Crew resource management: improving team work in high reliability industries

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Abstract

The aviation industry recognised the significance of human error in accidents in the 1970s, and has been instrumental in the development of special training, designed to reduce error and increase the effectiveness of flight crews. These crew resource management (CRM) programmes focus on “non-technical skills” critical for enhanced operational performance, such as leadership, situation awareness, decision making, team work and communication. More recently CRM has been adopted by other “high reliability” team environments including anaesthesiology, air traffic control, the Merchant Navy, the nuclear power industry, aviation maintenance, and the offshore oil industry. This review paper describes the basic principles of crew resource management, then outlines recent developments in aviation and other high reliability work environments.

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Introduction

Safety research has shown that human error and team work failures, as opposed to mechanical malfunction, are major causal factors in industrial accidents (FAA, 1998; Hollnagel, 1993; Wagenaar and Groenweg, 1987). The aviation industry recognised this more than 20 years ago (Maurino et al., 1995) and developed human factors training programmes, designed to increase the effectiveness of flight crews, known as crew resource management (CRM) (Wiener et al., 1993). Recently, CRM has been adopted by a number of other professions including the nuclear and offshore power industries, aviation maintenance, air traffic control, the Merchant Navy and surgical medicine. This paper describes the evolution of CRM, then outlines recent developments in aviation and other high-reliability work environments.

CRM in aviation

The motivation for the aviation industry to introduce CRM training for pilots can be attributed to a series of accidents in the 1970s, in which flight crew errors were implicated. For instance, the investigation into the 1977 Tenerife runway collision of two Boeing 747 aircraft operated by KLM and Pan Am with 583 fatalities, identified causal factors relating to low assertiveness, leadership, fatigue, decision making and communication (Weick, 1990). The emergence of CRM can be dated to a National Aeronautics and Space Administration (NASA) workshop in 1979 called Resource Management on the Flightdeck, which examined psychological research into aviation accidents (Cooper et al., 1980). For example, pilots had been interviewed about human factors in crew operations and “pilot error” accidents; and the causes of 62 jet transport accidents between 1968 and 1976 were scrutinised. At NASA-Ames, flight simulator studies on vigilance were beginning to identify cognitive and team co-ordination problems (Ruffell Smith, 1979). Later studies endorsed the need to address these aspects of crew behaviour – an analysis of the causes of civil aviation accidents reported that the crew is the primary cause in over 73 per cent of the accidents studied (Boeing, 1993). Data from cockpit voice recorders confirmed a recurrent
pattern in accident investigation reports – crews were not properly fulfilling their assigned roles on the flight deck. Emerging problems were characterised by failures in both cognitive and social skills, rather than a lack of technical ability. The synthesis of these research findings identified the main human factor causes of air crashes as: failures of interpersonal communication, crew coordination, decision making, and leadership. Consequently, there was now a more widespread recognition within the aviation industry of the need for a type of psychological training which would enhance these non-technical skills. The first generation of CRM was developed, initially by airlines such as United in the USA and KLM in Europe. CRM training was defined by Lauber (1984, p. 20) as “using all the available resources – information, equipment, and people – to achieve safe and efficient flight operations”.

Thus, as Figure 1 shows, CRM attempts to “close the loop” by providing social and cognitive skills training based on evidence from negative events such as accident investigation, as well as positive feedback from research into effective pilot behaviours, and ongoing analysis of successful operational performance. Operational teams function within a particular organisational climate which will affect their performance and assessment of this climate can also indicate where non-technical skills may require strengthening (Holt et al., 2001).

Figure 1 “Figure eight” CRM training model

CRM training is now used by all the major international airlines. A recent survey of International Air Transport Association affiliated airlines indicated that 96 per cent of respondents were running CRM courses. Over 60 per cent of these had been in existence for five years or more (O’Leary, 1999). In Europe, the Joint Aviation Authorities (JAA) require that pilots flying in multi-crew cockpits have been trained in CRM. Different national regulators set particular regulations to comply with the European requirements. For instance, in the UK, the Civil Aviation Authority (CAA) requires that CRM training be carried out annually by commercial pilots (CAA, 1993) and cabin crew (CAA, 1995). There is no standardised methodology for developing CRM training (Salas et al., 1999a), and airlines have been able to develop their own tailored courses, which may be fleet-specific.

The courses are typically classroom based and run for two to three days; the course content usually follows guidelines provided by the regulator (e.g. CAA, 1993; FAA, 1998; JAA, 1998). The topics covered “are designed to target knowledge, skills, and abilities as well as mental attitudes and motives related to cognitive processes and interpersonal relationships” (Gregorich and Wilhelm, 1993, p. 173). As shown in Figure 1, skills are identified from accident analyses, incident reports, training captains’ experience and simulator research studies. Core skills modules in a CRM course typically include:
team work, leadership, situation awareness, decision making, communication, and personal limitations.

CRM training techniques have developed over the last 20 years to address these early criticisms, and they have shifted emphasis from knowledge and attitude training (still used in \textit{ab initio} courses) to skills training (see Boehm-Bavish \textit{et al.}, 2001; Seamster and Keampf, 2001). Teaching methods include lectures, discussions, role play, exercises, case studies, accident analyses, video re-enactments of accident scenarios, and sometimes psychometric testing (personality instruments or peer appraisal). Helmreich \textit{et al.} (1999) described the evolution of five generations of CRM training, reflecting on the problems that have been encountered in changing the attitudes and behaviours of flight crews. The fifth generation of CRM aims to normalise error, and to generate strategies for the management of error.

Refresher training is also required. These are normally half or whole day courses focusing on a specific CRM topic. For flight crews, the CRM skills are practised in flight simulator sessions known as line-oriented flight training (LOFT) and can be assessed in simulator sessions known as line operational evaluation (LOE) or in routine line flight checks. The regulators are now requiring or encouraging formal evaluation of pilots’ CRM skills as part of ongoing training and licence renewal assessments (e.g. CAA, 1998). This requires the use of a robust method for evaluating pilots’ CRM skills and at present no standard technique is available, although major airlines may have developed their own methods (Flin and Martin, 2001; O’Connor \textit{et al.}, 2001). Current European research is testing a prototype behaviour marker system to rate pilots’ non-technical (CRM) skills, called NOTECHS for use in evaluation and training (van Avermaet and Kruijzen, 1998; Hoermann, 2001; Klampfer \textit{et al.}, 2001; O’Connor \textit{et al.}, in press).

\section*{Evaluation of CRM in aviation}

So how effective is CRM in improving aviation safety? According to Salas \textit{et al.} (1999b) the lack of consensus regarding both the content and delivery of training has led to confusion and, in some cases, adoption of theoretical and suboptimal CRM programmes. There are a number of metrics which can be used to test whether the CRM training is having the desired outcome on system safety (see Gregorich and Wilhelm, 1993; Holt \textit{et al.}, 2001; O’Connor \textit{et al.}, 2001; Salas \textit{et al.}, 2001). These are considered in turn, dealing first with the most obvious, objective measure, namely accident data. Then as this can be an unreliable metric in low accident workplaces, several indirect measures have been used to determine whether there has been any improvement in operators’ (i.e. pilots’) behaviours, attitudes or knowledge of CRM concepts which should reduce error and improve safety.

\subsection*{Accident rates}

The ultimate test of a programme designed to improve safety is a reduction in negative outcomes such as accidents. The civil aviation industry has a very low accident rate and hence this is a difficult measure to interpret. Studies in military aviation have indicated that CRM training decreased the accident rate by 81 per cent for US Navy A-6 Intruder crew members (Diehl, 1991). According to Burdekin (2000, p. 10):

The USAF has demonstrated that CRM can be successfully transferred to military operations. Since the introduction of its fully integrated CRM program of training, USAF accident and incident rates have reduced in number, and further measures of CRM assessment presently being introduced are expected to empirically confirm this.

Given the limited availability of conventional safety measures, alternative criteria have been used in aviation to assess the impact of CRM training on pilots’ performance. These are:

\begin{itemize}
  \item crew behaviour on the flightdeck;
  \item attitudes;
  \item learning and motivation showing acceptance or rejection of CRM concepts (Helmreich \textit{et al.}, 1999); and
  \item reactions to the training course.
\end{itemize}

Several anecdotal accounts have also been influential.

\subsection*{Crew behaviour}

The crew’s behaviour can be assessed through observations of CRM skills during routine simulated flights (line-oriented flight training-LOFT), evaluation simulated flights (LOE), as well as in normal flight (Boehm-Davis \textit{et al.}, 2001). In some companies, experienced observers (training/examining pilots) use a
behavioural marker system such as the aviation CRM behavioural markers UT/FAA Line/LOS checklist (Helmreich et al., 1997) to rate the crew or the European NOTECHS marker system (van Avermaete and Kruisjen, 1998) to evaluate the individual pilots’ CRM skills (see Klampfer et al., 2001 for guidelines on the use of behavioural marker systems). Data from this type of audit have demonstrated that CRM training that includes LOFT and recurrent training does lead to desired changes in behaviour (Helmreich and Foushee, 1993). In experimental studies involving military pilots, Salas and his colleagues have consistently found that CRM training can improve performance by 6-20 per cent (e.g. Smith-Jentsch et al., 1996; Stout et al., 1997).

Another example is a study conducted in a European airline (Goetters and Mascke, 2000), that measured CRM skills using the NOTECHS system before and after CRM training. They found a significant increase in observed skills from the four core behaviour categories: co-operation, leadership, situation awareness and decision making.

Attitudes
Another method of assessing the effects of CRM training in aviation is to measure the level of attitudes identified as playing a role in air accidents, before and after CRM training (Helmreich and Foushee, 1993; Helmreich et al., 1993a). Pilots’ attitudes are usually assessed by the Cockpit Management Attitudes Questionnaire (CMAQ (Gregorich et al., 1993)) which is a self-report measure of attitudes related to flightdeck resource management. The items concern communication and co-ordination, command responsibility, and recognition of stressor effects. For each statement in the questionnaire, the degree of agreement is assessed using a five-point Likert scale. An example of a statement is: “A debriefing and critique of procedures and decisions after each flight is an important part of developing and maintaining effective crew co-ordination”. Data from a number of airlines show that attitudes about flightdeck resource management change in the desired direction as a result of CRM training (Helmreich and Wilhelm, 1991; Helmreich and Merritt, 1998).

Learning and motivation
Training evaluation tools should provide feedback on how to improve training (Salas and Cannon-Bowers, 1997) and the degree of learning can be assessed by testing participants on the curriculum. Comparing knowledge levels before and after training provides an indication of which parts of the course have been retained by the participants. Using a multi-choice knowledge test, Salas et al. (1999b) found that although the training did not show an effect on the pilots’ attitudes, it did appear to increase their knowledge of team work principles. Another method of assessing the success of the CRM course is to ask participants the extent to which the training will effect their behaviour when they are actually flying, and to measure the degree to which they thought that the course was useful (Gregorich and Wilhelm, 1993). This is valuable for the trainers in providing feedback on the relevance of the course and gaining knowledge on where improvements can be made. Salas et al. (1999b) reported that military crews which had participated in a CRM course, strongly endorsed the usefulness of the training, and considered it important for mission accomplishment and flight safety.

Reaction data
Evaluating reactions is equivalent to measuring customer satisfaction. This is valuable for trainers in providing feedback on the relevance of the course and insight on where improvements can be made. Studies which measured reactions have generally reported an overall positive evaluation (O’Connor et al., submitted). To illustrate, Taggart and Butler (1989) assessed the reactions of over 2,000 flightdeck crew members to PanAm’s flight operations resource management (FORM) training. Using a paper-based questionnaire it was found that 71 per cent found the seminar to be either very, or extremely useful, and all but 11 per cent indicated that there would be some change in their behaviour on the flight deck.

Anecdotal accounts
These evaluation data are building an evidential foundation that is supporting the airlines’ investment in CRM training. One further source of persuasive evidence has
come from pilots’ own accounts of the importance of their CRM training in preventing accidents and in emergency management. The most cited case is that of the United Airlines McDonnell Douglas DC-10 which suffered a catastrophic engine failure which caused the loss of all three of its hydraulic flight control systems. Captain Al Haynes and his crew, with the assistance of a DC-10 training captain (who was aboard as a passenger), managed to devise a system of reverse thrust with the remaining engines and navigate the plane to a controlled crash landing. Of 296 aboard, 184 survived due to the extraordinary skill and team co-ordination of this flight crew. Captain Haynes (1992, p. 13) later wrote:

I am firmly convinced that CRM played a very important part in our being able to land at Sioux City with any chance of survival. I also believe that its principles apply no matter how many crew members are in the cockpit.

In summary, recent reviews of aviation CRM evaluation studies (O’Connor et al., 2001, submitted; Salas et al., 2000) show that while the data are still limited, the evidence to date is generally favourable. As a consequence, other high reliability organisations that require operational teams to perform with low error rates, under potentially demanding conditions have also become interested in CRM training (see Salas et al., 2001). CRM-type courses are now being developed by a number of other professions including aviation maintenance, air traffic control, cabin crew, medicine, the Merchant Navy, the nuclear power industry, and teams on offshore oil and gas installations. The application of CRM to these industries will be briefly outlined below.

**Other aviation applications**

**Aviation maintenance**

As with CRM for pilots, the motivation for the air maintenance industry to address human factors came from accidents which implicated human error as the primary cause. The FAA’s Office of Aviation Medicine has been sponsoring research on human factors in aviation maintenance and inspection for over eight years (Shepherd and Johnson, 1997). This programme was prompted by an accident on 28 April 1988 when an Aloha Airlines 737-200 experienced an explosive decompression and structural failure at 24,000ft, while en-route from Hilo, to Honolulu, Hawaii. The National Transport Safety Board (NTSB) attributed the probable cause of this accident to the failure of the Aloha Airlines maintenance personnel to detect the presence of significant disbonding and fatigue damage which ultimately led to failure of a joint in the fuselage. It was further concluded that the management failed to recognise the human performance factors of inspection (NTSB, 1989).

The human performance in maintenance course, developed by Transport Canada, is designed around the “dirty dozen” causes of maintenance error identified by Dupont (1997). These are the 12 most common causes of judgement errors which result in a maintenance failure and include lack of communication, stress, fatigue, complacency, distraction, lack of team work. They are addressed in the two-day training course with a syllabus that includes the use of video case studies followed by group discussion and active learning modules employing group problem solving exercises. Taylor (1998) found some evidence for an improvement in both occupational injury and aircraft damage in the aviation maintenance industry as a result of receiving human factors training. He has also produced convincing evidence of an impressive return on investment (ROI) from airline maintenance resource management training reducing costs of lost time incidents (Taylor, 2000).

**Air traffic control**

Although air traffic control systems are generally very reliable, when an incident does occur, it almost always involves human error (Kirwan et al., 1999). It has been proposed that human error contributes to as much as 90 per cent of incidents (FAA, 1990). Following a series of near misses between aircraft, in late 1988, the Canadian Aviation Safety Board (CASB) conducted an investigation of the safety aspects of their air traffic control. A detailed review was conducted on 217 occurrences and it was found that human factors were contributory in 88 per cent of incidents. These included problems in vigilance, communication and situation awareness (CASB, 1995). To address the human errors in air traffic control, the FAA catalogue of training (http://www.
Cabin crew
In the crash of a British Midland Boeing 737-400 in Kegworth, UK, in 1989, the pilots erroneously shut down the wrong engine after an engine fire. It transpired that the cabin crew had known which engine was on fire, but this information was not communicated to the pilots (Air Accidents Investigation Branch, 1990). To address some of the identified crew failures in this and similar accidents, CRM training was introduced for cabin crew (CAA, 1995). Recommended CRM training topics for them include: personality awareness, human error and reliability, automation, information acquisition and processing, situation awareness, workload management, stress, fatigue and assertiveness (JAA, 1998).

Non-aviation applications
The Merchant Navy
On average, about 370 merchant vessels are lost at sea each year (Helmreich et al., 1993b). In an analysis of 100 accidents at sea, Wagenaar and Groeneweg (1987) found that only four accidents occurred without any preceding human error. The Danish company, Maersk, introduced CRM for ships (often called Bridge Resource Management) in 1994, and has been running drilling rig CRM since 1997. According to Byrdorf (1998), incidents and accidents in the Maersk shipping company have decreased by a third from one major accident per 30 ship years in 1992 (before the introduction of CRM training) to one major accident per 90 ship years in 1996 (after the introduction of CRM training). In addition, at the beginning of 1998 all insurance premiums were lowered by 15 per cent. They attribute this reduction in accidents and incidents to the CRM and simulator training. The course consists of a four-day classroom course followed by three days sailing in a ship simulator. The topics covered in the course include: resource management, assertiveness, communication, team work, and stress coping. Various training centres around the world now offer bridge resource management courses, and attempts are being made to evaluate the development of key skills, such as shared mental models (Brun et al., 2001).

The nuclear power industry
In recent years, the nuclear power industry has recognised the importance of integrating non-technical and team skills training with the technical training given to its control room operators (Harrington and Kello, 1993). Both the Three Mile Island and Chernobyl nuclear plant disasters were caused by a combination of human and mechanical failures (Gaddy and Wachtel, 1992). Consequently CRM training courses have been designed, such as the human performance foundation course which is used to provide human factors training to control room staff in British Energy, a nuclear power company. Their course is based on the British Airways CRM course and consists of eight topics: operational conduct, health at work, decision taking, situation awareness, choosing behaviour, feedback, communication, and team skills. The facilitators make use of incidents reported by the industry, and videos made in-house to facilitate discussions. Due to a successful response from participants, the human performance foundation course is being delivered to all operations staff, not only control room operators (Belton, 2001).

This type of training is not only being carried out in the UK, similar CRM courses using simulators have been used in nuclear power utilities in the USA and France. The Institute of Nuclear Power Operations (INPO) has developed a generic 28-hour training course for improving team work in the control room (although facilitators are encouraged to modify the material to teach
other plant personnel). The course is designed to improve performance in communication, inquiry, advocacy, leadership, conflict management, and critique performance (Institute of Nuclear Power Operations, 1993). No evaluation data appear to have been published from these courses.

**Medicine**

As in the cockpit, personnel in the hospital operating theatre must function effectively as a team. The human interface problems found to be responsible for the majority of accidents in aviation are similar to those in the operating room (Helmreich, 2000). Explorations of incidents in anaesthesiology have found that between approximately 70 per cent (Williamson et al., 1993) or 80 per cent (Kumar et al., 1988) of medical mishaps made by anaesthetists were due to human error. In a survey of anaesthetists, McDonald and Peterson (1985) found that 24 per cent admitted to committing an error with lethal consequences. Helmreich and Schaeffer (1994) state that a large proportion of errors in surgical medicine are due to human factors issues relating to communication, decision making, interpersonal conflict, and team work.

The major drive for human factors training in medicine has come from anaesthetists, however, surgeons are becoming increasingly involved (Helmreich and Merritt, 1998). A human factors training course called anaesthesia crisis resource management (ACRM) has been developed in the USA (Howard et al., 1992). This includes brief instructional sessions, but it is primarily made up of a set (lasting several hours) of highly realistic simulation scenarios, each followed by a detailed debriefing session which includes reviewing videotapes of the simulation session. The course addresses medical and technical issues relevant to the simulated scenarios, but it concentrates on basic generic principles of anaesthesia crisis management. These include: leadership, team work, distribution of workload, communication, use of all available information and resources, and constant re-evaluation of the clinical situation (Howard et al., 1992). Anaesthetists at the Scottish clinical simulator have developed a similar course called crisis avoidance resource management (CARMA). With regard to evaluation of the impact of such programmes, research evidence is limited. According to Davies (2001, p. 278):

A worthwhile start has been made in the application of aviation CRM to medicine, although to date the evidence that such programs have more than short term effectiveness is similar to that from the early days of aviation CR.

**The offshore oil and gas industry**

The offshore oil and gas industry provides many of the task demands encountered by the teams discussed above. The first use of CRM-type training was mainly focused on emergency management. A short CRM course was used by Shell Expro for human factors training during a programme of offshore control room operator competence assessments and emergency response training (Flin, 1995). A similar set of modules were devised for their offshore installation managers and emergency response teams (Flin, 1996). Courses have also been introduced in the Norwegian oil industry; such as Elf Petroleum Norge's CRM course called emergency resource management (Grinde, 1996).

Given the experience in other industries that CRM had a wider application, namely to accident prevention during routine operations (as well as emergency response), a prototype CRM course for offshore platform crews was devised (Flin et al., 2000). The following section describes briefly how this course was designed and evaluated.

**Designing and evaluating a CRM course**

Designing a CRM course involves a standard training design processes (Goldstein and Ford, 2002; Patrick, 1992), starting with defining the training objectives, identifying the component skills, deriving the training content, designing the actual course and the evaluation methods (Seamster and Keampf, 2001; Helmreich et al., 1990). It is also recommended that organizational climate data are reviewed (Boehm-Davis et al., 2001).

An analysis of human factors causes of accidents, workforce safety climate surveys and related offshore research (e.g. Bryden et al., 1998; Flin and Slaven, 1996; Mearns et al., 1997; O’Dea and Flin, 2001) enabled the development of a prototype taxonomy of non-technical skills for CRM
training offshore (Flin and O’Connor, 2001) falling into six categories:

1. **Situation awareness:**
   - plant status awareness;
   - environmental awareness;
   - anticipation;
   - concentration/avoiding distraction;
   - shared mental models.

2. **Decision making:**
   - problem definition/diagnosis;
   - risk and time assessment;
   - recognition primed decision making/ procedures/analytical;
   - option generation/choice; and
   - outcome review.

3. **Communication:**
   - assertiveness/speaking up;
   - asking questions;
   - listening;
   - giving appropriate feedback;
   - attending to non-verbal signals.

4. **Team working:**
   - maintaining team focus;
   - considering others;
   - supporting others;
   - team decision making;
   - conflict solving.

5. **Personal resources:**
   - identifying and managing stress;
   - reducing/coping with fatigue;
   - physical and mental fitness.

6. **Supervision/leadership:**
   - use of authority/assertiveness;
   - maintaining standards;
   - planning and co-ordination;
   - workload management.

An offshore CRM course was designed on the basis of these core non-technical skills (see Flin and O’Connor, 2001, for details). It consisted of an introduction to CRM and six work packages:

1. situation awareness;
2. decision making;
3. communication;
4. team work;
5. fatigue and shift work;
6. stress.

The course was delivered onshore over two days, using lectures, practical exercises, case studies, and video clips. As in aviation, accident and near-miss statistics were not found to be useful in assessing the effect of CRM training, as they were too low to be interpretable for training evaluation.

Therefore, an alternative evaluation approach was used which consisted of several methods of assessment:

- **Course feedback questionnaire.** Feedback was obtained regarding the relevance, interest, standard of teaching, exercises, videos, and hand-outs from the 104 offshore personnel who participated in the course. Although the feedback was generally positive, it was recognised that there was a need to place further emphasis on skills, rather than the theoretical background.

- **Attitude questionnaire.** An attitude survey was administered before and after the training course. The questionnaire was based on the CMAQ (Gregorich et al., 1993). It consisted of 30 statements relating to communication, decision making, situation awareness, and personal limitations; rated with a five-point Likert scale. No significant differences were found between attitudes before and after the training course. A possible explanation for the lack of an effect, is that participants were found to have positive attitudes towards the CRM concepts at the onset of the training, which were broadly similar to those of pilots, post-CRM training (Helmreich and Merritt, 1998). Many of the course participants were already knowledgeable about various aspects of the CRM course. In fact, this company had already run CRM-type training for emergency management (see above) which may have contributed to this result.

- **Accident scenarios.** The participants’ explanations of the possible causes of two written accident scenarios were classified on the basis of the non-technical skills framework depicted in the bulleted list on this page. The majority of the causes could be classified in one of the categories, with very few explanations categorised as non-human factors. There was a tendency for participants to offer a larger number of possible explanations for the incident after the training, with an increase in the number of explanations classified as situation awareness, decision making, communication, and supervision. Thus, there is some tentative evidence of the effect of the training with a slight increase in the frequency of human factors explanations. The use of accident scenarios to evaluate CRM
training has also been used for air traffic controllers (Andersen and Bove, 2000). CRM training offshore is still in its infancy, however the evidence does suggest that it should help to address non-technical skills which contribute to safe and efficient performance in this environment.

Conclusion

The development and global implementation of CRM programmes by the aviation industry represents one of the most significant examples of team performance research being translated into policy and practice. The main endeavour now in aviation CRM is to develop robust methods of ensuring that what is taught in CRM courses actually transfers to the flightdeck and ultimately improves operational performance (Holt et al., 2001; O’Connor et al., 2001; Salas et al., 2000). In military aviation, there are new initiatives to ensure that selection procedures for pilots test for CRM skills (Hedge et al., 2000) and formal checking of CRM skills may be incorporated into commercial pilot licencing at some future date. The widespread adoption of CRM training by other high reliability industries is encouraging, but while the principles of CRM are applicable to many team work situations, if a CRM training programme is to be successfully adapted, the training materials must be customised for the particular domain, on the basis of the requisite psychological research.

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