



Human Factors Section

Special Audit of Pel Air Express Fatigue Risk Management System (FRMS)

21 December 2009

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Section 1 Executive Summary

The CASA Human Factors Section was asked to conduct a special audit of the Pel Air Express Fatigue Risk Management System (FRMS). This audit was completed by [redacted] and [redacted] over the period 2-21 December 2009. Given the nature of the special audit (initiated due to a recent accident of the operator involving a night ditching), and the high exposure to operational fatigue risks due to adhoc, back of the clock medivac operations, the special audit of the Pel Air Express FRMS was extensive and to a level of detail considered appropriate given the risks.

The aim at the outset was to review as much information as possible in search of evidence to validate and verify the maturity of the FRMS (either now or anytime in its past). From an operational perspective the audit focuses primarily on the Westwind fleet. From a systems perspective it is believed sufficient evidence was available to draw conclusion about the maturity of the Pel Air FRMS as a system, regardless of fleet.

Based on extensive evidence reviewed during the audit (including previous CASA audit reports of the Pel Air FRMS), the following conclusions are made:

Findings for CASA:

- Previous CASA oversight did not provide sufficient evidence to confirm the Pel Air FRMS had ever been managing fatigue risk to a necessary standard. Much of the correspondence and closure of RCAs was based on planned actions but no evidence was collected to confirm appropriate corrective actions had been completed.
- Only one signed and filed previous CASA audit report could be located within the Bankstown Field Office. All other reports were partially completed electronic copies or those provided by Rex Safety Management Group. It is assumed this documentation is on file somewhere but it could not be found over the period 3-21 December 2009. Hence, it is not known what follow up action was taken by CASA for many audit reports and observations.

Findings for Rex/Pel Air:

- No evidence was found that supported the claim that Pel Air FRMS had ever managed fatigue risk to a standard considered appropriate, particularly for an operator conducting adhoc, back of the clock medivac operations. The system has relied heavily on a fatigue score, which has not been operationally validated. Furthermore, the operator did not have an appropriate technical understanding and knowledge of the limitations of various tools being used within the FRMS nor had it collected appropriate feedback from operational personnel (flight and cabin crew) to determine suitability of the FRMS.
- There were a number of breaches of FRMS policy, including a critical breach involving a crew member who was allowed to conduct a duty totalling 23 hours and 45 minutes. This had not been fully documented within the rostering system (the civil pax flight was left out of the roster) and no fatigue occurrence report was submitted. From the evidence available this is considered a known and direct violation of FRMS policy.
- It is evident the fatigue reporting culture within Pel Air is deficient. This cannot be fixed quickly and will require a number of months to determine whether this reporting culture has improved. An open and honest reporting culture is critical to the success of any FRMS and there is evidence to suggest one or two key personnel may be the root cause of this cultural problem.
- The FRMS is largely reactive, in that an event must occur before action is taken. While a couple of more recent incidents were considered proactive, the majority of incidents have continued to repeat themselves (particularly exceedance of peak FAID scores) without positive action taken to update the system and prevent re-occurrence.

- Pel Air Express holds an international AoC and FRMS yet there remains no policy on how to manage time zone changes and circadian adaptation.
- Quality assurance processes to date have been ineffective. For operations where fatigue is considered a high risk the company must develop practices to provide assurance the FRMS manual is being followed and the system providing appropriate management of fatigue risk.

It should be noted considerable positive changes have been made since the new [redacted] and the new [redacted] commenced their roles. Unfortunately, it is the finding of this audit that a number of actions have the potential to rectify many of the problems of the existing FRMS but will take time to become effective. Hence, there is insufficient evidence at this time to support acceptable FRMS practices, knowledge and practical operational understanding and use of an FRMS. It is recommended that adhoc, back of the clock, medivac operations of Pel Air Westwind crew require further risk mitigation by CASA until evidence is available to confirm a number of deficiencies have been corrected.

[redacted]

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Section 2 Audit Preparation

2.1 Overview

The Pel Air special audit was conducted IAW the terms of reference and scope (File Ref: EF09/25167). Specific reference to FRMS audit as follows:

- *The policy and application of fatigue practices,*
 - *review of flight and duty records and compliance with FRMS*
 - *review of practices associated with monitoring fatigue on aero medical flights and the associated "standby" periods.*

Upon initial identification of some deficiencies with the Pel Air Express FRMS, CASA Human Factors was asked to provide specialist support and assistance with a more detailed audit. This audit was conducted by:

Audit preparation consisted of briefs from a number of members of the existing audit team. Preparation also involved a review of the Pel Air Express FRMS Manual as well as previous CASA audits of the FRMS, including those conducted prior to the existing AoC (as approved in October 2006).

Hence the corporate knowledge associated with the original FRMS was considered suitable for review to better gauge an understanding of the development of the FRMS from its first approval in 2002.

This audit is far more detailed than would normally be expected, largely due to the circumstances surrounding the special audit i.e. aircraft accident. Furthermore, ad hoc back of the clock medivac operations, which are a regular part of the Westwind operations, are considered higher risk from a fatigue management perspective. In part, the depth and detail of the audit was to provide every opportunity to identify practices and processes to provide positive support for the FRMS. It is easy to find fault within any system and the focus also remained on identifying good FRM practices.

2.2 Review of Previous CASA Audits of Pel Air FRMS

A summary of previous CASA audits of Pel Air FRMS is contained within Appendix A. Key Findings from previous CASA oversight:

- To date only one audit observation (no: 712500 dated 3Dec07) has been found to be fully completed, signed and filed within the CASA system. All other surveillance documentation from previous CASA audits of the Pel Air FRMS are electronic copies (some partially complete) as obtained from individual FOI's or from the Rex Safety Management Group.
- Based on findings within Pel Air for this audit and the key points raised (observations, RCA's) from previous CASA audits, the existing system continues to display all of the problems previously identified through CASA oversight. It is suggested previous audits did not provide the quality assurance to confirm problems identified had been rectified, as the one signed observation available was signed off on the premise that corrective actions had been agreed but there is no evidence this was ever followed up by CASA.

- There is no evidence that RCA's raised in May 2006 were closed as the sections titled remedial action, root causes and corrective action remain blank. There is no verification or signature by a CASA representative.
- In the absence of further formal CASA reports, it appears many agreed items were not followed up by CASA.

It is considered that the oversight by CASA has been inadequate as there is evidence to support that many of the problems identified by CASA during surveillance (Nov 04-Mar 08) were never appropriately actioned. There is a lack of any clear evidence to support corrective actions had been implemented and confirmed by CASA that they were effective. If this process is indicative of broader practices of CASA it is considered CASA is exposed to unnecessary risk, particularly if required to provide evidence to support how it approved an operator's system, in this case, their FRMS.

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Section 3 Audit Conduct

3.1 Audit Interviews

Full interview summaries are contained within Appendix B. This section provides a summary of the key interviews conducted onsite. The findings are contained within section 3.2.2.

This section of the report provides a listing of interviewees as conducted by the Human Factors team during the FRMS element of the onsite Pel Air Special Audit. Nineteen separate interviews were conducted over the two days. Nine out of a possible twelve Westwind fleet crew members were interviewed but their names have not been displayed within the interview sections of this report in an effort to assure their anonymity. An aggregated response combining the statements of all nine crew members has been recorded in the interview summary section (Appendix B) in order to ensure that individual statements cannot be attributed to any individual crew member.

A table of evidence documents gathered during the onsite portion of the FRMS audit is contained within Appendix G.

3.1.1 Interview Table.

The tables below indicate the timings, interviewee, interviewer/s and purpose of each interview conducted:

3.2 Audit Evaluation & Findings

3.2.1 Evidence & Evaluation

The audit team was provided with open access to all Rex/Pel Air Express data as related to fatigue and the FRMS. This data was extensive and was fully reviewed with the aim to search for evidence of positive and mature applications of fatigue management, particularly given the potential fatigue risks associated with adhoc, back of the clock medivac operations. A summary of key information is contained in Appendices A-I, as attached to this report. This also includes some interim communication between CASA human factors and CASA Bankstown regarding preliminary findings. Where this information is not contained within the Appendices, further electronic documents are available (and listed) as supporting evidence. This material is yet to be filed within the CASA system.

3.2.2 Interview Findings

The following are the key findings from the interviews conducted (see Appendix B for a full summary). Further evidence has been collected that has uncovered other areas in the Pel-Air FRMS that require addressing but they have not been discussed below and will be discussed in another section. Evidence that has been gathered to support the claims made by the interviewees in the following section will also be addressed in the Evidence section of this report.

- There appears to be many deficiencies with Pel-Air's FRMS at present. Most Pel Air crew identified a lack of understanding of the process and the training is regarded as inefficient and ineffective.
- Many safety check processes within the FRMS appear not to have been followed and there is a lack of training and understanding of fatigue-related safety issues within the Operations staff. This has led to an over-reliance by Operations staff on the FAID bio-mathematical modelling score to provide a fly/no-fly gauge.
- Management staff interviewed stated that they felt the FAID Peak Fatigue Score (set at 75) was set appropriately and allowed them to manage fatigue. However, the interviews with the crew show that it appears as having been set too high and is not picking up the realities of fatiguing duties. There was no indication from the interviews that Pel-Air had thought about evaluating the veracity of this score themselves.
- Many of the management staff interviewed believed that the safety management discussions that were being had in the Safety Management Committee meetings were making inroads into mitigating the fatigue-related issues uncovered. However, operational staff did not believe that they had seen changes in management behaviour or changes in any processes relating to the management of fatigue risk.

- From the interviews conducted with Pel-Air crew, it appears that permanent standby has resulted in psychological fatigue due to the expectation to perform duty and the anticipation of call-out. The short planning period, lack of knowledge of possible destinations and lack of support provided by Operations staff once doors closed appears to add to this fatigue. All crew interviewed stated that they felt there would be no issues in stating that they were fatigued and pulling out of duty but also felt that they had limited opportunities to fly and had to take these opportunities when they arose.
- Most Pel-Air crew interviewed stated that they had been part of a duty that was greater than 15 hours in length but there were no interview statements providing evidence that fatigue related extension of duty processes had been followed, safety reports had been written following the duty or that any management follow-up was conducted as is promulgated in the company FRMS manual.
- Several interviewees believed that the lack of management adherence to safety management requirements and the fatigue risk mitigation strategies as laid down in the company's FRMS manual was due to the pervasive culture currently imbuing the Westwind fleet. This culture and the attitudes emanating from it appeared to have been installed by the senior Westwind operations manager who presented as having an 'old school' mentality.

3.2.3 Rex/Pel Air Express Safety Data/Reports

A large amount of safety data (e.g. safety committee meeting minutes, incident investigations etc) was provided by the Rex Safety Management Group for review. A summary of the files reviewed and key reports is contained at Appendix C. Due to the sensitivity of this data with protecting the safety culture, particularly the ability to openly and honestly report incidents, this data will not be retained on CASA files.

The aim was a systemic review of as much fatigue related safety data and reports as available as evidence to further determine the operational maturity and practical functionality of the Pel Air FRMS. acknowledged the existing

The broad aim was to determine the maturity of strategic practices e.g. prior fatigue hazard identification, risk analysis, identification of risk controls and mitigation actions to manage fatigue as well as other day to day tactical activities e.g. fatigue reporting and incident investigation. A pertinent summary follows:

- The majority of processes to date have been reactive with many occurrences repeating themselves over time with minimal improvement from corrective actions.
- There is evidence of fatigue risk that was not further investigated, particularly where the IFLS was completed as a routine part of some investigations.
- There is evidence of known violation of FRMS practice in which a chief pilot was removed from rostering duties. This supports the existing evidence of cultural issues impacting actual use of the FRMS.
- Documented evidence of non compliance with the FRMS manual.

3.2.4 FRMS Compliance Checks

Appendix D contains a number of non-compliance events as well as a summary of records samples (logbooks, rosters (planned and actual) and flight records) collected and reviewed to ensure accurate data entry across fields and compliance with the FRMS manual procedures. The samples were chosen via a random review of flight crew logbooks with particular attention to entries with longer afternoon or night flights involving multiple sectors. The aim of selecting longer afternoon/night flights with multiple sectors for further comparison was to ensure the information was more likely to be representative of flights involving higher fatigue risk. Five significant violations of the FRMS manual and policy were identified from the random sample gathered (the table in Appendix D on page 31 refers).

3.2.5 FRMS Computer Based Training

As per Appendix D, the FRMS CBT was completed by two CASA staff points as follow:

. Key

- o The online course takes approximately two hours to complete.
- o The course is adequate in meeting the objectives and syllabus of training as listed within the FRMS manual.
- o A CASA FOI (with no prior FRMS training) completed the course and provided positive feedback confirming the course was appropriate.

Although not listed within the FRMS manual there is a need to ensure certain critical staff (those using FAID and the IFLS spreadsheet) are provided adequate training in the limitations and additional functions of the tools provided. During interview, no staff member was aware of those limitations (e.g. the FAID algorithm only models scores over a seven day period, hence if anyone is rostered for more than seven days the FAID score becomes irrelevant). The IFLS calculates the same score regardless of whether a flight is completed at 3am or 3pm. Other areas requiring clear training and consideration include split duty (e.g. what minimum sleep is it assumed flight crew will get when conducting a four hour split duty? What happens if they don't get any sleep during this time?).

Also, the feedback from operational staff consistently reported a mismatch between the online FRMS CBT and their practical understanding of the FRMS. This must be detected in future through improved quality assurance processes, particularly in those operations where fatigue is considered a high risk.

3.2.6 Mock Operational Trial of Pel Air FRMS

Appendix E contains a timeline and further details regarding a mock trial of the Pel Air FRMS. The aim was to simulate a similar flight as that of the Apia accident, during which played the role of a Westwind captain. Key points as follows:

- o In general, Operations and the Chief pilot provided good direction and support to the pilot.
- o Appropriate questions were asked to determine fitness for duty using the IFLS spreadsheet.
- o A log was recorded to capture critical information and timelines.
- o Calculations for the most part were accurate and correct and resulted in the crew not being allowed to depart Apia even though pressure was brought to bear to commence the medivac given the deteriorating state of the patient.
- o The trial did reveal some gaps in the understanding of how to use the IFLS spreadsheet and the need to clearly identify the type of sleep crew have received during the day (e.g. one long sleep; two (or more) shorter naps).

As an outcome of this audit, it is considered that the Chief Pilot's knowledge of how to further mitigate environmental risks and balance fatigue risk requires improvement. The FAID and IFLS score are a ballpark guide but there are many other factors that must be considered to balance operational requirements (e.g. a deteriorating patient) with safety needs.

As an ancillary issue some significant and repeated deficiencies were identified within the spreadsheet being used to calculate an IFLS. This was considered symptomatic of Pel Air safety management personnel rushing too quickly to the detriment of quality assurance (Appendix E on pages 35-36 refers).

3.2.7 Standby Time

From the interviews conducted with the Pel Air operational crews, it appears that permanent standby has resulted in psychological fatigue due to the expectation to perform duty and the anticipation of call-out (Appendix F on pages 37-38 refer). The short planning period, lack of knowledge of possible destinations and lack of support provided by Operations staff once doors had closed appears to have added to this fatigue. All crew interviewed believed that they felt there would be no issues in stating that they were fatigued and pulling out of duty but also felt that they had limited opportunities to fly and had to take these opportunities when they arose. Anticipatory stress may occur from both internally activated and external, or environmental stressors but can have a cumulative effect. Thus, while each stressor taken on its own may present as being mild and relatively innocuous, the combined stressors taken over time in conditions of continual activation can result in additional psychological fatigue. At the time of writing of this report, it is known that Pel Air have rostered in additional RDOs into the crews schedules. It will be recommended that they change their practices with regards continuous standby of crews.

3.2.8 Request for Corrective Action

The following text provides the body of the Requests for Corrective Action (RCA) recommendations that may be used by the Bankstown Field Office in preparing an audit response and oversight of Pel-Air in relation to FRMS requirements going forward. The RCA recommendations are as follows:

- There exists a requirement for providing evidence of the planned implementation of internal Quality Assurance in relation to fatigue risk management. The attempts at QA of tools and techniques put in place to provide support to management and operational decision making regarding fatigue risk were ill-informed, not understood and reactive. A systemic approach to quality assurance is required which fits in with appropriate hazard identification, risk mitigation strategies and the safety management system as a whole. Evidence of improved QA would be seen in the correct working and thorough understanding of their FRMS tools and mitigation strategies.
- There exists a requirement to show documented evidence of a dedicated plan for cultural change with relation to operational and management attitudes toward fatigue risk management reporting and compliance with the requirements of the manual. Evidence of cultural change would be seen in increased incident reporting, documentation relating to extended duty checklists and changes to continuous standby policies, management and operational interventions via the Safety Management Committee, management and operational training, increased positive reports in crew interviews.
- Improvements will need to be seen in the strategies Pel-Air puts in place with regards how they may deal with their understanding of the fatigue related issues in their highest risk operations. Evidence of attempts to increase understanding could be seen in proactive quality assurance plans, investigations into their own operational fatigue issues via sleep diaries and actigraphy trials, management and operational interventions and training, improved crew training and more mature, systems focussed risk mitigation strategies.
- Improvements will also need to be made to their FRMS manual in terms of added maturity in fatigue risk management understanding. Evidence of this will be updates that ensure no reliance on biomathematical modelling scores, a more systemic approach to fatigue risk management and inclusions of mitigation for time zone changes and circadian adaptation.

Section 4 Special Audit Conclusions

Based on extensive evidence reviewed during the audit (including previous CASA audit reports of the Pel Air FRMS), the following conclusions are made:

Findings for CASA:

- Previous CASA oversight did not provide sufficient evidence to confirm the Pel Air FRMS had ever been managing fatigue risk to a necessary standard. Much of the correspondence and closure of RCA's was based on planned actions but no evidence was collected to confirm appropriate corrective actions had been completed.
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Findings for Rex/Pel Air:

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- There were a number of breaches of FRMS policy, including a critical breach involving a crew member who was allowed to conduct a duty totalling 23 hours and 45 minutes. This had not been fully documented within the rostering system (the civil pax flight was left out of the roster) and no fatigue occurrence report was submitted. From the evidence available this is considered a known and direct violation of FRMS policy.
- It is evident the fatigue reporting culture within Pel Air is deficient. This cannot be fixed quickly and will require a number of months to determine whether this reporting culture has improved. An open and honest reporting culture is critical to the success of any FRMS and there is evidence to suggest one or two key personnel may be the root cause of this cultural problem.
- The FRMS is largely reactive, in that an event must occur before action is taken. While a couple of more recent incidents were considered proactive, the majority of incidents have continued to repeat themselves (particularly exceedance of peak FAID scores) without positive action taken to update the system and prevent re-occurrence.
- Pel Air Express holds an international AoC and FRMS yet there remains no policy on how to manage time zone changes and circadian adaptation.
- Quality assurance processes to date have been ineffective. For operations where fatigue is considered a high risk the company must develop practices to provide assurance the FRMS manual is being followed and the system providing appropriate management of fatigue risk.

It should be noted considerable positive changes have been made since

commenced their roles. Unfortunately, it

is the finding of this audit that a number of actions have the potential to rectify many of the problems of the existing FRMS but will take time to become effective. Hence, there is insufficient evidence at this time to support acceptable FRMS practices, knowledge and practical operational understanding and use of an FRMS. It is recommended that adhoc, back of the clock, medivac operations of Pel Air Westwind crew

require further risk mitigation by CASA until evidence is available to confirm a number of deficiencies have been corrected.

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- A. Summary of previous CASA audits of Pel Air FRMS
- B. Interview Summaries
- C. Summary of Rex Safety Management Group Reviewed Safety Data
- D. FRMS Compliance Checks and Review of FRMS CBT
- E. Mock Operational Trial of the Pel Air FRMS
- F. Considerations for Standby Time
- G. Evidence Table
- H. Core Preliminary Communication to Bankstown Field Office

Appendix A: Summary of Previous CASA Audits of Pel Air FRMS

The following is a summary of previous CASA audits of the Pel Air FRMS. The majority of this information was provided by [redacted]. It is yet to be determined whether these files have been signed and filed within CASA. A summary of key points as follows:

Date	Type of Surveillance	CASA Team	Summary of Pertinent Points
26Nov04	Audit Report		- It was determined that the current document needed updating to reflect current scientific opinion detailing the limitations of a sole reliance on the FAID fatigue modelling tool and the need to involve hazard identification within the organisations activities and subsequent risk mitigation. - The team talked to two pilots who were able to provide insights into how the current system operates. - The team had lengthy discussions with the CP, Director Safety and the QA Manager where it was agreed changes to the current document would be achieved by May05. - The current process in practice has tasks that are not auditable. All tasking must be trackable to a responsible position. All records are to be kept for a minimum of three years. All activities under the AoC must be risk managed. - The organisation was assessed as compliant with their system as it currently stands. - The system has evolved with CASA guidance and is dated Jan02. At that time the methodology was acceptable to CASA....Since then advancements in the understanding of the limitations of total reliance on a mathematical model have emerged.as a result of these discussions the operator has elected, with CASA facilitation, to re-write sections of the system to include risk management. The operator has agreed to complete these changes by May05. Between the time of its completion and the FMS expiry date of Aug05 a further audit will be conducted by the SBAO to ensure compliance.
26Nov04	Audit Observation	No name provided	- 12 observations raised regarding crew scheduling. - The contingency plans the company has in place are inadequate in giving employees guidance and assurance of what should happen. The pilots interviewed were not aware of what action should take place if delays occurred and access to FAID was not available. There is implied pressure for a pilot in Mackay to present for duty in an impaired state.... - The company flies across several time zones and has limited information on trans meridian travel. - All activities available to the company as authorised by their AoC should be risk managed.
May06	Audit Report		- Improvement is currently underway to align this system with industry best practice and implement risk management. The

		area of main concern for the future is that a culture will pervade that will enable an open and honest reporting system.... - The current system is very much out of date. The current system lacks the multi layered defences that currently exist for similar organisations who have more contemporary systems. The company understands this and after the 2004 audit undertook to re-write the current system and adopt contemporary scientific principles. This is nearly complete. Until this is complete and implemented the company must continue to comply with the existing system. The operator showed to be non compliant with the current system which puts them in breach of CAO 48.0 and an RCA was raised. It is clear there is a lack of faith within the company regarding an open and honest reporting system. - ...a timescale for the submission of the final draft of the new FRMS was decided to be within 6 weeks from the date of the audit. It is recommended that this be followed up with a post implementation audit of the new systems introduction with respect to the process in practice three months after this transition. No pilots were interviewed during this audit. This is contrary to normal FRMS audit practice, however, two Mackay based pilots were interviewed during the 2004 audit. The Chief Pilot conveyed that, in light of the lack of faith that currently exists with an open and honest reporting system (due to events in the past), this would in all likelihood not be productive. The auditor agreed with this, but it is now up to the company to reverse this culture and it will be of paramount importance to assess this via interviews during the audit suggested above. - ...it was made known that there were no safety meetings (no safety committee) and no retraining as required by the system. This non compliance has resulted in an RCA being issued.
May06	Audit Observation	- 4 observations raised regarding crew scheduling. - The current policy is weak... - ...there is little faith in an open and honest reporting system. - It was observed the management of extended duty was not being addressed properly. ...there is a reactive means by which an extension of duty is managed with respect to FAID evaluation. This is currently being completed the day after the extension... This should be addressed in a proactive sense whereby once an extension is required FAID is used live...
May06	RCA	In discussions with and during the audit of 4 May 2006 it was stated that at least two of the processes required by the company Fatigue Management System (version 3.0, dated January 2002) were not being undertaken. Specifically, these are the requirement to have a safety committee established and the additional requirement to have refresher training delivered annually to flight crew. These processes are required and described in section 3.2 and 4.6. It is acknowledged that the finalisation process is underway with the organisation to complete an amendment to their existing system.
3Dec07	Observation	Deficiency identified with FRMS training. Remedial Action: Complete development of the FRMNS training package, identify

	712500	crew lacking training and conduct FRMS training. Root cause: availability of suitable resources for employment. Corrective action: Complete development of the FRMS training package, identify crew lacking training and conduct FRMS training. A CASA FOI will be invited to attend the first training session.
18Apr07	Functional Surveillance	Signed by. 18Feb08; no further CASA signatures on verification of action. - Reviewed their open and honest reporting system which had problems in the past. DH stated he thought it was operating satisfactorily now. Reviewed several reports and this appears to be true. - overviewed the documentation as submitted, and found the following problems with the newly constructed system, Some forms need to be amended to described the actual process better. The PSWM has not been described adequately within the manual, some definitions differ from the CASA approved ones look the ones from the standard CAO 48 exemptions) and the action chart needs to be amended for corrective action. agreed to do this by 27 April 2007. - Recommend re-issue of the FMS exemption. - Existing exemption re issued for a further three months. A letter had been provided by Pel Air explaining the circumstances surrounding the delay in completing their FRMS amendment. - Acknowledgment of Pel Air amendment action.
18Jan07	Letter to Compliance Manager	
7Jun07	Letter to Chief Pilot	
12/13Mar08	Audit Report	- The audit of CAR 217 organisation's flight crew training records revealed that while flight crews had been operating under the FRMS for 11 months, the FRMS training required had not been conducted. This non-compliance was considered to represent an immediate threat to the safety of operations and CASA issued a 'Safety Alert' on the 12Mar08 which required operations under the FRMS to cease and operations to be conducted IAW CAO 48.0. The company accepted CASA's decision and advised CASA on the 17^{Mar08} that the required training had been completed. CASA responded on 18Mar08 buy issuing approval for the company to resume operations IAW the FRMS.
12Mar08	RCA	All pilots must revert to compliance with CAO 48.0 until CASA is satisfied that full compliance with the training requirements of the FRMS and the operations manual has been met.

As part of the Pel Air Special audit, the Bankstown Field Office was asked to provide copies of any signed and filed paperwork related to previous Pel Air FRMS audits, as all previous reports at this stage had been received as electronic emails, most being incomplete. This task commenced on 3Dec09 and the only filed and signed paperwork that could be provided from the Bankstown Field Office was the Observation dated 3Dec07.

Appendix B: Interview Summaries

Time	Interviewee	Purpose	Interviewer/s
1000 3Dec09		Entry/Introduction s	

An introductory briefing was provided to the Chief Pilot led by _____ gave an overview of his and backgrounds and discussed the particular reasons why he and _____ were part of the Special Audit. _____ also discussed what part of the audit TOR he and _____ would be addressing – namely the gathering of evidence to ascertain the effectiveness of the Pel Air FRMS as a safety system in itself and in dealing with the fatigue-related issues surrounding the 18Nov09 accident.

_____ was asked to organise interview rooms, interview attendees and the gathering of certain documents.

Time	Interviewee	Purpose	Interviewer/s
1050 3Dec09		Entry/Intro/System	

_____ believes that philosophically, he was afraid the FAID system is CAO48 by numbers but he was happy that it allows the pilot the right to say no. He stated he would prefer they say no if fatigued. _____ stated that the FRMS provides his organisation with a tool that allows them to train their pilots and take appropriate actions like compulsory breaks if the situation warrants.

He felt the Safety Management Committee (SMC) was adequately addressing fatigue-related issues and that it was becoming much more visible as part of their SMS. He felt the PFS of 75 worked well due to the long sectors flown as part of their medivac contracts. He stated they relied on the pilot to tell them they were fatigued and to discuss with _____ the circumstances surrounding their pulling out of duty. _____ stated that if a pilot could not fly due to fatigue, they were required to submit an incident report. _____ felt that the annual CBT-format training for FRMS worked well. _____ stated that his main concern at that time was to get the Westwind fleet back in the air safely.

Time	Interviewee	Purpose	Interviewer/s
1235 3Dec09		System/Incident	

_____ stated that the safety culture within Pel-Air had been improving over the previous twelve months. Incident reporting had risen from zero at the end of 2008 to 17.2 per 1000 sectors recently. This rise in reporting had followed the imposition by _____ of a daily Group Safety Review whereby any issues were followed up by either himself or his Safety Officer.

_____ stated that they had forwarded the new amended version of the FRMS manual to CASA for assessment several months earlier. _____ stated that he or _____ would provide documents relating to internal Pel-Air FRMS audits and the minutes to SMC meetings where fatigue issues were addressed and actions raised. _____ stated that he felt the CBT-format FRMS training was not being as effective as he hoped and he was in the process of sourcing a training supplier to provide face-to-face FRMS training.

_____ stated that Pel-Air had rented four houses near to the Brisbane, Darwin, Sydney and Adelaide airports whereby crew could be accommodated during their standby periods and not be required to travel far to commence duty. Once called off standby, they had two hours to arrive, plan and commence their flight. In terms of crew accommodation at the end of their sectors, hotel rooms were booked. The crew were accommodated in the Intercontinental hotel near the Apia airport when there. _____ and _____ discussed with _____ ways he could ascertain whether the accommodation set-up and sleep opportunities were resulting in rested crew members through sampling sleep diaries, actigraphy and like fatigue-recording methods.

stated that he was shocked to learn of the standby arrangements that were followed in the Westwind fleet. He stated that, due to single crews, 8 weeks standby occurred in Darwin and Cairns while three weeks standby occurred everywhere else. felt that this had been a traditional imposition of standby structure due to the minimal hours the Westwind crews flew (approximately 200-250 hours per annum) but also stated that the standby procedures were under review.

In terms of assessments regarding crew fitness for duty, stated that a 'Just Culture' was always being pushed at Pel-Air and in his time as Group Safety Manager he had seen improvements in the system. At the end of the day, stated that if the pilots said they were tired, that was it. They spoke to or and did not fly.

Time	Interviewee	Purpose	Interviewer/s
1530 3Dec09		System/Rostering	

was asked about her rostering techniques, the use of the FAID bio-mathematical modelling software and her training. stated that the rostering system had been developed to allow crew three days of standby, one intermediate day titled a 'Grey Day' and then two days off. The 'Grey Day' was put in place so that the crew member can decline a duty if it was to finish past 10pm and therefore may eat into their days off. stated that she had seen one crew member decline a duty due to the 'Grey Day' rules but that no paperwork had been raised.

In terms of using the FAID software and rostering, had had two days internal training on FAID before taking on the Westwind Operations duties and then had four days 'on the job' training in the Pel-Air Brisbane office. was asked about her knowledge of Individual Fatigue Likelihood Scores (IFLS) and Peak Fatigue Scores (PFS) and stated that she'd had no real training on these topics but had been shown how to calculate them during her training in Brisbane. re-iterated that all crew members had the right to put their hand up and decline duty if they felt they were fatigued. In this situation, stated that she would ring other crew members or push the commencement of the duty back until the crew were right to fly. No knowledge regarding any limitations on the FAID model or other functionality of the FAID program. If FAID score is greater than 75 then crew don't fly.

stated that the split-shift system in their roster was designed to provide crew members with a sleep opportunity once on the ground following a long sector of flying. She stated that once on the ground, the crew were given 5.5 hours that was made up of 90 minutes of admin and transit time and 4 hours of dedicated sleep opportunity. If the sector was longer than 6 hours of flying, the crew were given 10 hours on the ground. When asked further questions regarding split duty (what is the minimum sleep assumed the flight crew will get and what is the process if the flight crew do not sleep during the 4 hours) did have any answers.

stated that they would review a duty if the crew's FAID scores were above 70. The crew would usually be deemed as ok to fly if the operation was taking place in daylight hours however, if they were delayed or the duty went into the night, she would organise a split shift.

She stated that they relied on the FAID score to judge the crew's level of fatigue – it was up to the crew to say whether they were fatigued or not. If there was an issue with the roster or FAID scores (or a complexity relating to the operation), would discuss the situation with

. She had seen the FAID PFS of 75 exceeded only once but said no formal management action had taken place. The crew mainly rang rather than (she stated that it was about a 70/30 split) however for most major issues, they rang .

was asked about crew distribution. She stated there were only single crews in both Cairns and Perth and three crews each in Darwin and Sydney. She stated that the single crews were on standby for 3-4 weeks before they were relieved by another crew.

Time	Interviewee	Purpose	Interviewer/s
1640 3Dec09		System/Rostering	

_____ began this interview with a run down of the history of the FRMS within Pel-Air as he had been involved with it from the beginning. _____ stated that they had begun to put a bespoke fatigue measuring system in place when they were guided by CASA to acquire FAID and put an FRMS centred on FAID in place. _____ stated that the organisation that had sold FAID to Pel-Air, then did the FRMS assessment on CASA's behalf. _____ said that from 2004 until 2007, _____, took carriage of the development of the FRMS.

_____ stated that from his experience, he believed that the Apia trip was not excessively fatiguing but that Pel-Air had volunteered to stand down the incident crew for five days while they gathered their own evidence and had grounded the fleet in an act of good faith while they got to the bottom of the issues. He believed they planned their duties very well, incorporating a great deal of rest and that the crew got a lot of say in the planning phase. _____ stated that it was a business imperative that they operated on a 24/7 standby model. The contracts they had in relation to medivac operations required an ability to respond quickly to medical emergencies.

_____ stated that they were of the opinion that they needed to trust the crew's judgment when it comes to their stating their fitness for duty in relation to fatigue. _____ also stated that he did not get much involved in the scheduling of Westwind operational rosters and left it mostly to _____.

Time	Interviewee	Purpose	Interviewer/s
1800 3Dec09		System	

_____ stated that, at this time, he had to rely on the operations team to schedule their rosters appropriately using the FAID software. _____ stated that he believed there was no commercial pressure put on the pilots to fly while they were fatigued and they were quite within their rights to put their hands up and pull themselves off duty if they were fatigued. _____ was of the opinion that the company may have been relying too heavily on FAID scores for fatigue risk mitigation.

_____ stated that the Turbo-Prop fleet were a lot easier to roster due to more regular structured duty times and little requirement to roster standby periods. _____ was of the opinion that it was harder in the Westwind fleet to increase crew numbers and decrease standby times due to the decreased ability to provide crew training and proficiency opportunities because of the low number of hours flown. He stated that he had discussed the issues with the crews during the past few days and money was not an issue (_____ had asked the crews whether the offer of more money would improve their lot); the crews were more interested in having a more balanced lifestyle that was not possible under a 24/7 standby model.

_____ was confident that the new and proper safety management structure that had been put in place under _____ would deliver the appropriate safety focus. He had seen that there were more regular meetings and an increase in safety reporting from crews. _____ believed the framework was in place to capture the safety risks via investigations run by _____ team. _____ stated he was very happy with the paper trail and safety research being put in place and discussed in SMC meetings leading to actions and closure.

Time	Interviewee	Purpose	Interviewer/s
1915-2115 3Dec09	5 Pel-Air Westwind Crew Members	System	
0800-0900	4 Pel-Air Westwind Crew	System	

4Dec09

Members

and interviewed 9 out of a possible 12 Westwind crew members on the evening of 3Dec09 and the morning of 4Dec09. The first interview was done together to standardise interview approach and questions and then and interviewed four Captains and First Officers each. Interviews generally lasted 30 minutes and the crew members were asked to provide their thoughts and experiences relating to the following topics: rostering and the use of FAID; fatigue training effectiveness; fatigue countermeasures; long duties and split duties; continuous standby and support from Operations.

As a condition of speaking openly and frankly with the audit team, it was promised that no crew member would be identified in these interviews or any particular comment would be attributed to any one individual. Therefore, what follows are aggregated responses combining the interview input from all nine crew members under the main headings of discussion.

Rostering and the use of FAID

- Standby not taken into account when calculating FAID scores or making up rosters. The average for crew is 118 hours per week on standby, none of which is counted towards the fatigue score;
- Rely on Ops to keep scores under 75;
- FAID score more reliable when working on Turbo-Props;
- System does not reflect reality;
- The FAID score of 75 seems to allow you to do anything;
- On a trip to Apia, crew member stated he was knackered but the FAID score was low;
- No discussion of fatigue i.e. we don't get asked about prior sleep we are just told by operations whether we can do a trip based on 75 PFS;
- Over-reliance on FAID;
- There is confusion over definitions/obligations surrounding 'grey days'. Most crew felt it was another standby day;
- There are discussions in Operations regarding experience when a hard trip comes up – experienced crew are placed with inexperienced;
- Never used IFLS;
- Ops do not have enough training in these systems –back-up personnel have none.

Fatigue training effectiveness

- Ineffective, no understanding of FAID;
- Presents as a box-ticking exercise;
- Explains things in the round but not very well;
- Pushes the fact that fatigue is the crew's personal responsibility;
- Press the buttons and forget about it;
- Some flight crew were asked to score (from 0-10) the effectiveness of the training to improve their practical ability to manage fatigue risks within the Pel Air operational environment, 0 meaning they would be as effective managing fatigue in the operational environment had they not completed the training and hence the training provided no value; 10 meaning they learned a lot of practical strategies and tips to improve fatigue management. Scores out of 10 as follows: 2, 3, 3, 3, 6 initial course (3 as a refresher) due the training not being updated.
- Need face-to-face discussions involving operational case studies.

Fatigue countermeasures

- In-flight napping;
- Look after yourself;
- They have good in-flight catering;
- Strategic use of caffeine – 'V' and Red Bull.

Long duties and split duties

- Very short contact to doors times, rung at 7-8pm and leave at 10-11pm – Wheels up in 2 hours;

- Perceived self-imposed pressure to get the job done – need the hours to remain current;
- Pilot given the responsibility to make the call on rests – Ops gives them the options;
- Didn't realise busting 15 hours was an issue;
- Had gone longer than 15 hours on many occasions, but not fatigued so didn't report it;
- 15 hour duties are do-able but need to be managed;
- After a longer than 15 hour duty, told Ops and expected to fill in a report but wasn't required to;
- Have contacted Ops regarding a greater than 15 hour duty but no reporting;
- Hard to say no;
- Element of pressure from operations to complete the task/duty;
- Stopovers/breaks have been reduced - only 1 room to share;
- Split-shifts work for some;
- Crew state that they need to take responsibility and bring up the issue of fatigue – but takes some bravery to say 'no', particularly the younger aged flight crew.

Continuous standby

- Standby is neither on duty nor off duty;
- Not part of roster – starts at midnight;
- Continual standby draining – fatiguing/constant anticipation – an FO stated he was more attuned to his Captain's phone than his own;
- Crew feel they can't call in fatigued after standby or days off – self-imposed not because of pressure from Ops;
- The biggest issue is the impact it has on their lives – wears thin after awhile, hard to manage day-to-day requirements, there is a constant stress involved in being on constant call out;
- One crew were on standby for eight weeks, one crew member didn't have an RDO in two months.

Support from Operations

- Lacking once launched – no sat phone in some planes – have global roaming on mobile but some Captains don't;
- No negotiation regarding duties or rosters;
- Cant remember Ops ever discussing fatigue at the planning phase prior to departure;
- Feel ok to say 'no' but don't know of anyone doing it in the last 12 months – difficult to say no after being on standby and with so few hours available – company should not put us in a position where we may have to;
- Safety not compromised;
- Been told to stop once and duty was turned into a split-shift – took a 4 hour break;
- Asked once to stop and overnight prior to completing the last sector. Operations said the aircraft needed to be back for a trip the next day, which became implied pressure to continue;
- Tend to avoid putting the hand up – 'can do' attitude and thus, self-imposed pressure – especially among the younger guys;
- Operations try to help with breaks/accommodation but appear to side with the customer;
- Operations have a lack of knowledge of FAID;
- Crew don't want to make reports because they don't want to get into trouble;
- There is a pressure to do the work/complete the duty;
- Support is good – don't feel like you can't ask for time off – organisation is very accommodating;

Time	Interviewee	Purpose	Interviewer/s
1100		System	

stated that the FRMS had been developed and implemented by the then Compliance Manager. up until he left the organisation 18 months ago. believed that was less than open when it came to sharing the work required to ensure the FRMS worked appropriately within Pel-Air.

stated that he had learnt what he knew about the FRMS system via reading the manual and his own research. The FRMS had now been taken over by the Group Safety Team but no-one had 'owned' it for 18 months.

claimed that Jet Operations were a bit of a silo. They were not easy to talk to and showed little interest in any safety team initiatives or provision of safety input. believed this to be a cultural issue emanating from a couple of individuals' attitudes. believed that the crews did not want to report safety incidents/breaches as, due to the culture in the Westwind fleet, it would prove too onerous.

stated that they had begun incorporating quality assurance procedures into the system via the SMC meetings. had conducted regular internal audits on FRMS up to 18 months ago but had found no discrepancies when comparing flight records with the rosters. stated that he knew of regular duties that had gone longer than 15 hours and the procedure was to contact operations but he had seen no evidence that this had ever occurred. He believes there are no risk assessments, risk identification or mitigation on incidents carried out on any of the operations.

was asked what he believed would remedy the FRMS. He believed that there needs to be less reliance on FAID scores, more effective training and a simplified version of the manual that can be readily understood by all crew and staff. stated that there was no ready access to documentation due to its being only available online.

discussed the internal investigation he had carried out regarding a recent VCA event. believed the incident to be fatigue-related due to tight turnarounds, no proper breaks and the lack of provision of support from Operations. They had made sure proper breaks were being taken and had started getting QantasLink to do the loading and unloading to help the crew out. stated that they had also recently been conducting Ramp checks at night and this was also beginning to ensure changes were being made. He believed there had been a lot of changes within the Turbo-Prop side of operations.

Time	Interviewee	Purpose	Interviewer/s
1200		System/Rostering follow-up	

Follow on discussion with to clarify a few points. stated that the definition of a 'Grey Day' was that it was still classified as a work day but allows the crew member to decline the duty if the duty was going to take them past 2200 and eat into their days off. It was not classified as a day off.

stated that crew were issued with Cabcharge vouchers so they would not have to drive home after a long duty. believed that many options were available to crew and that in their home ports, the rented accommodation Pel-Air provided was always within five minutes of the airport.

stated that she had seen an 'Extension of Duty' checklist filled out when she first started as a demonstration but had not seen one filled in since and had not done one herself.

stated that ~~Darwin~~ was the only port that had changed from a twelve hour standby period to a 24 hour standby approximately twelve months ago. She did not know if CASA had been made aware of these changes.

stated that she had roster records available from when she started in 2008. For records before that, she would have to get them from the Brisbane office. was unsure as to how long records (e.g. crew duty times, rosters) should be kept.

Time	Exit Meeting	Purpose	Interviewer/s
1600		Feedback to management	

Provided broad feedback to [redacted] and [redacted] regarding the preliminary findings. It was stated upfront that there was an extensive amount of material yet to be reviewed with the aim of finding as many positive practices to support the identification of mature fatigue risk management through use of the Pel Air FRMS. All agreed the nature of adhoc medivac operations within the Pel Air WW fleet presented the highest fatigue risks when compared to other Pel Air operations that required careful consideration of fatigue and practical initiatives to manage the known fatigue risks. It was mentioned to date the FRMS had been heavily reliant on FAID and rather reactive in its management of fatigue.

[redacted] emphasised a thorough strategic hazard identification should be the first activity to analyse the fatigue risk, identify existing fatigue controls and determine whether further risk mitigation is required. It was emphasised the strategic approach involves taking a broad review of the typical operations that could be expected to expose crew to fatigue risk (e.g. relatively inexperienced crew, back of the clock flight, short notice, to a foreign destination the crew may not have been before etc). The aim of this strategic approach was to identify other environmental factors, which when combined with higher fatigue levels may contribute to unacceptable risk in the absence of other controls/mitigation strategies.

The feedback regarding training was also discussed. [redacted] mentioned significant work had gone into developing the existing FRMS CBT. [redacted] explained to [redacted] their may not be a problem with the content of that training (e.g. a basic understanding of basic fatigue science, how to maximise opportunity for sleep etc) but there still remained clear feedback from flight crew the training had not supported an operation and applied understanding of the Pel Air FRMS. It was mentioned an assurance process is necessary to ensure feedback is more readily obtained from flight crew to ensure the system is supporting their management of fatigue.

It was mentioned there appeared to be a history of activity when confronted by previous CASA RCA's to be seen to be doing something, but many previous issues with the Pel Air FRMS had not been appropriately corrected in the past.

Appendix C: Summary of Rex Safety Management Group Reviewed Safety Data

As part of the systemic investigation of the Pel Air FRMS it was emphasised to a number of Rex Group personnel to provide any safety data and previous safety reports that may assist with identifying mature applications of the Pel Air FRMS to assist with providing evidence to support the system had been effective with managing fatigue risk. As audits can focus on negative aspects of previous operations the aim was to search for the positives.

Much of the data provided is listed in the evidence table but will not be placed on CASA file as many were confidential safety reports. It was stated to the that this information would be de-identified to protect Rex's position in fostering a just internal safety culture i.e. if a confidential report was misused by the regulator this could have negative ramifications with crewmembers confidence in open and honest reporting of safety incidents to Rex SMG. The following provides a copy of the files reviewed:

This review was extensive and time consuming (over 2000 pages of material) but ensured the audit team exhausted all avenues to search for positive outcomes of fatigue management due to the use of the FRMS.

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Evidence obtained from the review of the above files as related to fatigue:

Date	Overview	Outcome	CASA Considerations / Limitations
6Nov09	Administration Memorandum A01/09: Turboprop rostered standby.	Changes made to turboprop rosters to improve the management of fatigue.	No paperwork to support consultation with crew, hazard, and identification of QA processes to ensure any risk associated with the change is acceptable and that the change addressed the identified risk.
22Oct09	Safety Event, Reference No 2826, turboprop. Flight crew set incorrect limiting altitude on APA and entered the CTA step to the west of Bankstown without a clearance. Crew had been on duty for approximately 13.5 hours at the time of occurrence without an allocated rest break (total duty period became 16 hours). The day had been very demanding as it involved multiple sectors (7), including aerodromes neither crew had operated into previously and operating to a very tight schedule (sometimes 20 min turnaround times). Several ports required the crew to manage the aircraft loading themselves, including loading and unloading part or all (of approx 500kg) of baggage on board.	Flight crew	
26Mar09-15Oct09	Pel- Air Safety Management Group (SMG) meeting Minutes as held monthly.	Review of fatigue related reports as a regular item for review. Reports have been received and action taken to follow up.	It is noted that within the last 12 months through the SMG, fatigue has been included as a formal item within the meetings. It is considered the majority of this activity to date (while an improvement over previous years) remains too reactive i.e. waiting until an event occurs prior to taking action.

22Aug08	Weekly FRMS Audit Report	Obs 1: Jet operations have to date not been able to provide documented evidence showing the times that FAID scores were actually updated. Obs 2: Flight crew continue to enter details of split duty on the same flight record sheet. This does not allow the correct information to be recorded in IAS, it also compounds the chance of an error being made. Obs 3: The use of multiple time zones has the ability to cause confusion: The use of UTC through all company documentation/rosters would help minimise this.	
15Aug08	Incident Report	Inappropriate accommodation/crew rest Mackay. Corrective action taken: appropriate accommodation sourced in a quieter area. Assessed by	
23Jul08	Incident Report	FAID 80.2. Recommended preventative action: Revised procedure Sydney ops roster. Assessed by	
23Jul08	Incident Report	Over FAID – peak 102 units. Summary of corrective action: Relocation of WW rostering from Bne to Sy; central fax server for flight record sheets (FRS); confirm FAID database is up to date; if operations do not have up to date FRS then ops staff to contact pilot directly and get the required info to update FAID. Assessed by Investigation findings/root causes: Unsatisfactory accepted practices relating to the dispatch of adhoc charter crew over night and over the week end; failure of the properly rostered crew to accept the assigned duty; inadequate physical and procedural systems for maintaining and accessing current FAID information.	Prior undetected FAID exceedance (76.5) by this pilot on 9May and was rostered for a 4 th flight on the 10May resulting in a PFS of 102 (again undetected) until after the flight. The IFLS report completed in error as the form states the potential fatigue risk was not elevated yet the IFLS score is 72.5 (page 175 of Pdf titled 2008 Reports).
9Jul08	Audit Report – FRMS Data	Verification of the integrity of the data being used to calculate fatigue scores by comparing a sample of fatigue scores/duty time from the flight crew roster system, with flight record sheets. No discrepancies were found that would have resulted in a higher fatigue score than otherwise calculated.	Not considered a sufficiently detailed review of the system to provide assurance the FRMS is working. An appropriate start but the CASA audit found a number of serious breaches of FRMS policy through a relatively small sample of duty data (flight logs).
18Jun08	Incident Report	Over FAID – 80.6. Exceeded planned timings. Recommended preventative action: revised procedure sy ops roster. Assessed by	

18Jun08	Incident Report	Over FAID – 75.6. Seek revised schedule Toll. Assessed by	Predicted hours 74.7.
5Jun08	Incident Report	Peak FAID 77.1. No recommended preventative action. Assessed by	
5Jun08	Incident Report	Peak FAID 75.7. No recommended preventative action. Assessed by	
18May08	Incident Report	FAID 80.9. Recommended preventative action: Revised procedure Sydney ops control roster. Assessed by	Minimal detail provided as to corrective action taken. Full incident report template not provided and appears the report was partially completed using the last page only.
12May08	Incident Report	FAID 84.9 and 82.7. Operations manager assigned additional duty to this crew without checking predicted FAID PFS. Recommended preventative action: release approved FRMS manual for use; all-crew and ops manager to be trained in FRMS procedures.	
25Mar08	OH&S, SMS, and FRMS (Reporting) Audit	FRMS findings: One occurrence found where a FAID score from Brisbane Operations exceeded 75. This occurrence is reportable as per the FRMS manual on Form PEL 6009. There was no record of the report being received by the safety officer or manager. A corrective action request (08-019-CAR) was raised.	
15Jan08	Incident Report	At FL210 enroute Bn to Cs and aircraft suffered a rapid depressurisation. IFLS calculated as 15.5. Assessed by	Signed off as no corrective action required yet the IFLS was extreme (an IFLS of 12 is the highest score possible within the FRMS manual) and would require task cancellation if detected prior to flight.
23Jul07	Incident report	PSWR and IFLS indicated elevated fatigue risk.	No action taken for the fatigue element of this report.
10Jul07	Hazard and Near Miss Report Form	Documented evidence from a flight crew member of poor rostering practices in contravention of the FRMS manual rostering practices.	No follow up actions from safety or compliance.
Apr07	Incident Report	FAID 86.2. Assessed by	No evidence of CASA notification.
2Apr07	Incident Report	A series of loud explosions were heard while climbing through FL340.	Fatigue assessment component of the investigation incomplete, form suggests crew member had been

				awake for 26 hours. May be in error but no follow up evident.
8Mar07	Fatigue Occurrence Report Form	FAID 75.2.		
5Mar07	Incident Report	Long duty, operational pressure on crew. Crew had requested a stop enroute due to fatigue (10 hour day, 7.7 hours flight time). Was told this was not possible because the aircraft was required in Nowra the next day.		Inadequate evidence of any effective preventative action.
5Mar07	Incident Report	FAID 75.9. Cause: operational, no further action. Assessed by		
5Mar07	Incident Report	FAID 75.4. Cause: operational, no further action. Assessed by		
5Mar07	Incident Report	FAID 85.9. Cause: communication between Chief Pilot and rostering. Recommended preventative action: rostering to be carried out by independent personnel. Review effectiveness of new arrangements. Corrective action taken: Made clear to Chief Pilot that this is unacceptable. Rostering has been removed from the Chief Pilot.		
5Mar07	Incident Report	FAID 78.5. Cause: operational. No further action. Assessed by		
5Mar07	Incident Report	FAID 80.0. Cause: late sign off. Recommended preventative action: suggest later sign on times to the customer. Assessed by		
14Feb04	Incident Report	FAID score peaked at 75.5. Causes operational. No further action. Assessed by		

Appendix D: FRMS Compliance Checks & Review of FRMS CBT

IAW normal audit procedures for FRMS a sample of records (logbooks, rosters (planned and actual) and flight records) were collected and reviewed to ensure accurate data entry across fields and compliance with the FRMS manual procedures. The samples were chosen via a random review of flight crew logbooks with particular attention to entries with longer afternoon or night flights involving multiple sectors. The aim of selecting longer afternoon/night flights with multiple sectors for further comparison was to ensure the information was more likely to be representative of flights involving higher fatigue risk.

A summary of the logbook information planned for comparison with flight records and rosters as follows:

Compliance checks were completed for the following and found to be accurate:

As part of this task the flight records were given a cursory review to inspect entries for duty times. Entries greater than 10 hours were then prioritised for further investigation and review of logbooks. The following violations of the FRMS manual were identified. These were considered significant enough to not warrant further review of the planned pilot logbooks in addition to that already completed.

Date	Evidence	Breach of Policy
15Jul09	Flight Record: 62976. Crew duty 17.5 hours. Entry in actual roster 16.5 hours.	No <u>Fatigue Extension of Duty Checklist</u> (Form PEL 6010) completed prior to flight. No <u>Fatigue Occurrence Report Form</u> (Form PEL 6009) submitted post flight.
22Jul09	Flight Record: 62891. Crew duty 16.5 hours.	No <u>Fatigue Extension of Duty Checklist</u> (Form PEL 6010) completed prior to flight. No <u>Fatigue Occurrence Report Form</u> (Form PEL 6009) submitted post flight.
23Jun09	Test flight entered in logbook but no entry in the roster.	Not IAW rostering practices.
27Mar09	Flight Record: 065651. Crew duty 14.5 hours, which is incorrect. flew civil air the morning prior to position for the flight entered in this flight record. This meant a sign on time of 2100UTC and sign off at 2015UTC. A duty time of 23hours 45 minutes.	3.2.3.1 Positioning is that travel required by the operator used when positioning the flight crew for flying duties before or after a flight. For the purpose of fatigue risk management, positioning is always considered work. The civil flight was not entered into the roster. No <u>Fatigue Extension of Duty Checklist</u> (Form PEL 6010) completed prior to flight. No <u>Fatigue Occurrence Report Form</u> (Form PEL 6009) submitted post flight.
	Rosters requested for September 2007 were not available. said they could not be located.	Data should be retained for 3 years (as per previous CASA audit report).

Copies of flight records sheets and final rosters attached in separate pdf file titled 'Annex D_Flight Records_Compliance Check_Pel Air FRMS'. A further detailed compliance audit will be conducted as follow up to RCA's raised for the Pel Air Express FRMS.

Review of FRMS CBT Training

The online Pel Air FRMS CBT training course was completed including an independent review from a CASA FOI with no prior FRMS training. A summary of findings as follow:

- The course met the training objectives and syllabus as approved within the Pel Air FRMS manual.
- The course took approximately 2 hours to complete online.
- The review by a non FRMS trained CASA FOI was positive and no problems in understanding the concept of the FRMS and found their programme to be very informative as to the operation of the FRMS, and how it would be used within their operation.

There remains the issue that feedback from flight crew clearly suggests there is a gap between what is covered via the CBT FRMS course and their practical understanding of how the FRMS works in an operational context. This may (in part) be a by product of the cultural influence of a minority that has shaped the flight crew attitudes towards the FRMS.

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Appendix E: Mock Operational Trial of the Pel Air FRMS

While Pel Air has committed to a number of action items to improve their FRMS there still remains and absence of good data (evidence) to support

To further assess the existing system further interviews were conducted with the [redacted] and the [redacted], who remain the personnel primarily responsible for the effective operation of the FRMS. The scenario involved the manager Human Factors [redacted] playing the role of a new Westwind captain with minimal experience within Pel Air and shift work who had completed the online FRMS CBT but not the face-to-face FRMS training. I have a wife and two young kids (3 years and 10 months old). The scenario involved a discussion with the chief pilot and operations controller to ask some questions about how the FRMS worked in practice and followed with a mock flight, in which [redacted] continued to role play the Captain. A summary of events as follow:

Mock Trial of Pel Air FRMS	
Date/ Time (local Sydney)	Event
16Dec09 1605	Telephone interview with [redacted] to ask operations about the FRMS and how it works. Areas discussed included: standby time, how to maximise sleep, the use of split duty, PSWR and its practical use, IFLS, extension of duty checklist, the requirement for fatigue assessment, some strategies that could be used (caffeine, napping, split shift, delay, reassign or cancel the flight etc), requirements for longer duties (12-15 hours), what to do if [redacted] doesn't answer her phone, who else I can call. All answered well and understood by [redacted]. Some areas that require further consideration: - Use of any personnel for future support if they in the past contributed to the poor reporting culture and FRMS practices not IAW the manual. Sam mentioned I could call [redacted] as back up, which is not endorsed due to previous contribution to the dysfunctional FRMS. - The FAID scores require a hazard to ensure a red flag is raised appropriately for [redacted] to seek further support from the CP. - 24/7 call options must be reviewed. Suggest use of a dedicated mobile phone so crew know a common number to call at all times and an appropriate rostering system to manage workload of operations personnel. This could draw upon the existing practices within Brisbane turboprop operations.
16Dec09 1640	Phoned [redacted] as a care flight representative requesting a medivac with the following details: depart Sydney 2300 local; 16Dec09 local time, fly to Apia via Norfolk Island to pick up a patient. Patient to depart Apia for Melbourne (via Norfolk Island) on 17Dec09 at 0900UTC (2300 local).
16Dec09 1700	Discussion with [redacted] to seek some general advice on how to best manage fatigue when conducting back of the clock medivac operations as well as further discussion about the FRMS and how it works. Areas discussed included: FRMS manual, join responsibilities, my family circumstances, options for enhanced crew rest if experiencing difficulty with home sleep, reporting (particularly rostering staff) if there were any issues, split duty, FAID, occurrence reporting, sleep patterns (I asked whether I should stay up later than normal to increase sleep during the day), my normal sleep patterns, who to call within operations, split duty, extension of duty checklist, options to spend more time with operations to look at various patterns using FAID, callout requirements. Some areas that require further consideration: - Limitations of FAID: [redacted] mentioned the model is predictive to 14 days (this is not correct as it only looks back over 7 days).

	- Discussed with a formal process to detect other risks beyond actual sleep/PSWR/IFLS including number of sectors/workload, MELs, weather, nav aids, crew experience and whether they have flown the route before. The problem remains if the crew are already fatigued and this is affecting their ability to make sound decisions then someone not fatigued within operations must be able to support this process to ensure all factors combined remain an acceptable risk.
16Dec09 1910	called pilot number 1 to ask whether they were fit to perform the medivac to Apia. Provided with the following information: Sleep in last 24 hours - 8 hours (11pm-6am; 1-1.5 hours early afternoon); sleep two days ago - 7 hours (11pm-5am, 1 hour nap mid morning). Based on the PSWR and IFLS this pilot was told they would not be suitable for the flight. Pilot number 2 (Captain Cook): Sleep in last 24 hours - 10 hours (10pm-6am; nap 2pm-4pm); sleep two days ago - 9 hours (10.30pm-6am; nap 1 hour mid morning). IFLS scored as 7 and further questions asked about suitability to fly. Extension of duty checklist completed by operations. Told a fatigue report would need be completed due to the IFLS and that this was a normal procedure to capture further fatigue data. Provided with appropriate information regarding the flight e.g. accommodation, dip clearances, times etc. Told to call operations once signed off at Apia and to re call them 2 hours prior to departure to re check fatigue scores.
17Dec09 0800	SMS from : asked to confirm arrival into Apia and final sign off time. Reminded to complete the fatigue occurrence report at earliest convenience. SMS from : <i>Arrived and signed off as planned. Sorry for the delay with response but we are a bit tired after a long night.</i> SMS from : <i>Would it be ok to fill out the form when I get back? Internet access is not great and didn't work last time we were here?</i> SMS from : <i>Main priority is for you to rest/sleep will discuss with you later in the day regarding occurrence report. Please call me two hours prior to departure in order to reassess your fatigue score.</i>
17Dec09 1243	SMS from : <i>Hi . What was the planned doors close tonight? The weather and pool is great over here! Shame we have to fly back tonight!</i>
17Dec09 1309	SMS from : <i>ETD 0900 UTC. Please call me 2 hours prior to departure to reassess your fatigue levels.</i>
17Dec09 1710	Called to get an update on my fatigue levels. Was asked to provide sleep in last 24 and 48 hours. The response involved the pilot thinking aloud to determine total sleep for the day along the lines of: <i>Once I got to the hotel I had around 2-3 hours sleep, was woken by a cleaner and decided to have some lunch and a swim in the pool, returned to my room and got another couple of hours sleep and that I had not long woken up prior to calling. I said I'd had about 4.5 hours of good quality sleep although I had been in my room for a longer period resting and trying to get to sleep. Initially told I could not fly due IFS. I explained to I was feeling good and that the doctor had told me any delays would result in the death of the patient. Was told by she would need to chat with called me back and said I would need to be stood down. I asked to speak with and she transferred me.</i> Spoke with and explained I'd had 4.5 hours of good sleep today in the hotel (about the best I can get during the day), a normal amount of sleep the day before (7.5-8hours) and that the patient would die if we delayed the flight. I also mentioned the aircraft had no MELs, the weather enroute was good, the refueller was ready to go at Norfolk Island and was aware of the criticality of a quick turn around, the last approach would be within CTA and an expected ILS into Melbourne where we would stay for the night. re checked his fatigue scores and told me I would not be able to fly.

	Exercise complete at 1740.
17Dec09 1740	Exercise complete. Provided some feedback to and that I felt confident I was getting good support and direction from operations.
18Dec09	Electronic copies of paperwork associated with the exercise were provided by (see electronic files 'img-Z181106-001.pdf' and 'img-Z181107.pdf') and discussed further with and . There were some further issues identified in the operational understanding of how to use the IFS checklist, as and had both entered the same data into the spreadsheet using two different methods. This confusion and/or lack of understanding was related to whether the pilot had acquired the sleep in the last 24 hours in one block or via two separate sleeps. This required further clarification on the spreadsheet itself and careful use of questions. It would not be sufficient to just ask how much sleep a pilot had obtained in the last 24 hours as it is necessary to confirm whether it was obtained in one sleep opportunity. Where total sleep was obtained via two or more naps then question no 5 (How many hours of extra sleep have you had since you woke up?) is required to be used.

An ancillary finding of this mock trial was detection of errors in the electronic IFS spreadsheet, as provided by . It became apparent the quality assurance of this product (spreadsheet) had not been conducted by Rex/Pel Air. A summary as follows:

Fatigue Assessment Form V1.7: There was an error detected in the formula used within the spreadsheet resulting in a small (6 minute) change in actual sleep in the last 24 hours resulting in an excessive change in the IFS. The reference to 24 hours in the lower sentence should read 48 hours. These errors were acknowledged by and a new version of the spreadsheet disseminated for review.

Question		Pilot 1	Pilot 2
1	How much sleep have you had in the previous 24 hours?	4	3.9
2	How much sleep in the 24 hours prior to above?	8	8
Total Sleep in the last 48 Hours		12	11.9
3	How many hours since you woke up?	1	1
4	How many hours until the end of the actual or proposed duty?	12	12
Total waking hours to the end of the actual or extended duty?		13	13
5	How many hours of extra sleep have you had since you woke up?	0	0
Total hours sleep in the last 24 hours		12	11.9
Increased risk of fatigue		YES	YES
Individual Fatigue Score		2	14.1

Fatigue Assessment Form V1.8: A further anomaly was detected in version 1.8 while discussing with the Rex Safety Manager a suitable process for performing tests on the spreadsheet to assure these anomalies were not repeated. In this case it was discovered it was possible to have an IFS (16 – see below) that was off scale due excessive fatigue with the above box remaining green and indicating there was no increased risk of fatigue. These errors were further acknowledged by for correction. It was also discussed that CASA would not perform a quality assurance test on the spreadsheet as this remained the responsibility of Rex/Pel Air.

Question		Pilot 1	Pilot 2
1	How much sleep have you had in the previous 24 hours?	1	
2	How much sleep in the 24 hours prior to above?	12	
Total Sleep in the last 48 Hours		13	0
3	How many hours since you woke up?		Enter sleep in hours, e.g. 1.5 etc
4	How many hours until the end of the actual or proposed duty?	12	
Total waking hours to the end of the actual or extended duty?		13	0
5	How many hours of extra sleep have you had since you woke up?	0	
Total hours sleep in the last 24 hours		13	0
Increased risk of fatigue		NO	NO
Individual Fatigue Score		16	5

Fatigue Assessment Form V2.0: These issues were resolved by version 2.0. At this stage CASA Human Factors is not aware of the detailed quality assurance tests conducted by Rex/Pel Air to ensure the spreadsheet is working as expected.

Question		Pilot 1	Pilot 2
1	What was the length of your main sleep in the past 24 hours?	2	4.5
2	How much sleep in the 24 hours prior to question 1	8	8
Total Sleep in the last 48 Hours		10	12.5
3	How many hours since you woke up?	1	1.5
4	How many hours until the end of the actual or proposed duty?	10	10
Total waking hours to the end of the actual or extended duty?		11	11.5
5	How many hours of extra sleep have you had since your main sleep in question 1?	2.5	0
Total hours sleep in the last 48 hours		12.5	12.5
Prior Sleep Wake Rule (Increased Risk of Fatigue) PSVR		YES	YES
Individual Fatigue Likelihood Score (IFLS)		12	2

It was disappointing that the process of quality assurance was incomplete and rushed, as evident by the gross errors and anomalies found with the spreadsheet. These should have been detected by Rex / Pel Air prior to submission.

Appendix F: Considerations for Standby Time

Anticipation Stress

From the interviews conducted with the Pel-Air operational crews, it appears that permanent standby has resulted in psychological fatigue due to the expectation to perform duty and the anticipation of call-out. The short planning period, lack of knowledge of possible destinations and lack of support provided by Operations staff once doors have closed appears to add to this fatigue. All crew interviewed believed that they felt there would be no issues in stating that they were fatigued and pulling out of duty but also felt that they had limited opportunities to fly and had to take these opportunities when they arose.

This psychological fatigue appears related to what has been termed in the literature as anticipation (or anticipatory) stress. Anticipation stress has been defined as the anxiety and emotional fatigue suffered before meaningful life experiences, whether positive or negative¹. Stressors that can give rise to anticipation stress can be seen as either arising within the individual (internal) or can be attributed to something in the individual's immediate environment (external). Internal sources of stress can arise from an individual's perceptions of an environmental threat, even if no such danger actually exists.

Environmental stressors are external conditions beyond an individual's control. Bhagat² has reported that work performance can be seriously impaired by external stressors and many aspects of an individual's interaction with the organisation they work for can become external stressors. These include issues of structure, management's use of authority, monotony, a lack of opportunity for advancement, excessive responsibilities, ambiguous demands, value conflicts, and unrealistic work loads. A person's non-working life (e.g., family, friends, health, and financial situations) can also contain stressors that negatively impact job performance³.

Several theories that link stress to health issues or disease have now incorporated the concept of prolonged activation. Prolonged activation relates to the sustained nature of the stress reaction given continuous exposure to stressors. Recent researchers⁴ argue that these theories still lack an important element, that is, the cognitive nature of the mechanism that causes stress responses to be sustained. The perception of stress and the initial response to it do not automatically lead to prolonged activation. The active cognitive representations of stressors need to be prolonged in order to extend their physiological effects. This mediating process has been termed perseverative cognition, and it is manifested in phenomena such as worry, rumination, and anticipatory stress. It is felt that these phenomena are associated with physiological activation, including cardiovascular, endocrinological and immunological parameters that can result in health issues if activation occurs over a long period.

In this particular case, the interviews with crew presented many of the factors listed above that had been manifested in the continual standby, their own perceived pressure to get hours up, the perceived pressure to perform a successful medivac and save lives, the 'can-do' attitudes the crew portrayed, the lack of experience, the lack of knowledge of the areas they were flying into, the short lead time from contact to doors closed and the lack of support from Operations once the doors were closed. These factors all presented as mild stressors that when combined appear to have had an impact on the operational crews' fatigue levels.

¹ Mosby's Dictionary of Complementary and Alternative Medicine. (c) 2005, Elsevier.

² Bhagat, R. S. 1983. "Effects of stressful life events on individual performance effectiveness and work adjustment processes within organizational settings: A research model." *Academy of Management Review*. 8(4): 660-671.

³ Walonick David S. Causes and Cures of Stress in Organizations. <http://www.survey-software-solutions.com/walonick/organizational-stress.htm>. Accessed 13 Dec 09.

⁴ Brosschot J F, Pieper S, Thayer J F. 2005. Expanding stress theory : Prolonged activation and perseverative cognition. *Psychoneuroendocrinology* 2005, vol. 30, no 10, pp. 1043-1049.

The following guidance is provided within the **UK CAA CAP 371**:

Standby Duty: *A period during which an operator places restraints on a crew member who would otherwise be off duty. However, it shall not include any time during which an operator requires a crew member to be contactable for the purpose of giving notification of a duty which is due to start 10 hours or more ahead.*

12 Standby Duty

12.1 *The time of start, end and nature of the standby duty must be defined and notified to crew members. The time a standby duty starts determines the allowable FDP, except that when the actual FDP starts in a more limiting time band then that FDP limit will apply. However, when standby is undertaken at home, or in suitable accommodation provided by the operator, during the period 2200 to 0800 hours local time and a crew member is given 2 hours or less notice of a report time, the allowable FDP starts at the report time for the designated reporting place.*

12.2 *When a crew member is on standby duty on immediate readiness at an airport, then the allowable FDP is calculated using the start time of the standby duty.*

12.3 *If a crew member is called out from standby, the standby duty will cease when that individual reports at the designated reporting point.*

12.4 *The following limits apply:*

Case A

If a crew member is called out from standby to conduct an FDP before completing 6 hours standby duty then the total duty period allowed is the sum of the time spent on standby and the FDP allowable from paragraph 13, Tables A, B, C, or paragraph 23, Table D.

Case B

If a crew member is called out from standby to conduct an FDP after completing 6 or more hours standby duty, then the total duty period allowed is the sum of all the time spent on standby and the allowable FDP, reduced by the amount of standby worked in excess of 6 hours.

NOTES:

1 *The method of adding time spent on standby to cumulative totals is stated in paragraph 22.*

2 *The reference to 'total duty period' applies only to the sum of the standby time achieved + the allowable FDP obtained from paragraph 13. On the day, for cumulative duty totals and for minimum rest purposes, the total duty achieved will be standby time achieved + FDP achieved + post flight duties + any positioning.*

12.5 *When any period of standby finishes, during which a call-out has not occurred, at least 12 hours rest must follow prior to the next duty period. Similarly, following the end of a contactable period or periods, at least 10 hours must elapse prior to the next duty period.*

17 Rest Periods

17.5 *After being called out from a standby duty the length of minimum rest shall be determined by the length of standby duty, plus any time spent on positioning, and any FDP completed.*

22.3 Calculation of Cumulative Duty Hours (all aircraft)

Duty hours shall be added to cumulative totals in accordance with the following:

a) To count in full:

- i) Duty periods and flying duty periods, plus subsequent post-flight duties*
- ii) All standby duty, except that specified in b) i) and ii) below*
- iii) The time spent on positioning.*

b) To count as half the time on duty:

- i) The standby duty, when the period of notice given to the crew member by the operator before reporting for duty, is treble or more than the specified minimum report time.*
- ii) The standby duty when undertaken at home, or in suitable accommodation provided by the operator, takes place during the period 2200 to 0800 hours, and the crew member can take undisturbed rest and is not called out for duty.*

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Appendix G: Evidence Table

No.	Evidence	Source	Pages	Why
1	Logbook Extract – – 4 May to 17 Nov	Pilot's Logbook	10	Hours comparison with roster and daily flight records
2	Logbook Extract – – 4 May to 17 Nov	Pilot's Logbook	7	Hours comparison with roster and daily flight records
3	Logbook Extract – – 3 Mar to 5 Jun	Pilot's Logbook	3	Hours comparison with roster and daily flight records
4	Logbook Extract – – 4 Sep to 30 Oct	Pilot's Logbook	3	Hours comparison with roster and daily flight records
5	Logbook Extract – – 3 Sep to 20 Nov	Pilot's Logbook	3	Hours comparison with roster and daily flight records
6	Flight Record extracts – – 27 Jun to 10 Nov	Flight Records System	20	Hours comparison with roster and pilot's logbook
7	Flight Record extracts – Jun to 13 Nov	Flight Records System	24	Hours comparison with roster and pilot's logbook
8	Flight Record extracts – – 1 Jun to 17 Nov	Flight Records System	32	Hours comparison with roster and pilot's logbook
9	Flight Record extracts – – 7 Jun to 4 Nov	Flight Records System	30	Hours comparison with roster and pilot's logbook
10	Special Audit Questionnaires – 3 Crew	CASA Special Audit Team	18	Picture of FRMS functionality
11	Pel-Air FRMS Audit Reports – dated 9 Jun 2008 & 22 Aug 2008	Pel Air Safety Team	2	Evidence of FRMS functionality
12	Pel-Air OH&S, SMS & FRMS (Reporting) Audit – March 2008	Pel Air Safety Team	10	Evidence of FRMS functionality
13	Pel-Air Turbine (Westwing) Rosters – 7 Jun to 21 Nov 2009 – Planned and Actuals (duty and hours)	Pel Air Operations	36	Hours comparison with pilot's logbook and daily flight records
14	SMG/Steering committee meeting minutes – since Oct 06	Rex Safety Manager	Electronic files	Evidence of FRMS functionality
15	All previous documentation related to FRMS risk register/risk assessment/mitigation; investigations; fatigue reports.	Rex Safety Manager	Electronic files	Evidence of FRMS functionality
16	Logbook Extract – – entire logbook	Pel Air Operations	24 (double sided)	Hours comparison with roster and pilot's logbook
17	Logbook Extract – Mar-Nov09	Pel Air Operations	4 (double sided)	Hours comparison with roster and pilot's logbook

Appendix H: Core Preliminary Communication to Bankstown Field Office

The following is a summary of key emails related to preliminary feedback provided to Bankstown Field Office as this larger report was being completed:

From: CASA Officer CASA Officers To: CASA Officers Cc: CASA Officers Subject: Special Audit Fatigue Risk Management Dot Points [SEC=IN-CONFIDENCE-AUDIT]	Sent: Sun 06/12/2009 14:59
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As requested, some dot points that & I have put together to provide you with our current fatigue-related audit findings and state of thought. These are taken mainly from corroborated interview statements from crew, operations personnel and management and documentary evidence that Pel-Air has supplied on the 3-4 December:

1. There appears to be many deficiencies with Pel-Air's FRMS at present. Most Pel Air crew identified a lack of understanding of the process and the training is regarded as inefficient and ineffective.
2. Many safety check processes within the FRMS appear not to be followed and there is a lack of training and understanding of fatigue-related safety issues within the Operations staff. This has led to an over-reliance by Operations staff on the FAID bio-mathematical modelling score to provide a fly/no-fly gauge. The Peak Fatigue Score (set at 75) also appears as having been set too high and is not picking up the realities of fatiguing duties.
3. As part of the audit, we requested (and emphasised) to the Safety Manager and Operations staff the importance of providing documentary evidence to confirm that the FRMS is functioning as an operational system. We have received internal audit reports and minutes from Safety Management Group meetings from the last 12 months, however, at this stage, we have found very little supporting evidence that the FRMS (or the SMS) is functioning adequately.
4. All Pel-Air crew interviewed (9 out of a possible 12) stated that permanent standby resulted in psychological fatigue resulting from expectation to perform duty and anticipation of call-out. The short planning period, lack of knowledge of possible destinations and lack of support provided by Operations staff once doors closed appears to add to this fatigue. All crew interviewed stated that they felt there would be no issues in stating that they were fatigued and pulling out of duty but also felt that they had limited opportunities to fly and had to take these opportunities when they arose.
5. Most Pel-Air crew interviewed stated that they had been part of a duty that was greater than 15 hours in length but there was no evidence that fatigue related extension of duty checklists had been followed, safety reports had been written following the duty or that any management follow-up was conducted as is promulgated in the company FRMS manual.
6. As quite rightly pointed out in email (dated 4 Dec 09), this operator has a world-wide AOC & does not take into account time zone and body clock fatigue issues in the FRMS manual.
7. & I both believe that on the weight of the interview and documentary evidence gathered and analysed to date, Pel-Air's FRMS exemption should be withdrawn and they revert to CAO48 with special exemption until corrective actions have been adequately dealt with. In the past the Bankstown field office has withdrawn the FRMS privileges based solely on inadequate FRMS training. In this area alone the system remains deficient.

will explore these issues further on his return to Pel Air offices tomorrow to get definitive evidence/statements. Full report to follow by Monday 14 December.

Cheers & happy to discuss

Civil Aviation Safety Authority
GPO Box 2005, Canberra, ACT, 2601

From: CASA Officer	Sent: Tue 08/12/2009 21:44
To: CASA Officer	
Cc: CASA Officer	
Subject: FW: Response to Roger [SEC=IN-CONFIDENCE;AUDIT]	

Its late and I won't change the wording (it has signature block) and I have been to and fro to consolidate our response:

here is the combined response from & I for the FRMS element of the action plan letter. We believe that the original second dot point is not correct as responsibility for identifying excessive fatigue state rests solely with the crew, which results in a process with inadequate support to crew by operations, irrespective of FAID scores. We have inserted some statements which we feel is closer to the mark as a major requirement for Pel-Air - they need to stop the FRMS manual from being shelfware! We've also added a dot point on FRMS requirements for time zone changes as this is a major omission from the manual.

- o No up to date and documented fatigue hazard identification, risk analysis, risk controls and mitigation strategies. The company considers adhoc aero medical operations, which often occur at the back of the clock, to be its highest fatigue risk yet there is no recent documented process to confirm the risks have been managed to as low as reasonably practicable.
- o Overreliance on FAID as the primary fatigue decision making tool.
- o Inadequate adherence to FRMS policy IAW the approved manual.
- o Inadequate FRMS training including feedback mechanisms to confirm the training is fit for purpose.
- o Excessive periods of 24/7 standby.
- o No designated and accountable person managing the FRMS.
- o No FRMS policy regarding fatigue management for multiple time zones changes.

As always - happy to discuss

Cheers -

Operational Safety Analysis
Safety Performance Analysis
Civil Aviation Safety Authority
GPO Box 2005, Canberra, ACT, 2601

From: CASA Officer
To: CASA Officer
Cc: CASA Officers
Subject: FW: URGENT: Review of Pel-Air Management Action Plan [SEC=IN-CONFIDENCE/AUDIT]

Sent: Thu 10/12/2009 11:13

Hi

Here's the consolidated response from [redacted] and I.

One of the key areas that we believe is missing from the action plan is a list to cover the quality assurance (QA) processes i.e. there is a lot of activity within the list but how will they determine and assure themselves and CASA the actions have been effective. For example, safety culture and reporting remain an issue with the WW operators and this process takes time (minimum 6 months) to influence and then determine the change has been effective. This will require formal feedback from operational personnel (e.g. safety culture/climate questionnaire). The lack of adhering to documented FRMS policy will require time for examples of appropriate use to be collected, and audit including feedback from operational personnel to ensure the processes within the FRMS manual are being followed. The QA will provide the evidence that the actions have actually contributed to improvements.

The Pel Air list as related to FRMS is a little rushed but I understand this could be expected organisational behaviour given the accident, CASA audit and the need to get back in the air. The first process should involve 1.15 which is the hazard, risk analysis, identification of controls and their effectiveness and development of further mitigators as related to WW fatigue risk management. We appreciate this process is not isolated to fatigue but other identified hazards as well. This would provide better insights based on direct feedback from operational personnel as to what's working, what's not and what should be done to address. Some further points specific to the item numbers:

- 1.11 Review FRMS E-Learning: The CBT package already contains a feedback form regarding the quality of the course and it appears it has not been used upon completion. A review of the training is fine and from my initial review there is no problem with the basic content, what needs to be determined is why operational staff believe it has been ineffective, which could be further consideration to some education principles rather than the existing content e.g. does CBT meet their learning needs. Much of the feedback from flight crew related to the need for greater work and facilitated discussion on some operational case studies to allow them to understand the process in a more practical sense. Hence, the primary evidence required to confirm the training processes are fit for purpose will be feedback from operational personnel. This will require an ability for flight crew to provide confidential feedback (i.e. it's not mandatory to record your name against the form) to ensure they can provide open and honest appraisal of the training. Other deficient training is the understanding of FAID, its various other functions and any assumptions made by the product e.g. how much sleep is it assumed crew receive when rostering split shifts. This should feed to improved policy e.g. if a split shift is planned and the crew don't get any sleep what happens? Also, where is the fatigue risk management training (not just FAID training) for Ops personnel? This also needs to be recurrent.
- 1.13 Any checklist must be linked to other hazards and risk. For example, most crew members flying back of the clock medivac will have some level of fatigue and questions can be used to support operations' decision making as related to fatigue e.g. prior sleep history. But, this must be matched with other environmental hazards and risks, which will ultimately allow an appropriate decision to be made as to whether the fatigue (and other) risks are acceptable e.g. highly experienced crew with good weather flying within controlled airspace versus a relatively low experienced crew, flying somewhere they have not been before, with bad weather forecast enroute and the last approach of the day requiring a circling NDB around 5am. Operations must look at the big picture, assume crew decision making in some cases is already unduly influenced by fatigue and operational pressure, and use this to improve their own decision making and support to operational personnel.
- 1.14 The focus from a crew perspective should not be on FAID, it must be on any significant changes to the planned operation and/or new hazards/risks. FAID should primarily be used for strategic rostering practices as due to individual differences with fatigue you can have FAID scores much lower (60) and be unduly influenced by fatigue, others may have a score of 80 or above and be functioning fine. The company needs to ensure in the planning phase they allow larger buffers to planned rosters and use a validated FAID score for the type of operation. Other questions required: who determined 75 was acceptable for back of the clock medivac operations? Pel Air needs to be satisfied the 'planning' tool is appropriately aligned with actual practice, increased margins are used

at the planning stage including an appropriate FAID score to allow for enroute contingencies etc. A FAID exceedance does not have to be a major issue, ensuring there is robust process in the tactical phase to support any operational decisions to manage the risk is more important. In a mature sense and to ensure the system has multiple defences and operational understanding of its fatigue risks, the operator should be able to turn FAID off and still be comfortable with how it can manage fatigue and make sound operational decisions.

- 1.15 Should be the first action item for FRMS. It will potentially identify the problems and shape the necessary actions to address those deficiencies. It will also foster an environment in which operational personnel will be part of improving the process and has the potential to enhance stakeholder engagement.
- 1.16 Require review of the standby process, clear and documented consultation with flight crew to determine how long is too long etc and updates to the policy within the FRMS manual.

Furthermore, there will need to be improved QA processes that are more 'quantitative' in nature to get further feedback from the system as to the real impact of fatigue. Any routes considered higher risk with continued feedback from flight crew to support (trends) could incorporate the use of items such as sleep diaries, sleepiness/fatigue questionnaires at appropriate times (e.g. sign on, after top of climb, prior to top of decent, sign off etc), and/or actigraphy to grab a more accurate snap shot of the real impact of fatigue on the operation. This information can be fed back to improve the FRMS manual should risks be unacceptable. This would need to be a voluntary process and one focused at improving the system rather than looking at specific individuals. I appreciate resources are likely to be stretched and this is something that may need to be considered through use of external organisations (universities) through research projects or by comparison of data from the experiences of other operators conducting similar operations.

Regards

From: CASA Officer

Sent: Wednesday, 9 December 2009 19:14

To: CASA Officers

Subject: URGENT: Review of Pel-Air Management Action Plan [SEC=IN-CONFIDENCE:AUDIT]

Importance: High

Folks,

Attached is the management action plan that Pel-Air propose to implement to enable return to flying operations of the Westwind. Once accepted by CASA this plan will become a condition on the AOC and which will be the mechanism to hold the company to the objectives.

As a matter of urgency I ask each of team member to review the proposed actions and return comment to me by 1500 (Sydney time) Thursday 10 December.

Pel-Air management are also proposing a restructure to remove _____ from the Standards role in the Westwind fleet. I will be exploring that further with Pel-Air management and will discuss this factor with each of you through the day.

I will schedule a telecon for 1600 Sydney time to discuss your review and any changes that you propose to the plan.

I have also attached the letter that I sent to Pel-Air that addressed the significant issues. These are a summary of the issues that were discussed by the team and by _____ and myself with Pel-Air. This letter does not replace an audit report and does not carry the detail so if you see items missing please do not be concerned as these will be included in the report.

I will aim to have guidance to you tomorrow to clarify how each member will contribute to the reporting process. My sincere apologies for not getting this to you sooner.

Thankyou all for your efforts on the audit to date.

I look forward to talking to you tomorrow.

Kind regards,

General Aviation, Sydney Region
Operations Division
Civil Aviation Safety Authority

From: CASA Officer	Sent: Thu 10/12/2009 20:16
To: CASA Officers	
Cc: CASA Officers	
Subject: [SEC=IN-CONFIDENCE:AUDIT] FRMS Training [SEC=IN-CONFIDENCE:AUDIT]	

Gents

To keep everyone in the loop here's an update on a position re the Pel Air FRMS training:

- The content is fine and iaw the approved manual and this information was passed today to Rex and Pel Air.

- Having reviewed my notes, at the exit meeting with on Monday I said there may not be a problem with content (at that meeting I had not reviewed the online course) but there was an issue with operational staff not being happy the training had prepared them to understand the system. They all suggested some more operationally focused examples via some face to face training would be a good way to provide a practical working knowledge. originally raised this question during the meeting. The use of 'inadequate training' in the preliminary update was open to misinterpretation.

- It was discussed Monday afternoon that the critical process missing was the collation of feedback from flight crew regarding the training. An appropriate feedback form is contained within the training package but there is no evidence to support its use. This may be indicative of the adverse influence of one or two individuals.

From the review of various material to support processes ie. the evidence to support how the system is actually functioning, there is still quite a bit of material to get through. This will be completed in time to meet the report deadline.

Regards