was initially known as Cockpit Resource Management.

As CRM programs evolved to include flight attendants, maintenance personnel and others, the phrase Crew Resource Management has been adopted.

6.4. CRM now refers to the effective use of all available resources; human resources, hardware, and information. A current definition includes all other groups routinely working with the cockpit crew who are involved in decisions required to operate a flight safely. These groups include but are not limited to:

- (i) Aircraft dispatchers
- (ii) Flight attendants
- (iii) Maintenance personnel
- (iv) Air traffic controllers
- (v) Management

- 6.5. CRM is one way of addressing the challenge of optimising the human/machine interface and accompanying interpersonal activities. These activities include team building and maintenance, information transfer, problem solving, decision making, maintaining situational awareness, and dealing with automated systems. CRM training is comprised of three basic components: initial indoctrination/awareness, recurrent practice / feedback, and continual reinforcement. Each component must be continually renewed.

7. The Mission of CRM Training

CRM training has been conceived to prevent aviation accidents by improving crew performance through better crew co-ordination.

8. Basic Concepts of CRM

CRM training is based on 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 might not guarantee safe operations in the absence of effective crew co-ordination.

- 8.1. Experience has shown that lasting behaviour changes in any environment cannot be achieved in a short time period, even if the training is very well designed. Trainees need awareness, practice and feedback, and continuing reinforcement: in a word, time to learn attitudes that will endure. In order to be effective, CRM concepts should be integrated into all aspects of training and operations.
- 8.2. While there are various useful methods in use in CRM training today, certain features are highly recommended:
- (1) CRM training should focus on the functioning of crewmembers as teams, not as a collection of technically competent individuals.
 - (2) CRM training should instruct crewmembers how to behave in ways that foster crew effectiveness.
 - (3) CRM training should provide opportunities for crewmembers to practice the skills.
 - (4) Necessary to be effective team leaders and team members.
 - (5) CRM training exercises should include all crewmembers functioning in the same roles (for example, captain, first officer, and/or flight engineer, flight attendants) they normally perform in flight.
 - (6) CRM training should include effective team behaviours during normal, routine operations.
- 8.3. Good training for routine operations can have a strong positive effect on how well individuals function during times of high workload or high stress. During emergency situations, when time pressure might exist, a crewmember probably would not take the time to reflect upon his or her CRM training in order to choose the appropriate behaviour. But practice of desirable behaviours during times of low stress increases the likelihood that emergency's will be handled effectively.

- 8.4. CRM is defined by the following characteristics:
- (1) CRM is a comprehensive system of applying human factors concepts to improve crew performance.
 - (2) CRM embraces all operational personnel.
 - (3) CRM can be blended into all forms of aircrew training.
 - (4) CRM concentrates on crewmembers attitudes and behaviours and their impact on safety.
 - (5) CRM uses the crew as the unit of training.
 - (6) CRM is training that requires the active participation of all crewmembers. It provides an opportunity for individuals and crews to examine their own behaviour and to make decisions on how to improve cockpit teamwork.
 - (i) In cases where simulators are not available, crewmembers can participate in group problem solving activities designed to exercise CRM skills. Through taped feedback during debriefing, they can then assess the positive and negative behaviours of all crewmembers.
 - (ii) Crewmembers may also participate in role playing exercises. Such exercises permit practice in developing strategies for dealing with incidents and allow analysis of behaviours during those incidents.
Again, taped feedback is useful for assessment and feedback during debriefing. Crews abilities can be clearly observed in such areas as decision making, teamwork, and leadership.
 - (iii) Attitude and/or personality measures can also be used to provide feedback to participants, allowing them to assess their own strengths and weaknesses.
 - (7) Success of a CRM training program depends upon check airmen, instructors, and supervisors who are highly qualified and specially trained in CRM.

9. Fundamentals of CRM Training Implementation

- 9.1. Research programs and airline operational experience suggest that the greatest benefits are achieved by adhering to the following practices:
- a. Assess the Status of the Organisation before Implementation. It is important to know how widely CRM concepts are understood and practised before designing specific training. Surveys of crewmembers, observation of crews in line observations, and analysis of incident/accident reports can provide essential data for program designers.
 - b. Get Commitment from All Managers, Starting with Senior Managers. CRM programs are received much more positively by operations personnel when senior managers, flight operations managers, and flight standards officers conspicuously support CRM concepts and provide the necessary resources for training. Flight operations manuals and training manuals should embrace CRM concepts by providing crews with necessary policy and procedures guidance.

- c. Customise the Training to Reflect the Nature and Needs of the Organisation. Using knowledge of the state of the organisation, priorities should be established for topics to be covered including specific issues such as the effects of mergers or the introduction of advanced technology aircraft. This approach increases the relevance of training for crewmembers.
 - d. Define the Scope of the Program. Institute special CRM training for key personnel including check airmen, supervisors, and instructors. It is highly beneficial to provide training for these groups before beginning training for crewmembers. CRM training may be expanded to include aircraft dispatchers, flight attendants, maintenance personnel and other company team members as appropriate. It is also helpful to develop a long term strategy for program implementation.
 - e. Communicate the Nature and Scope of the Program before Start-up. Training departments should provide crews with a preview of what the training will involve together with plans for initial and continuing training.
These steps can prevent misunderstandings about the focus of the training or any aspect of its implementation.
 - f. Institute Quality Control Procedures.
- 9.2. It has proved helpful to monitor the delivery of training and to determine areas where training can be strengthened. Monitoring can be initiated by providing special training to program instructors (often called facilitators) in using surveys to collect systematic feedback from participants in the training.

10. Components of CRM Training

- 10.1. The topics outlined below have been identified as recommended components of effective CRM training. They do not represent a fixed sequence of phases, each with a beginning and an end. Ideally, each component is continually renewed at every stage of training.
- a. Initial Indoctrination/Awareness:
 - (1) Indoctrination/awareness typically consists of classroom presentations and focuses on communications and decision making, interpersonal relations, crew co-ordination, and leadership. In this component of CRM training, the concepts are developed, defined, and related to the safety of line operations. This component also provides a common conceptual framework and a common vocabulary for identifying crew co-ordination problems.
 - (2) Indoctrination/awareness can be accomplished by a combination of training methods. Lectures, audio-visual presentations, discussion groups, role playing exercises, computer based instruction, and videotaped examples of good and poor team behaviour are commonly used methods.

- (3) Initiating indoctrination/awareness training depends upon the development of a curriculum that addresses CRM skills that have been demonstrated to influence crew performance. To be most effective, the curriculum should define the concepts involved and relate them directly to operational issues that crews encounter. Many organisations have found it useful to survey crewmembers. Survey data have helped identify embedded attitudes regarding crew co-ordination and cockpit management. The data have also helped to identify operational problems and to prioritise training issues.
- 10.2. Effective indoctrination/awareness training increases understanding of CRM concepts. That understanding, in turn, often influences individual attitudes favourably regarding human factor issues. Often the training also suggests more effective communication practices.
 - 10.3. It is important to recognise that classroom instruction alone does not fundamentally alter crewmember attitudes over the long term. The indoctrination/awareness training should be regarded as a necessary first step towards effective crew performance training.
 - a. Recurrent Practice and Feedback.
 - (1) CRM training should be included as a regular part of the recurrent training requirement. Recurrent CRM training should include refresher practice and feed back exercises such as role plying in a flight training device. It is recommended that these recurrent CRM exercises take place with a full crew, each member operating in his or her normal crew position. A complete crew will always be scheduled, and every attempt will be made to maintain crew integrity.
 - (2) Recurrent training and feedback allows participants to practice newly improved skills in communication and interpersonal relationships and to receive feedback on their effectiveness. Feedback has its greatest impact when it comes from self-critique and from peers, together with guidance from a facilitator with special training in assessment and debriefing techniques.
 - (3) Effective feedback refers to the co-ordination concepts identified in Indoctrination/Awareness training and relates to specific behaviours. Practice and feedback are best accomplished through the use of simulators or training devices and videotape. Taped feedback, with the guidance of a facilitator, 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. Attitudes and behaviours are easily seen, and appropriate adjustments are often self-evident.

- b. Continuing Reinforcement.
- (1) No matter how effective each curriculum segment is the classroom the role playing exercises, or the feedback, one-time exposures are simply not sufficient. The attitudes and norms that contribute to ineffective crew co-ordination have developed over a crewmembers lifetime. It is unrealistic to expect a short training program to reverse years of habits. To be maximally effective, CRM should be embedded in every stage of training, and CRM concepts should be stressed in line operations as well.
 - (2) CRM should become an inseparable part of the organisation's culture.
 - (3) There is a common tendency to think of CRM as training only for the managers and captains. This notion misses the essence of the CRM training mission: the prevention of crew related accident CRM training works best in the context of the entire crew. Training exercises are most effective if all crewmember's work together and learn together. In the past, much of flight crew training has been segmented by crew position. This segmentation has been effective for meeting certain training needs such as seat dependent technical. Training and upgrade training, but segmentation is not appropriate for CRM training.
 - (4) Reinforcement can be accomplished in many areas. Training such as joint cabin and cockpit crew training in security can deal with many human factor issues. Joint training with aircraft dispatchers, maintenance personnel and gate agents can also reinforce CRM concepts.

11. Suggested Curriculum Topics

The topics outlined below have been included in many current CRM programs. Specific content of training and organisation of topics should reflect an organisation unique culture and specific needs. Appendix 1 offers a set of behavioural markers fitting subtopics within each topic cluster. These markers may be helpful in curriculum development Appendix 3 gives additional CRM training topics.

- 11.1. Communications Processes and Decision Behaviour. This topic includes internal and external influences on interpersonal communications. External factors include communication barriers such as rank, age, gender, and organisational culture. Internal factors include listening skills and decision making skills, conflict resolution techniques, and the use of appropriate assertiveness and advocacy. More specific subtopics include the following:
- (1) Briefings. Training in addressing both operational and interpersonal issues, and training in establishing open communications.
 - (2) Inquiry/Advocacy/Assertion. Training in the potential benefits of crewmember's advocating the course of action that they feel is best, even though it may involve conflict with others.

- (3) Crew Self-Critique (Decisions and Actions). Illustrating the value of review, feedback, and critique focusing on the process and the people involved. One of the best techniques for reinforcing effective human factor practices is careful debriefing of activities highlighting the processes that were followed. Additionally, it is essential that each crewmember be able to recognise good and bad communications, and effective and ineffective team behaviour.
- (4) Conflict Resolution. Demonstrating effective techniques of resolving disagreements among crewmember's in interpreting information or in proposing courses of action. Demonstrating effective techniques for maintaining open communication while dealing with conflict.
- (5) Communications and Decision Making. Demonstrating effective techniques of seeking and evaluating information showing the influence of biases and other cognitive factors on decision quality. There are benefits in providing crews with operational models of this group decision process. Crews may refer to these models to make good choices in situations when information is incomplete or contradictory.

11.2. Team Building and Maintenance. This topic includes interpersonal relationships and practices. Effective leadership/follower-ship and interpersonal relationships are key concepts to be stressed. Curricula can also include recognising and dealing with diverse personalities and operating styles. Subtopics include:

- (1) Leadership/Follower-ship/Concern for Task. Showing the benefits of the practice of effective leadership through co-ordinating activities and maintaining proper balance between respecting authority and practising assertiveness. Staying centred on the goals of safe and efficient operations.
- (2) Interpersonal Relationships/Group Climate. Demonstrating the usefulness of showing sensitivity to other crewmember's personalities and styles. Emphasising the value of maintaining a friendly, relaxed, and supportive toxic in the cockpit and aircraft cabin. The importance of recognising symptoms of fatigue and stress, and taking appropriate action.
- (3) Workload Management and Situational Awareness. Stressing the importance of maintaining awareness of the operational environment and anticipating contingencies. Instruction may address practices (for example, vigilance, planning and time management, prioritising tasks, and avoiding distractions) that result in higher levels of situational awareness. The following operational practices may be included:
 - (i) Preparation/Planning/Vigilance. Issues include devoting appropriate attention to required tasks, asking for and responding to new information, and preparing in advance for required activities.
 - (ii) Workload Distribution/Distracton Avoidance. Issues involve proper allocation of tasks to individuals, avoidance of work overloads in self and in others, prioritisation of tasks during periods of high workload, and preventing nonessential factors from distracting attention from critical tasks.

- (4) Individual Factors/Stress Reduction. Training in this area may include describing and demonstrating 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 familiarisation with various permissible countermeasures for coping with stressors. 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.

12. Specialised Training in CRM Concepts

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

- a. After all current crewmembers have completed the Initial Indoctrination/Awareness component of CRM training, arrangements are needed to provide newly hired crewmember's with the same material. A number of organisations have modified their CRM initial courses for inclusion as part of the initial training and qualification for new hire crewmembers.
- b. Training for upgrading to captain provides an opportunity for specialised training that deals with the human factor aspects of command. Such training can be incorporated in the upgrade process.
- c. Training involving communications and the use of automation can be developed for crews operating aircraft with advanced technology cockpits, or for crews transitioning into them.

13. Assessment of CRM Training Programs

It is recommended that each program be assessed to determine if it is achieving its goals. Each organisation 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.

- a. The emphasis in this assessment should be on crew performance. The CRM related processes recommended for assessment include communications, decision making, team building and maintenance, workload management and situational awareness; and the

assessment should address the blending of traditional technical proficiency with those processes. An additional function of such assessment is to determine the impact of CRM training and organisation-wide trends in crew performance.

- 13.1 For optimal assessment, data on crewmember's' attitudes and behaviour should be collected before CRM indoctrination and again at intervals after the last component of CRM training to determine both initial and enduring effects of the program. The goal should be to obtain an accurate picture of the organisation's significant corporate personality traits before formal adoption of CRM training and to continue to monitor those traits after implementation.
- 13.2 Reinforcement and feedback are recommended components of effective OHM training programs. Crewmembers should receive continual reinforcement to sustain CRM concepts. Effective reinforcement depends upon usable feedback to crewmembers on their CRM practices and on their technical performance.
- 13.3 Usable feedback requires consistent assessment. Crewmembers and those involved in training and evaluation should be able to recognise effective and ineffective CRM behaviours. It is not expected or intended that crewmember's should be formally evaluated and graded on the practice of CRM concepts. Rather, CRM concepts should be included during briefing/debriefing phases of training.
- 13.4 To summarise, the assessment program should:
 - (1) Measure and track the organisation's corporate culture as it is reflected in attitudes and norms.
 - (2) Identify topics needing emphasis within the CRM program.
 - (3) Ensure that all check airmen, supervisors, and instructors are well prepared and standardised.

14. The Critical Role Of Check Airmen And Instructors

- 14.1. The success of any CRM training program ultimately depends on the skills of the people who administer the training and measure its effects. CRM instructors, check pilots, supervisors, and course designers should be skilled in all areas related to the practice and assessment of CRM. It is important to note that these skills are complementary to those skills associated with traditional flight instruction and checking.
- 14.2. Gaining proficiency and confidence in CRM instruction, observation, and measurement requires special training for instructors, supervisors, and check pilots in many CRM training processes. Among those processes are role playing simulations, systematic crew centred observation, and providing useful feedback to crews.
- 14.3. Instructors, supervisors, and check pilots also require special training in order to calibrate and standardise their own skills.

- 14.4. Instructors, supervisors, and check airmen should use every available opportunity to emphasise the importance of crew co-ordination skills. The best results occur when the crews examine their own behaviour with the assistance of a trained instructor who can point out both positive and negative OHM performance. Whenever highly effective examples of crew co-ordination are observed, it is recommended that these positive behaviours be discussed and reinforced.
- 14.5. Feedback from instructors, supervisors, and check airmen is most effective when it refers to the concepts that are covered in the initial indoctrination/awareness training. The best feedback refers to instances of specific behaviour, rather than behaviour in general.

15. Evolving Concepts of CRM: Extending Training Beyond the Cockpit


More and more carriers are discovering the value of extending CRM training beyond the cockpit. Their objective is to improve the effectiveness of additional groups within the operations team.

- 15.1. For many years air traffic controllers have been welcome in the cockpit in order to gain familiarity with procedures by observation from the cockpit jump seat. Similarly, pilots are welcome to observe operations in air traffic facilities.
- 15.2. Aircraft dispatchers have functioned jointly with flight captains for years. They have been allowed, indeed required to observe cockpit operations from the cockpit jump seat as part of their initial and recurrent qualification under the CARs. Some carriers have included day trips to their aircraft dispatchers' offices to provide the pilot insight into the other side of the joint function scheme. Those trips have commonly been part of the special training offered to first-time captains.
- 15.3. Maintenance personnel have also had access to the cockpit jump seat under the CARs. Training of first-time captains has often included day trips to a carrier's operations control centre where a pilot and a maintenance supervisor can meet face to face and discuss issues of mutual interest in a real-life setting.
- 15.4. Even broader sharing of CRM concepts has been considered, using other groups such as passenger service agents, mid and upper level managers and special crisis teams like hijack and bomb threat teams.
- 15.5. Cabin attendants are probably the most obvious of the groups other than pilots who may profit from CRM training. One idea for joint training has been that each group be made aware of highlights of the other's training on shared issues, with particular emphasis on differences. Examples of shared issues include delays, the use of personal electronic devices in the cabin, and evacuation and ditching. Other specific topics for joint training have been proposed, including:

- (1) Pre-flight briefings;
 - (2) Post incident/accident procedures;
 - (3) Sterile cockpit procedures;
 - (4) Notification procedures pre-takeoff and pre-landing;
 - (5) Procedures for turbulence and other weather;
 - (6) Security procedures;
 - (7) Passenger handling procedures;
 - (8) In-flight medical problems;
 - (9) Smoke/fire procedures,
 - (10) Passenger related CARs such as those covering carry-on baggage, smoking, and. exit row seating; and
 - (11) Authority of the pilot in command.
- 15.6. It is thought that CRM principles are made more relevant for both pilots and flight attendants by treating them in a familiar job related context. Furthermore, each group should benefit from concurrent training in CRM that is complemented by usable knowledge of the other's job.
- 15.7. Communication and co-ordination problems between cockpit crewmembers and flight attendants continue to challenge air carriers and the CAA. Other measures with positive CRM training value for flight-crews are being considered such as.
- (1) Requiring cockpit observation flights for all new-hire flight attendants; and permitting cockpit observation flights for all other flight attendants;
 - (2) Including flight attendants as participants
 - (3) Scheduling month-long pairings of pilots and flight attendants; and
 - (4) Providing experienced flight crewmembers to teach new-hire flight attendant orientation classes.

16. Summary

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



AMINULLAH CHAUDRY
Director General
Civil Aviation Authority
Date **16.5.99**

**APPENDIX "A"
TO ANO 91.0014**

CREW PERFORMANCE MARKER CLUSTERS

These behavioural markers are provided to assist organisations in program and curriculum development and to serve as guidelines for feedback. They are not presented as a checklist for evaluating individual crewmembers.

A. Communications Processes and Decision Behaviour Cluster.

A.1. Briefings. The effective briefing is interesting and thorough. It addresses co-ordination, planning, and problems. Although briefings are primarily a captain's responsibility, other crewmembers may add significantly to planning and should be encouraged to do so.

A.2. Behavioural Markers:

- (1) The briefing establishes an environment for open/interactive communications (for example, the captain calls for questions or comments, answers questions direct, listens with patience, does not interrupt or "talk over," does not rush through the briefing, and makes eye contact as appropriate).
- (2) The briefing is interactive and emphasises the importance of questions, critique, and the offering of information.
- (3) The briefing establishes a "team concept" (for example, the captain uses "we" language, encourages all to participate and to help with the flight).
- (4) The briefing covers pertinent safety and operational issues.
- (5) The briefing identifies potential problems such as weather, delays, and abnormal system operations.
- (6) The briefing provides guidelines for crew actions; division of labour and crew workload is addressed.
- (7) The briefing includes the cabin crew as part of the team.
- (8) The briefing sets expectations for handling deviations from standard operating procedures. The briefing specifies pilot flying and pilot not flying duties and responsibilities.

A.3. Inquiry/Advocacy/Assertion. These behaviours relate to crewmembers' promoting the course of action that they feel is best, even when it invokes conflict with others.

A.4. Behavioural Markers

- (1) Crewmembers speak up and state their information with appropriate persistence until there is some clear resolution.
- (2) "Challenge and response" environment is developed.
- (3) Questions are encouraged and are answered openly and non-defensively.
- (4) Crewmembers are encouraged to question the actions and decisions of others.
- (5) Crewmembers seek help from others when necessary.

- A.5. Crew Self-Critique Regarding Decisions and Actions. These behaviours relate to the effectiveness of a group and/or an individual crewmember in critique and debriefing. Areas covered should include the product, the process, and the people involved. Critique may occur during an activity, and/or after completing it.
- A.6. Behaviour Markers:
- (1) Critique occurs at appropriate times, which may be times of low or high workload.
 - (2) Critique deals with positive as well as negative aspects of crew performance.
 - (3) Critique involves the whole crew interactively.
 - (4) Critique makes a positive learning experience. Feedback is specific, objective, usable, and constructively given.
 - (5) Critique is accepted objectively and non-defensively.
- A.7. Communications/Decisions. These behaviours relate to free and open communication. They reflect the extent to which crewmember's provide necessary information at the appropriate time (for example, initiating checklists and alerting others to developing problems). Active participation in the decision making process is encouraged. Decisions are clearly communicated and acknowledged. Questioning of actions and decisions is considered routine.
- A.8. Behavioural Markers:
- (1) Operational decisions are clearly stated to other crewmembers.
 - (2) Crewmembers acknowledge their understanding of decisions.
 - (3) "Bottom lines" for safety are established and communicated.
 - (4) The "big picture" and the game plan are shared within the team, including flight attendants and others as appropriate. Crewmembers are encouraged to state their own ideas, opinions, and recommendations. Efforts are made to provide an atmosphere that invites open and free communications.

B. Team Building and Maintenance Cluster

- B.1 Leadership Follower-ship/Concern for Tasks.
These behaviours relate to appropriate leadership and follower-ship. They reflect the extent to which the crew is concerned with the effective accomplishment of tasks.

Behaviour Markers:

- (1) All available resources are used to accomplish the job at hand.
- (2) Flight deck activities are co-ordinated to establish an acceptable balance between respect for authority and the appropriate practice of assertiveness.
- (3) Actions are decisive when the situation requires.
- (4) A desire to achieve the most effective operation possible is clearly demonstrated.
- (5) The need to adhere to standard operating practices is recognised.

- (6) Group climate appropriate to the operational situation is continually monitored and adjusted (for example, social conversation may occur during low workload, but not high).
- (7) Effects of stress and fatigue on performance are recognised.
- (8) Time available for the task is well managed.
- (9) Demands on resources posed by operations of automated systems are recognised and managed.
- (10) When programming demands could reduce situational awareness or create work overloads, levels of automation are reduced appropriately.

B.2. Interpersonal Relationships/Group Climate. These behaviours relate to the quality of interpersonal relationships and the pervasive climate of the flight deck.

B.3. Behavioural Markers:

- (1) Crewmembers remain calm under stressful conditions.
- (2) Crewmembers show sensitivity and ability to adapt to the personalities of others
- (3) Crewmembers recognise symptoms of psychological stress and fatigue in self and in others (for example, recognises when he/she is experiencing "tunnel vision and seeks help from the team; or notes when a crewmember is not communicating and draws him/her back into the team).
- (4) "Tone" in the cockpit is friendly, relaxed, and supportive.
- (5) During times of low communication, crewmember's check in with others to see how they are doing.

C. Workload Management and Situational Awareness Cluster

C.1. Preparation/Planning/Vigilance. These behaviours relate to crews anticipating contingencies and the various actions that may be required. Excellent crews are always "ahead of the curve" and generally seem relaxed. They devote appropriate attention to required tasks and respond without undue delay to new developments. (They may engage in casual social conversation during periods of low workload and not necessarily diminish their vigilance.)

C.2. Behavioural Markers:

- (1) Demonstrating and expressing situational awareness; for example, the "model" of what is happening is shared within the crew.
- (2) Active monitoring of all instruments and communications and sharing relevant information with the rest of the crew.
- (3) Monitoring weather and traffic and sharing relevant information with the rest of the crew.
- (4) Avoiding "tunnel vision" caused by stress; for example, stating or asking for the "big picture."
- (5) Being aware of factors such as stress that can degrade vigilance and watching for performance degradation in other crewmembers.
- (6) Staying "ahead of the curve" in preparing for planned situations or contingencies.

- (7) Ensuring that cockpit and cabin crewmember's are aware of plans.
- (8) Including all appropriate crewmember's in the planning process.
- (9) Allowing enough time before manoeuvres for programming of the flight management computer.
- (10) Ensuring that all crewmembers are aware of initial entries and changed entries in the flight management system.

C.3. Workload Distributed/Distractions Avoided. These behaviours relate to time and workload management. They reflect how well the crew manages to prioritise tasks, share the workload, and avoid being distracted from essential activities.

C.4. Behavioural Markers:

- (1) Crewmembers speak up when they recognise work overloads in themselves or in others.
- (2) Tasks are distributed in ways that maximise efficiency.
- (3) Workload distribution is clearly communicated and acknowledged.
- (4) Non operational factors such as social interaction are not allowed to interfere with duties.
- (5) Task priorities are clearly communicated.
- (6) Secondary operational tasks (for example, dealing with passenger needs and communications with company) are prioritised so as to allow sufficient resources for primary flight duties.

D. Appropriate CRM Training Topics

1. Background Information.

D.1. Research findings suggest that CRM training can result in significant improvements in flight crew performance. CRM is seen as an effective approach to reducing flight errors and increasing aviation safety.

E. Training Topics, Principles, And Techniques.

E.1. CRM training is recommended which includes the curriculum topics described in this Air Navigation Order and the topics, principles, and techniques which follow:

- a. Theory and practice in using communication, decision- making, and team building techniques and skills.
- b. Theory and practice in using proper supervision techniques, i.e., captains working with first officers.
- c. Theory and practice in selecting and using interventions needed to correct flying errors made by either pilot, especially during critical phases of flight. These interventions may include, but not be limited to, communication, assertion, decision-making, risk assessment, and situational awareness skills.
- d. During simulation training, information, and practice of non-flying pilot functions, i.e., monitoring and challenging pilot functions, and monitoring and challenging errors made by other crewmembers for

flight engineers, first officers, and captains. Training will alert flight-crews of hazards caused by tactical decision errors, which are actually errors of omission. Practice in monitoring and challenging errors, especially during taxi operations, should be included. These skills are important to minimise procedural errors, which may occur as a result of inadequately performed checklists.

- e. Training for check airmen in methods which can be used to enhance the monitoring and challenging functions of both captains and first officers.
- f. Training for new first officers in performing the non-flying pilot role to establish a positive attitude toward monitoring and challenging errors made by the flying pilot.
- g. Training for captains in giving and receiving challenges of errors.
- h. Factual information about the detrimental effects of fatigue and strategies for avoiding and countering its effects.
- i. Training for crewmember's which identifies conditions in which additional vigilance is required, such as holding in icing or near connective activity.
Training should emphasise the need for maximum situation awareness and the appropriateness of sterile cockpit discipline, regardless of altitude.
- j. Training for crewmember's in appropriate responses when passengers intimidate, abuse, or interfere with crewmember performance of safety duties. Training should address crew co-ordination and actions, which might defuse the situation. Training should include specific communication topics, such as conflict resolution.
- k. For cockpit crewmembers which address appropriate responses to the effects of a blocked pilot tube. Emphasis should be on situation awareness, inquiry/advocacy/assertion, and crew co-ordination, when flight instruments act abnormally.
- l. For cockpit crewmember's which contain a controlled flight into terrain scenario. Emphasis should be on prevention through effective communication and decision behaviour. The importance of immediate, decisive, and correct response to a ground proximity warning should also be addressed.

F. Appropriate Training Interventions.

- F.1. The most effective CRM training involves active participation of crewmembers. Sessions give each crewmember opportunities to practice CRM skills through interactions with other crewmember's. If the training is videotaped, feedback based on crewmember's' actual behaviour.
- F.2. CRM training can be presented using a combination of the following training interventions:
 - (1) Operator in-house courses.
 - (2) Training centre courses.
 - (3) Special Purpose Operational Training.
 - (4) Computer Based Training courses.