

### Developing a Non-Technical Skills Training Program: A Case Study Approach

#### Overview

1. **Aim.** The intent of this appendix is to provide guidance for high and low capacity regular public transport (RPT) airlines on implementing the recommendations of CAAP SMS-3(1). A hypothetical low capacity RPT airline is used to illustrate the main steps required to establish an effective non-technical skills training and assessment program.
2. In particular, the appendix provides practical guidance on how to:
  - generate management and organisational commitment to non-technical skills training;
  - identify non-technical skills training needs within your organisation;
  - develop and conduct awareness training;
  - collaborate with other organisations and agencies to improve training content and reduce the costs of training; and
  - develop a schedule for the implementation of non-technical skills training.
3. To maximise alignment with the operational environment this guidance has also been shaped by advice from Brindabella Airlines.
4. A key reference is: *Safety at the sharp end: A guide to non-technical skills* by Rhona Flin, Paul O'Connor and Margaret Crichton, published by Ashgate in 2008.
5. **Assumptions.** There are a number of assumptions to be considered when reviewing this Appendix:
  - The case study presented herein is intended to provide broad guidance. This Appendix should **not** be considered as a strict template to meet the recommendations of CAAP SMS-3(1). Rather, any training program developed by operators should be designed to meet their own specific needs.
  - For the purpose of this case study a Maintenance Controller was utilised as part of the Airline's internal team for development and implementation of non-technical skills training. While the human factors training requirements for maintenance personnel/organisations are covered by their own regulations, for some airlines a collaborative approach may be a more efficient and cost-effective. It may avoid unnecessary duplicated processes when developing human factors and non-technical skills training programs across the airline.
  - It will take time to develop and implement a non-technical skills training and assessment program. For an operator without existing training in non-technical skills, a period of three years is considered a reasonable timeframe for phased implementation that relies mainly on in-house expertise to develop and deliver training to the recommended level.

- Timelines are adjustable. For the purposes of this case study, it is assumed that the low capacity RPT airline does not conduct non-technical skills training at present. Of course, most aviation operators will have some non-technical skills training (e.g., crew resource management (CRM)) incorporated within the existing training program. Therefore, the timelines given in the case study for the development of a non-technical skills training program should be shortened for operators who already meet some of the CAAP SMS-3(1) recommendations.
- Similarly, an operator that outsources components of the development, delivery and/or assessment of non-technical skills training to external specialist providers should also be able to reduce the timeline for reaching the recommended training and assessment goals.
- Training has three main developmental phases. Typically, non-technical skills training commences with awareness training, perhaps a two-hour session highlighting the importance of human and organisational factors to performance and safety by showcasing relevant case studies. A training needs analysis would assist in identifying areas for the next phase: more specialised knowledge development. These topics might be incorporated into a two-day training course tailored for particular occupations within the organisation (traditional CRM training courses for pilots are consistent with this approach). Once this knowledge has been assessed as having been assimilated by relevant personnel, a skills-based training phase can be implemented (for select staff – see Section 2 of CAAP SMS-3(1)).
- Training will be implemented gradually. Consistent with the three-phase hierarchy of training outlined in CAAP SMS-3(1) – awareness, knowledge, skills – non-technical skills training should be implemented in a staggered way to allow consolidation of learning, gradual attitudinal and behavioural change, and increasing integration of knowledge and skills into operations.
- Training should be integrated. There is considerable scope for the non-technical and technical aspects of aviation operations to be integrated into a consolidated training program (and associated training manuals). Such complementary training will more closely reflect the performance requirements of actual operations.
- Training will be continuously modified. The assessment and evaluation of training will help to ensure that training is regularly updated and that its effectiveness is constantly improved. There are many ways to evaluate training, from verbal feedback to sophisticated behavioural rating systems.

### **‘Blue Gum’ Airline**

6. To provide a narrative flavour to this appendix, a fictitious airline will be used to discuss typical issues and challenges facing an airline that is developing a program of non-technical skills training and assessment.

7. *Blue Gum* Airline is a low capacity airline that conducts regular public transport operations between major capital cities and regional communities. Table 1 provides an overview of the personnel and aircraft within *Blue Gum* Airline.

**Table 1: Blue Gum Airline Personnel and Aircraft**

<b>Business area</b>	<b>No.</b>	<b>Description</b>
<b>Aircraft</b>	2	BAE Jetstream 41 (multi-crew)
	3	Fairchild Metro (multi-crew)
	1	PA-31 Navajo (single pilot)
<b>Executive</b>	1	Managing Director
	1	Chief Executive Officer
	1	Chief Operating Officer
	1	Chief Pilot
	2	Fleet Manager
	2	Maintenance Controller
<b>Full-time Operational Personnel</b>	1	Operations Manager
	1	Manager – Safety & Standards
	1	Document Controller
	29	Multi crew pilots (14x Captains; 15x First Officers)
	4	Cabin Crew
	2	Baggage Handlers
	7	Administrative Staff (e.g. Ticketing, Accounts)
	3	LAME
	4	AME
4	Apprentices	
<b>Part Time (Casual)</b>	3	Cabin Crew (casual)

### **Stages in Developing a Non-technical Skills Training and Assessment Program**

8. **Ensuring management commitment.** In their weekly operations meeting, the company executive discussed the new CAAP SMS-3(1) and identified there were important training implications. The potential value of non-technical skills training to performance and safety standards was acknowledged. The executive decided to establish a training development team that would plan and coordinate the company’s response to the CAAP SMS-3(1) recommendations. Executive guidance was that *Blue Gum* Airline would maximise the use of internal resources to develop and mature their non-technical skills training program, with selective use of specialist capabilities when appropriate.

9. **Establishing a training development team.** Publicity and discussions across the airline about the intention to establish a training development team ensued. A week later, the team was established with the following members: the Chief Operating Officer, the Manager Safety and Standards, and a pilot (First Officer) who was nearing the end of graduate certificate studies in aviation human factors at an Australian university and who was very keen to be involved. The Manager Safety and Standards was appointed team leader and was provided with formal authority and a budget to develop a non-technical skills training and assessment program for *Blue Gum* Airline.

10. **Preparatory reading.** The Training Development Team began to ‘read themselves into’ the task. The following resources were perused or studied (information in brackets indicates the time required):

- Review CAAP SMS-3(1) in detail, including the appendices (3 hours).
- Overview relevant information within the CASA Training Resource *Safety Behaviours: Human Factors for Pilots* (3 hours).
- Review CAAP 5.59-1(0): *Teaching and assessing single-pilot human factors and threat and error management* (2 hours).
- Study the reference *Safety at the sharp end: A guide to non-technical skills*; Chapters 9-11 (6 hours).

11. **Identifying training needs.** The training development team recognised that a training needs assessment with respect to non-technical skills was a crucial early step. As Flin et al (2008) noted:

*“... a good training needs assessment will pay dividends when it comes to designing the training. There is no point in developing a training course that does not address the needs of a given job and ultimately the needs of the organisation, because it was based upon a poor training needs assessment. This is a waste of time, resources and money. Further, the opportunity for developing a worthwhile training course is lost”* (p. 244).

12. **Clarifying training goals.** The training development team realised that it was premature to conduct a ‘gap analysis’ between present levels and desirable levels of knowledge and skill across their organisation because they had not yet determined what these desirable levels would be. At the next Executive meeting, the Chief Operating Officer sought guidance about the ultimate goals of training. It was decided to examine the Safety Management System for key indicators of non-technical skills that could be used to quantify skill levels. A parallel task to identify the skill domains of relevance to the main occupational groups listed in Table 2 was commenced. Common tools and techniques used to identify non-technical skills are listed in Section 4 of CAAP SMS-3(1).<sup>1</sup>

13. **Conducting the training needs assessment process.** The training development team decided to use questioning techniques and event-based analyses to determine training needs. The Chief pilot and one of the Maintenance Controllers were tasked to review the organisation’s safety incident reports, particularly for known hazards, risks and risk controls related to non-technical skills. The Chief pilot and Maintenance Controller also sought advice from the Human Factors section within CASA and the Australian Transport Safety Bureau (ATSB) website (<http://www.atsb.gov.au/>) about accident/incident analyses for similar operators in Australia. Discussion with Safety Managers from other low capacity airlines regarding the status of their non-technical skills training and their proposed way forward to address CAAP SMS-3(1) was also undertaken.

14. A consultant was engaged to conduct interviews with senior personnel and focus groups with the main occupational groups within the airline. The consultant not only provided expertise in these questioning techniques, there was a general perception of impartiality that appeared to encourage frank disclosure and discussion. Four focus groups were conducted (two pilot groups; 1 maintainer group; and 1 miscellaneous group) over two days. A report was delivered by the consultant that summarised the key training themes that emerged from the interviews and focus groups.

15. The training development team used the consultant’s report, the analysis of company incident reports, feedback from other airline safety managers, CASA and the ATSB website, and their own experience with external CRM training to develop a list of training needs in a rough priority order.

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<sup>1</sup> These techniques are discussed in detail in Chapter 9 of Flin et al.

16. **Holding a strategic ‘stakeholder commitment’ workshop.** A one-day workshop was then developed to engage and inform key company personnel about the emerging non-technical skills training program. Attendees at the workshop were:

- Managing director
- Chief Executive Officer
- Manager Safety and Standards (Facilitator)
- First Officer (Secretary)
- External consultant (Co-facilitator)
- Maintenance Controller x 1
- Chief Pilot
- Fleet Managers x 2
- Aircraft Captain x 2
- First Officers x 2
- Senior Cabin Crew x 1

17. Components of the workshop were:

- a review of CASA SMS CAAP SMA-3(1) and its implications and potential benefits for Blue Gum Airline;
- a review of key issues and challenges drawn from the reference material examined by the training development team;
- a summary of relevant findings from internal and external safety incident databases and accident investigation reports;
- a presentation by the consultant who conducted interviews and focus groups about the findings;
- facilitated syndicate discussions to define training needs and challenges within the company; and
- a central discussion forum to develop consensus about the way ahead in terms of developing and implementing the non-technical skills training and assessment program.

18. **Identifying the developmental phases of training.** One outcome of the strategic workshop was the determination of the non-technical skills training requirement by occupational group and developmental phase of training (awareness, knowledge and skills – as outlined in Section 2 of CAAP SMS 3(1)). As shown in Table 2, occupations were grouped in light of the “Occupations this CAAP applies to” preamble section of CAAP SMS-3(1) which summarises formal ICAO guidance.

19. While there is no ICAO requirement for knowledge and skills-based training for several aviation industry occupations, *Blue Gum* Airline recognised the value of increased knowledge about non-technical skills across its entire staff and decided upon a policy to encourage all staff to undertake select parts of the knowledge phase of training on an opportunity basis. In addition, Cabin Crew would be sponsored to undertake relevant skills-based training provided by external agencies and larger airlines when opportunities arose.

**Table 2: Non-Technical Skills Training by Occupation and Developmental Phase**

	<b>Comment</b>	<b>Awareness</b>	<b>Knowledge</b>	<b>Skills</b>
<b>Flight crew</b>	This group would include licensed crew members charged with duties essential to the operation of an aircraft during a flight duty period.	✓	✓	✓
<b>Flight operations officer/flight dispatcher</b>	These roles include persons designated by the operator to engage in the control and supervision of flight operations, suitably qualified in accordance with extant regulations, who support, brief and/or assist the pilot-in-command in the safe conduct of the flight.	✓	✓	✓
<b>Cabin crew</b>	A crewmember who performs, in the interest of safety of passengers, duties assigned by the operator or the pilot-in-command of the aircraft, but who shall not act as a flight crew member.	✓	✓	Not required but encouraged
<b>Other personnel</b>	Through the use of a SMS, should any unacceptable risks be attributed to the non-technical skills (e.g., fatigue, stress, communication, decision making etc) of other staff performing safety-related work (e.g., safety management personnel, flight operations senior management, ramp staff etc), it may be necessary to develop non-technical skills training programs as controls to manage this risk.	✓	Not required but encouraged	Not applicable at this stage; will monitor SMS outcomes
<b>Maintenance personnel</b>	Noting that aircraft maintenance staff are subject to existing human factors/non-technical skills training requirements (refer to CASR Parts 66, 145 and 147), it was decided to attempt to include these staff in an integrated non-technical skills training program where feasible.	✓	✓	✓

20. **Constructing training objectives.** Training objectives guide the development of the content of the course. For each non-technical skill that was identified in the training needs assessment, training objectives need to be written. In order to design methods to address these training objectives, specialist training development support may be required. Objectives should be developed so that they can be efficiently and empirically evaluated to determine whether they were achieved. Fortunately, the First Officer in the training development team was a Certificate Level IV qualified workplace instructor and felt confident he had the competencies to construct the training objectives, based on the preceding work and guidance from the strategic workshop.

21. **Develop and conduct awareness training.** As indicated in Table 2, Blue Gum Airline elected to conduct non-technical skills training for its entire staff. A two-hour module was developed and delivered by the First Officer member of the training development team using materials from his tertiary studies and existing presentations sourced from other airlines. The module was added to the existing induction training program for all staff and was conducted as part of the annual training program in order to capture all current staff. The awareness presentation was intended to promote improved awareness of the safety management system and human factors issues within Blue Gum Airline.

22. Other aims of the awareness training were to engage existing staff, determine their levels of motivation and interest in safety, and increase their awareness of the benefits of targeted non-technical skills training. If met with significant resistance at this time, Blue Gum Airline may have needed to implement further initiatives. Development of the awareness training required minimal resources and cost when compared with knowledge and skills-based training. An evaluation of the awareness training module was undertaken via a simple survey.

23. A specific goal was to make staff aware of the just culture concept and the importance of safety reporting (consistent with the CAAP SMS 1(0)). Specific content included:

- an opening statement by the managing director to demonstrate management commitment to the training program;
- an explanation of the potential benefits of human factors/non-technical skills training;
- an overview of human factors/non technical skills and their relevance to Blue Gum Airline using a topical and riveting case study;
- an explanation of the 'Reason Model' including a Blue Gum Airline case study;
- an overview of the just culture concept and the responsibility of all staff to conscientiously report safety incidents;
- an invitation for internal 'safety champions' who would like to be part of the development and delivery of non-technical skills training; and
- a brief evaluation survey.

24. **Maximising collaboration.** As noted in Section 2 of CAAP SMS-3(1), operators are encouraged to make use of existing resources and to maximise collaborative opportunities with other airlines and industry agencies. Examples of such potential collaboration include:

- conducting training with other operators to share costs and resources;
- negotiating the use of a larger operator's training programs and resources;
- utilising an external service provider with relevant expertise and experience; and
- acquiring an 'off-the-shelf' training product (particularly if expertise in course development is lacking within the organisation).

25. **Taking stock and setting a schedule.** Given the high workloads of the members of the training development team, progress had been surprisingly swift. The preceding activities had occurred over a six-week period. The team felt it was time to evaluate their progress and determine a feasible schedule to establish an effective training and assessment program in accordance with the recommendations of CAAP SMS-3(1).

26. The broad outcomes to date were to develop knowledge-based training for pilots, flight dispatch, cabin crew and other staff. Additionally, it was identified that assessment of non-technical skills was required for pilots and flight dispatch.

27. Another outcome of the strategic workshop was a broad framework and schedule to develop and implement the training program. Table 3 provides the final product created by the training development team, in consultation with various senior Blue Gum employees. The table was refined over a period of four weeks after the strategic workshop by the Manager Safety and Standards. This provides information on the specific areas to be covered by Blue Gum Airline during implementation, including major training components, responsible persons, and timelines.

28. **Developing knowledge-based training.** On completion of the training schedule, it was time to commence the development of tailored 'knowledge based' training and associated forms of assessment for pilots, flight officers/flight dispatch and cabin crew. This developmental process required further working groups and subject matter expertise. One goal, for example, is to develop a two-day facilitated CRM training course for pilots. Given the extensive material provided in the *Safety Behaviours Human Factors for Pilots*, which was developed specifically for low capacity RPT operators, Blue Gum Airline elected to use this as a primary resource to tailor a CRM program to meets its own training needs.

29. The development of knowledge-based training is a work in progress in Blue Gum Airline, and this is where this appendix draws to a close. Once the knowledge-based training modules have had sufficient time to mature, and appropriate assurance as to their operational effectiveness has been completed through program evaluation, it will be time to consider skills-based training and assessment. Blue Gum Airline will primarily focus on skills-based training and assessment for pilots, and has elected in the first instance to adopt a modified version of the competency standards from the day visual flight rules (VFR) syllabus. The ultimate aim is to progress (via phased implementation) to a more elaborate form of assessment similar to the guidance material provided in Appendix 2 of this CAAP.

30. **Conclusion.** This appendix has provided guidance primarily focused toward smaller RPT operators that are commencing to develop non-technical skills training in response to the recommendations of CAAP SMS-3(1). It has covered a range of pragmatic topics, including how to generate management and organisational commitment to non-technical skills training; identify non-technical skills training needs within your organisation; develop and conduct awareness training; collaborate with other organisation and agencies to improve training content and reduce the costs of training; and setting a schedule for the implementation of non-technical skills training.

31. The authors are grateful for the guidance provided by Brindabella Airlines staff during the development of this document.

**Table 3. Example project schedule for the implementation of CAAP SMS- 3(1)**

Note: Blue Gum Airline has no existing non-technical skills training.

Task/Subtask	Responsible position(s)	2010			2011						2012						2013		
		Jul - Aug	Sep - Oct	Nov - Dec	Jan - Feb	Mar - Apr	May - Jun	Jul - Aug	Sep - Oct	Nov - Dec	Jan - Feb	Mar - Apr	May - Jun	Jul - Aug	Sep - Oct	Nov - Dec	Jan - Feb	Mar - Apr	May - Jun
<b>1. Management commitment</b>		*																	
1.1 Continuously demonstrate commitment to the training and assessment of non-technical skills.	Executive Management	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.2 Develop policy supporting the implementation of non-technical skills training in the organisation.	Executive Management	*																	
1.3 Allocate appropriate resources to underpin development of the training program (financial, time and personnel resources).	Executive Management	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<b>2. Select key training personnel</b>																			
2.1 Develop a scoping document for the non-technical skills training program, including areas of responsibility for the implementation team.	Executive Management	*																	
2.2 Select and authorise the training development team, chaired by the Manager Safety and Standards, which is responsible for program development and implementation.	Executive Management	*																	
2.3 Nominate personnel to develop and integrate non-technical skills assessment into their organisation.	Manager Safety & Standards	*																	
2.4 Examine the value of securing the external training development expertise during the initial implementation phase	Training development team	*																	

Task/Subtask	Responsible position(s)	2010			2011						2012						2013		
		Jul - Aug	Sep - Oct	Nov - Dec	Jan - Feb	Mar - Apr	May - Jun	Jul - Aug	Sep - Oct	Nov - Dec	Jan - Feb	Mar - Apr	May - Jun	Jul - Aug	Sep - Oct	Nov - Dec	Jan - Feb	Mar - Apr	May - Jun
<b>3. Familiarise training development personnel with the proposed program</b>																			
3.1 Familiarisation with relevant training information (see paragraphs 11-18 of this appendix).	Training development team		*																
<b>4. Identify training needs</b>																			
4.1 Conduct activities, with specialist support, to identify training needs across occupational groups. (See Section 4.2 of CAAP SMS-3(1)).	Training development team		*																
4.2 Summarise and prioritise training needs, with specialist support.	Training development team		*																
4.3 Develop training objectives, with stakeholder guidance.	Training development team			*															
<b>5. Selection and training of instructional staff</b>																			
5.1 Select staff to assist in the delivery of the non-technical skills program.	Training development team				*														
5.2 Instructional staff given training on instructional and facilitation methods, as required.	Training development team				*	*													
5.3 Awareness training is implemented.	Manager Safety & Standards					*	*	*	*	*	*	*	*	*	*	*	*	*	*
<b>6. Knowledge-based training</b>																			
6.1 Develop individual module/course objectives.	Training development team						*	*											

Task/Subtask	Responsible position(s)	2010			2011						2012						2013		
		Jul - Aug	Sep - Oct	Nov - Dec	Jan - Feb	Mar - Apr	May - Jun	Jul - Aug	Sep - Oct	Nov - Dec	Jan - Feb	Mar - Apr	May - Jun	Jul - Aug	Sep - Oct	Nov - Dec	Jan - Feb	Mar - Apr	May - Jun
6.2 Acquire/develop appropriate material for knowledge-based training.	Training development team						*	*											
6.3 Develop the knowledge-based training module/course content.	Training development team							*	*										
6.4 Implement knowledge-based training modules/courses for pilots, flight dispatch and cabin crew.	Training development team									*	*	*	*	*	*	*	*	*	*
<b>7. Develop skills-based training and assessment measures</b>																			
7.1 Conduct a non-technical skills familiarisation process.	Training development team										*	*	*						
7.2 Develop assessment measures using the CASA 'Safety behaviours' guidance material and CAAP 5.59-1(0).	Training development team											*	*	*					
<b>8.0 Train instructional staff in assessment techniques</b>																			
8.1 Conduct basic Instructional course for staff involved in assessment. <sup>1</sup>	Training development team													*	*	*	*		
8.2 Evaluate the effectiveness of the training program.	External specialist																*	*	
<b>9.0 Implement assessment of non-technical skills</b>																			
9.1 Develop and implement an information package for pilots on how the assessment system will work. <sup>2</sup>	Training development team															*	*	*	

Task/Subtask	Responsible position(s)	2010			2011						2012						2013		
		Jul - Aug	Sep - Oct	Nov - Dec	Jan - Feb	Mar - Apr	May - Jun	Jul - Aug	Sep - Oct	Nov - Dec	Jan - Feb	Mar - Apr	May - Jun	Jul - Aug	Sep - Oct	Nov - Dec	Jan - Feb	Mar - Apr	May - Jun
9.2 Implement new assessment of non-technical skills into current assessment program.	Training development team																	*	*
9.3, Foster a continuous improvement process utilising the company SMS and training feedback.	Manager Safety & Standards																		*
9.3 Develop competency-based assessment of non-technical skills to pass/fail criteria.	Training development team																		*

Notes.

1. The basic instructional course would include topics such as: The concepts of validity, reliability, bias and skill erosion; basic instructional techniques; technical assessment criteria; assessment forms; assessment scenario role-plays utilising video recording and feedback;
2. The assessment system package would include components such as a brief history of non-technical skills assessment, assessment terminology and criteria; how to standardise assessment conditions; how training deficiencies will be dealt with.

**Table 4. Example of a mature non-technical skills training program**

Module Title	Module Description Learning outcomes	Participants	Participant Numbers	Method of Assessment	Course Duration (Days)	Status of Course	Available for Delivery
Induction Training	Introductory session for all staff to generate awareness of key non-technical skills issues (see paragraph 23 of this appendix)	Pilot	Max 15	N/A	2	Complete	Yes
		Flight dispatch		N/A	2	TBA	No
		Cabin crew		N/A	2	Complete	Yes
		All new staff		N/A	0.5	TBA	No
Cabin crew non-technical skills	Training topics to include: <ul style="list-style-type: none"> <li>▪ Fatigue and stress management</li> <li>▪ Alcohol and other drugs</li> <li>▪ Communication</li> <li>▪ Teamwork</li> <li>▪ Leadership</li> <li>▪ Situation awareness</li> <li>▪ Decision making</li> <li>▪ Other areas identified in the company's SMS</li> </ul>	All	Max 15	N/A	0.5		
Flight operations officer/flight dispatcher non-technical skills	Training to include: <ul style="list-style-type: none"> <li>▪ As for cabin crew plus threat and error management</li> </ul>	All	Max 15	N/A	0.5		
Initial Crew Resource Management for Pilots	Training to include: <ul style="list-style-type: none"> <li>▪ As for flight operations officer/flight dispatcher plus airmanship</li> </ul>	All	Max 15	Line and simulator assessment	2		

Module Title	Module Description Learning outcomes	Participants	Participant Numbers	Method of Assessment	Course Duration (Days)	Status of Course	Available for Delivery
Non-technical skills assessment for check and training captains	Training to include: <ul style="list-style-type: none"> <li>▪ Topics areas as for pilots; albeit to a more advanced level</li> </ul>	All	Max 20	Line and simulator assessment	1		
Command Upgrade Training	Training to include: <ul style="list-style-type: none"> <li>▪ Topic areas as for check and training captains</li> </ul>	All	Max 6	Line and simulator assessment	2		
Recurrent non-technical skills training for personnel mandated under ICAO Annex 6	All topics to be covered in a 3-year cyclical program.	All	Max 15	To be determined	0.5		