Cabin crew expected safety behaviours: Development and evaluation.

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Introduction

Within the airline industry, expected safety behaviours or non-technical skills, are being increasingly used to assess or observe flight crew CRM performance. While human factors and CRM programs are well established components of cabin crew training, airlines are yet to identify the non-technical skills required of cabin crew to successfully manage safety critical tasks and situations. In addition, there is a lack of data on how cabin crew avoid, manage and recover error.

Expected safety behaviours are generally thought of as observable, non-technical behaviours that contribute to effective performance within a specific work environment. They are usually structured into categories, and the categories are constructed of several elements or behaviours. An element or behaviour should describe a specific, observable behaviour, and demonstrate a causal relationship to performance outcome. Behavioural markers can enable CRM performance measurement and assessment, and can also be used to build performance databases to identify norms and prioritise training needs, including the evaluation of training programs (Klampfer et al., 2001)

Behavioural marker systems are becoming increasingly accepted as a legitimate means of measuring individual and team performance in a range of high reliability contexts, most notably aviation (Flin & Martin, 2001), nuclear power (O’Connor, Flin & O’Dea, 2001) and medicine (Fletcher, McGeorge, Flin, Glavin & Maran, 2002). In the aviation industry, three research groups have led the push for behavioural markers systems.

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In Europe, the Joint Aviation Authority has produced the NOTECHS (Non-Technical Skills) framework, motivated by Joint Aviation Requirements (JAR) which mandate the training and assessment of pilot’s CRM skills. NOTECHS is an amalgamation of existing airline behavioural markers systems to measure non-technical skills.

In the United States, the University of Texas has recently developed the Line Operations Safety Audit (LOSA) program to provide a new platform to collect data. LOSA utilises trained observers to collect data about flight crew behaviour on normal flights under non-jeopardy conditions. Observers record potential threats to safety and how the flight crew detect, recover and manage errors (Helmreich, Klinect, & Wilhelm, in press).

The Gottlieb Daimler and Karl Benz Foundation launched the GIHRE (Group Interaction in High Risk Environments) aviation project to validate the existing behavioural markers for CRM assessment under conditions of high workload. Comparisons between the NOTECHS and LOSA behavioural markers will identify which behavioural markers differentiate best between effective and ineffective crews under high workload (Klampfer et al., 2001).

In addition to the three projects described above, a number of airlines have developed their own behavioural marker systems for training and assessing flight crew skills (see Flin & Martin, 2001, for a review). For example, Qantas Airways assess CRM expected behaviours as part of their Advanced Proficiency Training (APT) project.

However, methodological guidelines for the development of behavioural markers are lacking. For example, the NOTECHS system has been developed based on an amalgamation of existing marker systems amongst various European carriers. A number of airlines have developed their own behavioural markers using of a variety of informal methods and techniques. It appears that studies using established, valid and reliable processes such as cognitive task analysis or critical decision techniques are required (eg., Hoffman, Crandall, & Shadbolt, 1998).

Furthermore, there does not appear to be any published research into the development of behavioural markers for cabin crew, despite cabin crew CRM training being mandated in many countries. Numerous investigation reports reinforce the need for cabin crew to take appropriate action to deal with non-normal inflight situations. The handling of these calls for
knowledge, skills and abilities quite different from those associated with the provision of normal service duties, yet there is no consensus on which skills are needed for effective cabin crew CRM or how to train CRM behaviours (ICAO, 2002).

A behavioural marker system for cabin crew is also on the regulatory agenda in Australia. Unlike other countries, human factors training and assessment has not been mandatory for Australian air carriers. Recently the Australian Civil Aviation Safety Authority (CASA) released an Advisory Circular which details a plan for regulating human factors training for flight and cabin crew based on a competency-based framework, including the identification of competency standards and behavioural markers. Therefore, the development of a behavioural marker system for Qantas cabin crew is expected to not only meet this requirement, but lead the wider industry towards this type of program. A practical, proven methodology to identify and assess cabin crew behaviours would be beneficial to the wider industry in the form of guidance material.

Method
Participants
The participants consisted of eighty Customer Service Managers (CSMs). CSMs are responsible for supervision of cabin crew, and administration of cabin service (known as Pursers or Cabin Supervisors in some airlines). The CSMs were a mixture of short haul (54%) and long haul (46%) from various bases across Australia. They had spent an average of 7.5 years as a CSM (range = 1-25yrs, s = 6.2yrs), and the mean age was 42 years (s = 7.0yrs).

The criteria for participation were that the person must be a CSM, and that they could discuss, in detail, a recent safety-related event that was challenging. The interviews were conducted by six interviewers, who were also CSMs. Although their main role was interviewing, these six team members also helped with data analysis and development of the expected safety behaviours, and acted as expert practitioners for the project because of their large domain knowledge of cabin safety issues.
Design

The variables of home base location (Sydney, Melbourne, Brisbane, Perth) and operation type (short or long haul) were controlled to ensure the CSMs proportionally represented the Qantas operation.

The interview process was based on Klein’s Critical Decision Method (CDM) (Klein, Calderwood & McGregor, 1989), which is a variant of Flanagan’s (1954) Critical Incident Technique. Flanagan states that the Critical Incident Technique can be applied for a variety of situations and uses in aviation including; measuring typical performance and evaluating safety behaviour, measuring proficiency in a check and training situation, and measuring training program effectiveness. These are three areas that the Expected Safety Behaviours project may eventually cover at Qantas.

The CDM is a retrospective interview strategy that applies a set of cognitive probes to non-routine incidents that requires expert (CSM) judgement or decision making (Klein et al., 1989). A semi-structured interview format is used to probe different aspects of the decision process. The CDM is effective in revealing expert’s knowledge, especially tacit knowledge, reasoning and decision strategies (Hoffman, Shadbolt, Burton & Klein, 1995). The reliability of the procedure is based on the idea that experts have clear memories of salient or unusual safety-related incidents (Hoffman et al., 1995). This method of knowledge elicitation has been used successfully in a variety of naturalistic environments (see Simpson, 2001 for a review), and it is now established as a valid and reliable method of cognitive task analysis and knowledge elicitation (Hoffman, Crandall & Shadbolt, 1998; Taynor, Crandall & Wiggins, 1987).

Procedure

The procedure for employing CDM is well documented (Klein et al., 1989; Hoffman et al., 1998), but the basic steps used in the interviewing process included:

1. Incident selection - CSMs select a recent, non-routine incident that was challenging;
2. Obtain an unstructured recall of the event;
3. Establish the sequence of decision events and constructs a time line;
4. Identify specific decisions that were made;
5. Probe decision points to identify effective decisions and resultant behaviours;
6. The interviewer chooses several decision points, and asks hypothetical questions;
7. Standard case study - CSMs are provided with a standard case study and repeat steps three to six as if they were the CSM on-board that aircraft.

Participants were informed that the interviews were anonymous. Interviews were conducted in a quiet office and tape-recorded (if permission was granted). Most interviews lasted for 1.5 – 2 hours; requiring at least one hour for the first critical incident, and half to one hour for the repeated case-study incident. Verbatim transcripts were made from the tapes.

The second stage of the study involved the coding of the interviews and development of the Expected Safety Behaviours. The procedure consisted of a number of stages (only stage 1 and 2 have been completed):

1. Initial coding of the transcripts to develop behavioural markers;
2. Improve the structure and markers with feedback from CSM team;
3. Analysis of survey data and behavioural markers by general Qantas CSM population, including rating the importance of each behavioural marker;
4. Attain a frequency count of behavioural marker elements occurring in each incident;
5. Construct a risk matrix of behavioural markers (frequency occurring vs importance), based upon the results from steps 3 and 4; and
6. Produce a master list of Expected Safety Behaviours.

**Results and Discussion**

The following results are only preliminary, and are subject to change as the project progresses. The majority of critical incidents recalled by CSMs were categorised under seven headings (see Fig 1). Almost half of the incidents were related to disruptive or drunk passengers (20%), in-flight medical emergencies (17%), and security/terrorism threats (12%). The large number of security/terrorism threats has only occurred since Sept 11th. It is interesting to note that so many safety issues revolve around aircraft door and slide issues (10%). Aircraft Technical issues (8%) refer to problems such as aborted take-offs, engine problems, and cockpit and cabin equipment malfunctions.

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1 The standard case study was a real Qantas incident involving smoke and fumes in the cabin, with many CRM issues and problems.
The break down of all Qantas’ reported cabin safety incidents for the one year period Jan 2001 to Feb 2002 is proportionally similar to those of this study. For example, the main reported incidents were passenger behaviour (24%), medical (16%), door/slide issues (5%), smoke/fumes (18%), and turbulence (1%) (Qantas, 2002).

![Figure 1. Type of Critical Incidents Recalled](image)

The initial coding of interviews has revealed eight expected safety behaviour categories, each with multiple expected safety behaviour elements and behaviours. These are listed in Table 1. Whilst the expected safety behavioural categories are fairly stable, the elements and behaviours are only preliminary and are subject to further refinement and development.

<table>
<thead>
<tr>
<th>Expected Safety Behaviour Category</th>
<th>Expected Safety Behaviour Element / Behaviour</th>
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<tbody>
<tr>
<td>Situation Awareness</td>
<td>• Demonstrates awareness of flight phase</td>
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<td></td>
<td>• Considers political &amp; cultural context</td>
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<td></td>
<td>• Considers time constraint</td>
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<tr>
<td></td>
<td>• Recognises higher safety goals and priorities</td>
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<td></td>
<td>• Anticipates decision consequences</td>
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<td></td>
<td>• Develops contingency plans</td>
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<tr>
<td>Resource Management</td>
<td>• Identifies &amp; utilises all resources</td>
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<tr>
<td></td>
<td>• Gathers information</td>
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<tr>
<td></td>
<td>• Critically analyses information</td>
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<tr>
<td></td>
<td>• Confirms common understanding</td>
</tr>
<tr>
<td></td>
<td>• Prioritises tasks</td>
</tr>
<tr>
<td></td>
<td>• Confirms common understanding of information</td>
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### Future Stages - Stage 1

The main product to be developed from the Cabin Crew Expected Safety Behaviours project is a master list of expected safety behaviours (as per Table 1). These are to be used in training of cabin crew, and for the evaluation of human factors and CRM skills.

In the short term, the interview transcripts can also be used as training aids. There are now eighty Qantas-specific incidents that can be used as case studies and examples for cabin crew training and education. Because the incidents focus on the cognitive aspects of the situation, they are an excellent training aid for teaching expert skills and behaviours to novices.

The safety behaviours could also be used in recruitment of cabin crew. Potential staff could be recruited against the actual safety behaviours and skills required by Qantas.

| Information Feedback | • Critically analyses information  
|                     | • Provides timely feedback to those who need to know  
| Operational Understanding | • Demonstrates knowledge of BAK  
|                     | • Understands authority/duty of CSM  
|                     | • Understands authority/duty of others  
| Passenger Management | • Assesses pax (boarding or in-flight)  
|                     | • Monitors potentially threatening pax behaviour/condition  
|                     | • Acts decisively to modify pax behaviours/condition  
|                     | • Considers pax well-being  
|                     | • Presents a calm, controlled image to pax  
|                     | • Diffuses situation in a non-confronting manner  
|                     | • Minimises cabin disruption  
| Crew Management | • Assesses crew  
|                     | • provides onboard coaching and training to modify behaviour  
|                     | • Considers crew well-being  
|                     | • Considers impact of non-routine events on crew performance  
|                     | • Allows and provides crew debrief  
| Negotiation & Influencing skills | • Consults with others to develop a common strategy  
|                     | • Manages upwards – identifies problem  
|                     | • Manages upwards - expresses concern  
|                     | • Manages upwards - provides options  
|                     | • Manages upwards - uses emergency language  
| Workplace Safety | • Personal safety  
|                     | • Hazard awareness  
|                     | • Monitors potentially threatening work conditions  

cabin crew, rather than against generic industry requirements, ensuring that only the most suitable applicants are selected.

**Future stages - Stage 2**
In the longer term, the expected safety behaviours can be used in a similar manner to the way in which they are used for cockpit crew – the evaluation of CRM and non-technical skills in training.

However, the greatest challenge is moving the evaluation and observation of safety behaviours out of the training environment and into normal line operations, in the form of a cabin crew LOSA program. There are many issues and problems to overcome before in-flight cabin observations can take place. Such problems include:

- Cabin environment is not as contained as a cockpit.
- Double deck aircraft.
- All information goes through CSM.
- Observers are more obtrusive in cabin.
- Errors tend to be less consequential in the cabin.
- Impact on customers & service.
- Multiple crew to observe.
- Less external threats to inflight safety in the cabin.

Check and training for technical skills has been an accepted practice for decades. Further, CRM and non-technical skills audit and evaluation is gaining acceptance in the cockpit, and a cockpit LOSA program is running at Qantas. As yet, no airline has committed to a LOSA-style program for cabin crew. To our knowledge, the proposed Qantas project is the first attempt to apply this program within the cabin environment.

**Summary and Conclusion**
Expected safety behaviours are being increasingly used to assess or observe flight crew CRM performance. Safety and human factors programs are now well established components of cabin crew training, but the non-technical skills required to successfully manage safety critical tasks and situations have not yet been identified. This paper described a two-part research project being undertaken within Qantas Airways to address this lack. Stage 1 involved the application of the Critical Decision Method protocol to identify successful decision making skills and expected safety behaviours
amongst experienced cabin crew (CSMs). Seven main categories were developed. Stage 2 of the project may involve the implementation of the flight crew LOSA-style program within the Cabin Crew environment, utilising the expected safety behaviours developed in Stage 1. The applicability of LOSA for cabin crew operations as well as the logistical and practical challenges of planning and implementing normal operations monitoring for cabin crew are still major issues to be resolved.

References


