

# Advisory Circular

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## TRAINING ON CREW RESOURCE MANAGEMENT

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### GENERAL

Advisory Circulars (ACs) are issued by the Director-General of Civil Aviation (DGCA) from time to time to provide practical guidance or certainty in respect of the statutory requirements for aviation safety. ACs contain information about standards, practices and procedures acceptable to CAAS. An AC may be used, in accordance with section 3C of the Air Navigation Act (Cap. 6) (ANA), to demonstrate compliance with a statutory requirement. The revision number of the AC is indicated in parenthesis in the suffix of the AC number.

### PURPOSE

This AC provides guidance to demonstrate compliance with, and information related to, requirements regarding the development and implementation of Crew Resource Management (CRM) training programmes for flight crew members and other personnel essential to flight safety.

### APPLICABILITY

This AC is applicable to a Singapore AOC holder operating in accordance with ANR-121.

### RELATED REGULATIONS

This AC relates specifically to Regulations 143, 148, 151 and 156 of ANR-121.

### RELATED ADVISORY CIRCULARS

- AC 121-8-2 Cabin Safety for Airbus A380 aircraft

### CANCELLATION

This AC supersedes AC AOC-34.

### EFFECTIVE DATE

This AC is effective from 1 October 2018.

**OTHER REFERENCES**

- ICAO Human Factors Training Manual - Document 9683
- FAA AC 120-51E Crew Resource Management Training
- Asia Pacific Regional Aviation Safety Team (APRAST) - Safety Enhancements Initiative (SEI) CFIT/5.

## **1 BACKGROUND**

- 1.1 The AOC holder is required to provide CRM training for all crew, including cabin crew. The training should focus on the functioning of crew members as a team and not simply as a collection of competent individuals. The crew members should be shown the importance of effective teamwork and communication, the barriers involved and how to overcome them. Emphasis should be given on their role as safety practitioners and the need to maintain a high level of awareness in the environment they operate in.
- 1.2 CRM constitutes an integral part of the AOC holder's operational activities. It focuses on situation awareness, communication skills, teamwork, leadership, task allocation, decision-making, error management, and stress management within a comprehensive framework of standard operating procedures (SOPs).
- 1.3 Effective CRM begins in initial training and it is strengthened by constant practice and feedback. It is sustained by continuing reinforcement as a part of the corporate culture and embedded in every stage of the training.
- 1.4 Investigations into causes of air operator accidents have shown that human error is a contributing factor in 60-80% the incidents and accidents<sup>1</sup>. Long term research has demonstrated that these events share common characteristics. Many problems encountered by flight crew have very little to do with the technical aspects of operating in a multi-crew flight deck. Instead, problems are associated with poor group decision making, ineffective communication, inadequate leadership, and poor task or resource management. Pilot training programmes historically focused almost exclusively on the technical aspects of flying and on an individual pilot's performance. They, however, did not effectively address crew management issues that are also fundamental to achieving a safe flight.

## **2 DEFINITIONS AND CONCEPTS**

### **2.1 CREW RESOURCE MANAGEMENT (CRM)**

- 2.1.1 As used in this AC, CRM refers to the effective use by the flight crew of all available resources, namely, human resources, hardware, and information to achieve safe and efficient operation. Other groups routinely working with the flight crew and who are involved in decisions required to operate a flight safely are also essential participants in an effective CRM process. These groups include, but are not limited to, flight dispatchers, cabin crew, maintenance personnel and air traffic controllers.

### **2.2 CREW RESOURCE MANAGEMENT TRAINING**

- 2.2.1 CRM training is one way of addressing the challenge of optimising human-machine interface and the accompanying interpersonal activities. These activities include team building and maintenance, information transfer, problem solving, decision making, maintaining situation awareness, and dealing with automated systems.
- 2.2.2 CRM training is for the development of knowledge and skills related to human performance. It is based on awareness that a high degree of technical proficiency is essential for safe and efficient operations. However, demonstrated mastery of CRM concepts cannot overcome a lack of technical proficiency. Similarly, high technical proficiency cannot guarantee safe operations in the absence of good CRM.

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<sup>1</sup> FAA AC 120-51E

2.2.3 The recommendations for CRM training programmes in this AC are derived from the coordinated efforts made by representatives from the aviation community. These recommendations provide useful reference for understanding and application of the critical elements in CRM training<sup>2</sup>.

2.2.4 The AOC holder should also refer to AC 121-8-2 for guidance on CRM training for the Airbus A380.

## 2.3 BASIC CONCEPTS OF CRM

2.3.1 While there are various useful methods in use in CRM training today, certain essentials are universal:

- (a) CRM training is most effective within a training programme centred on clear, comprehensive standard operating procedures.
- (b) CRM training should focus on the functioning of crew members as a team, not as a collection of technically competent individuals. Whenever possible, pilots should be graded as a crew, rather than as individuals.
- (c) CRM training should instruct crew members how to behave in ways that foster crew effectiveness.
- (d) CRM training should provide opportunities for crew members to practise the skills necessary to be effective team leaders and team members.

## 2.4 ERROR MANAGEMENT

2.4.1 It is now understood that pilot errors cannot be entirely eliminated. It is important, therefore, that pilots are trained in appropriate error management skills and procedures to prevent as many errors as possible. Since such errors cannot all be prevented, the detection of and recovery from errors should also be addressed during error management skill and procedure training. This follows that during evaluation of pilots, skills in error management (error prevention, detection, and recovery) should be considered.

## 3 COMPONENTS OF CRM

3.1 The topics outlined below have been identified as critical components of an effective CRM training. No matter how effective each curriculum segment is, one-time exposure will not be sufficient. The attitudes and norms that contribute to ineffective crew coordination may develop over a crew member's career. To optimise training effectiveness, CRM should be embedded in every stage of crew training, and CRM concepts should be stressed in line operations as well.

### (a) COMMITMENT FROM MANAGEMENT

CRM programmes 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.

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<sup>2</sup> Refer CAAS AC 121-2-3 Standard Operating Procedures for Flight Deck Crew members.

Flight operations manuals and training manuals should embrace CRM concepts by providing crews with necessary policy and procedure guidance centred on clear, comprehensive SOPs. Central to the CRM concept is communication. It is essential that every level of management supports a safety culture in which communication is promoted by encouraging appropriate questioning. It should be made perfectly clear in the operations manuals, and in every phase of the pilot's training that appropriate questioning is encouraged and that there will be no negative repercussions for appropriate questioning of one pilot's decision or action by another pilot.

(b) INITIAL CRM TRAINING (INDOCTRINATION / AWARENESS)

The AOC holder is to ensure that a crew member undergoes and complete initial CRM training, as part of the introduction training, before the crew member commences line flying. Initial CRM training addresses the nature of the operations of the AOC holder concerned, as well as the associated procedures and it's company culture. This includes areas of operations that produce particular difficulties or involve adverse weather conditions and unusual hazards.

A crew member who has not previously completed the AOC holder's initial CRM training has to complete the initial CRM training course before commencing line flying. The initial CRM training should be completed within a specified period of time after the new crew member has joined the AOC holder. If the crew member has not been previously trained in Human Factors, the crew member should then undergo a theoretical course based on the human performance and limitations programmes for the Airline Transport Pilot License (ATPL) (refer applicable requirements for the issue of Flight Crew Licenses) which should be completed before the initial CRM training.

(c) RECURRENT CRM TRAINING

CRM training is to be included as part of recurrent training. Recurrent CRM training should include modular classroom or briefing room CRM training to review and amplify CRM components, followed by practice and feedback exercises. All major topics of CRM training should be covered over a period not exceeding 3 years.

These topics of CRM training should include the following:

- (i) Human error and reliability, error chain, error prevention and detection;
- (ii) Company safety culture, SOPs, organizational factors;
- (iii) Stress, stress management, fatigue and vigilance;
- (iv) Information acquisition and processing, situational awareness, workload management;
- (v) Decision-making;
- (vi) Communication and coordination inside and outside the flight deck;
- (vii) Leadership and team behaviour, synergy;
- (viii) Automation and philosophy of the use of automation (if relevant to the type);
- (ix) Checklist and briefing;
- (x) Specific type-related differences;
- (xi) Case based studies; and
- (xii) Additional areas that warrant extra attention, as identified by the accident prevention and flight safety programme.

Note:

1. CRM elements should be integrated into all the phases of recurrent training – by all the personnel conducting recurrent training.
2. The AOC holder should ensure that all personnel conducting recurrent training are suitably qualified to integrate elements of CRM into this training.

(d) ACQUIRING A NEW AIRCRAFT TYPE-RATING

If a pilot acquires a new aircraft type-rating, elements of CRM training should be integrated into the transition training. Line Orientated Flying Training (LOFT) with emphasis on CRM should be applied in training for a multi-crew aeroplane. Training involving communications and the use of automation should also be developed for crew who operate aircraft with advanced technology flight decks, or for crew transitioning to such flight decks. Line Operational Simulation (LOS) which incorporates CRM skills can be substituted for CRM training.

(e) COMMAND TRAINING

Human factors aspects of command should be incorporated into the training for a crew member to undertake appointment as a pilot-in-command.

(f) JOINT CRM TRAINING

More and more operators are discovering the value of revising CRM training to reach various employee groups, and sometimes to combine those groups during training. Their objective is to improve the effectiveness and safety of the entire operation team as a working system. Reinforcement can be accomplished in many areas. Training such as joint cabin and flight crew training in security can deal with many human factors issues.

## **4 SUGGESTED CURRICULUM TOPICS**

### **4.1 CRM INTEGRATION**

- 4.1.1 CRM performance requirements or procedures need to be integrated into the AOC holder's SOPs. Specific callouts, checks, and guidance need to be included in normal checklists, quick-reference handbooks, abnormal/emergency procedures, manuals, and job aids. This integration should capture CRM principles into explicit procedures to be used by the flight crew.

### **4.2 CRM AND CULTURE ISSUES**

- 4.2.2 While an individual or a team may perform well under many conditions, they are subject to the influence of at least three cultures - the professional cultures of the individuals themselves, the cultures of their organisations, and the national cultures surrounding the individuals and their organizations. If not recognised and addressed, factors related to culture may degrade crew performance. Hence, effective CRM training must address culture issues as appropriate in each training population.

### 4.3 SUGGESTED COURSE CURRICULUM

Core Elements	Initial CRM Training	Acquiring a new aircraft type	Changing operator	Command course	Recurrent training
Human error and reliability, error chain, error prevention and detection	In depth	In depth	Overview	Overview	Overview
Company safety culture, SOPs, organisational factors		Not required	In depth	In depth	
Stress, stress management, fatigue & vigilance					
Information acquisition and processing situation awareness, workload management		Overview	Not required	In depth	
Decision-making					
Communication and coordination inside and outside the flight deck			Overview		
Leadership and team behaviour synergy					
Automation, philosophy of the use of automation (if relevant to the type)	As required	In depth	As required	As required	As required
Specific type-related differences			Not required		
Case based studies	In depth	In depth	In depth	In depth	As appropriate

## **5 CRM TRAINING AND EVALUATION**

### **5.1 THE CRITICAL ROLE OF INSTRUCTORS AND CHECK PILOTS**

5.1.1 The success of any CRM training programme ultimately depends on the skills of the people who administer the training and measure its effect. CRM instructors, check pilots, supervisors, and course designers 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 instructors, supervisors, and check pilots in many CRM training processes. Instructors, supervisors, and check pilots need special training in order to calibrate and standardise their own skills. The best results occur when the crew examine their own behaviour with the assistance of a trained instructor who can point out both positive and negative CRM performance. Whenever highly effective examples of crew coordination are observed, it is vital that these positive behaviours are discussed and reinforced. Debriefing and critique skills are important tools for instructors, supervisors, and check pilots.

5.1.2 Feedback from instructors, supervisors, and check pilots 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.

### **5.2 CRM EVALUATION**

5.2.1 Any human factors programme should include appropriate evaluation criteria as an integral component. Detailed behavioural measurement is integral to any evaluation, since it is the best index of how individuals apply what they have learned. Behavioural measurement requires the development of objective behavioural markers, which can be externally judged and are relevant to the operating environment. Behavioural markers can be measured both during training as a marker of progress, and subsequently as an indicator of how well the training has transferred.

5.2.2 The flight crew must be assessed on their CRM skills in accordance with a methodology acceptable to CAAS and published in the AOC holder's Operations Manual. The purpose of such assessment is to provide feedback to the crew collectively and individually and serve to identify retraining. The assessment can also be used to improve the CRM training system.

### **5.3 APPROPRIATE TRAINING INTERVENTIONS**

5.3.1 The most effective CRM training involves active participation of all crew members. LOFT sessions give each crew member opportunities to practice CRM skills through interactions with other crew members. If the training is video recorded, feedback based on crew members' actual behaviour during the LOFT, provides valuable documentation for the LOFT debrief.



5.3.2 CRM training can be presented using a combination of the following training interventions:

- (a) AOC holder's in-house courses
- (b) Training centre courses
- (c) Special Purpose Operational Training
- (d) LOFT sessions
- (e) Computer Based Training courses

## **6 CRM INSTRUCTORS**

6.1 The AOC holder is to ensure that all CRM instructors conducting recurrent training are suitably qualified to integrate the elements of CRM into its training.