

Fatigue Risk Management Systems

Fatigue Risk Management Systems and CAO 48

The current system for managing fatigue aircrew in Australia is Civil Aviation Order 48. It is prescriptive, relatively inflexible and is not based on scientific principles; rather it is largely based on industrial practices in existence at the time of its development.

Because the legislation cannot meet operator requirements in all situations, a provision of the Order at 48.0.4 allows CASA to issue exemptions from compliance with the CAO 48 rules. A series of 'Standard' exemptions tailored to industry sectors were available to operators and provided a degree of flexibility when compared with CAO 48. Despite the original intention to limit exemptions on issue to the 'standard' exemptions, over time, the number of different exemptions on issue to industry became unworkable and led to the potential for some operators to gain commercial advantage over others.

Furthermore, as the exemptions, too, lacked a scientific basis they were seen as a major factor in the increasing incidence of fatigue in aircrew.

CASA, in response to the recommendations of 'Beyond the Midnight Oil', has recently adopted a policy whereby an operator seeking to renew a non-standard exemption may be required to comply with CAO 48 or a standard exemption or, with the increasing emphasis on a scientific approach to the management of fatigue in the workplace, develop a fatigue management system incorporating the concept of fatigue risk management to replace his non-standard exemption. A fatigue risk management system (FRMS) would be the cornerstone of an operator's fatigue management system.

Risk Management

Under the CASA proposal, the concept of risk management outlined in Australia/New Zealand Standard (AS/NZS) 4360:1999 is adapted to fatigue management becoming a system for managing the risk of becoming fatigued and the consequences arising therefrom.

A Risk Management System established under AS/NZS 4360:1999 has the following attributes:

Policy

which includes the objectives of and the commitment for managing risk

Commitment

Management commitment to the establishment, implementation and maintenance of a risk management system

Responsibility and Authority

joint responsibility and authority for the identification and assessment of risk factors and their treatment, communication and consultation

Resources

for education, training, verification and review

Implementation

sponsorship and support of senior management, policy development and communication, management of risks at all levels within the organization

Monitor and Review

Ongoing monitoring of risks and effectiveness of the risk management process

How do you manage the risks of fatigue?

The fatigue risk management system proposed by CASA consists of a two element system of management where the likelihood of becoming fatigued while operating is determined and treated and the risk from operating in a fatigued state is determined and treated.

Fatigue

exhaustion of mind or body resulting from labour or exertion.

Research has confirmed that fatigue is also "an exhaustion" which is caused by lack of sleep. In fact the research has confirmed that, of all the factors which contribute to fatigue, lack of sleep is the most significant contributing factor.

Risk

The chance of something happening that will have an impact upon objectives measured in terms of consequences and likelihood. *AS/NZS 4360: 1999 Risk Management*

Risk Management

the culture, processes and structures directed towards effective management of potential opportunities and adverse effects. *AS/NZS 4360: 1999 Risk Management*

'potential opportunities'

in the context of Fatigue Risk Management equates to 'something happening'.

'something happening'

may be termed a hazard.

Hazard

a source of potential harm or a situation with a potential to cause loss. *AS/NZS 4360: 1999 Risk Management*

That hazard is the performance of tasks at fatigue levels in excess of those considered safe in the circumstance.

Fatigue Risk Management

is thus a process of managing fatigue in aircrew and other workers in the aviation industry so that it does not become a source of potential harm. This description satisfies the requirements of ICAO Annex 6:

The State of the Operator shall establish regulations specifying the limitations applicable to the flight time and flight duty periods for flight crew members. These regulations shall also make provision for adequate rest periods and shall be such as to ensure that fatigue occurring either in a flight or successive flights or accumulated over a period of time due to these and other tasks, does not endanger the safety of a flight.

Implementing a Fatigue Risk Management System

Commitment

The implementation of a fatigue risk management system involves a commitment by management to support the concept of fatigue risk management as a tool for managing company operations. Without such commitment, there is a risk that a FRMS will be seen simply as a tool for increasing rate of effort.

Safety Case

Once management has committed to the concept of fatigue risk management and established the context in which fatigue is a factor, a safety case approach must be applied to the identification, analysis, evaluation and treatment of fatigue. AS/NZS 4360:1999 provides a generic framework for such risk assessment which would satisfy CASA's requirements.

Such factors as the type of operation and the indicators and consequences of fatigue particular to each type of operation need to be identified and addressed.

An acceptable level of risk in light of consequences needs to be determined for each type of operation together with justification.

Procedures need to be developed to enable fatigue hazard identification and strategies need to be developed to mitigate such hazards. A number of measures may be available to the operator to either minimise the onset of fatigue or mitigate the effects of fatigue such as:

- the provision of rest or sleep facilities;
- the provision of transport;
- the availability of catering;
- the provision of adequate support staff;
- upgrading of equipment essential to the task;
- the availability of operational support such as flight planning.

The list is not complete but the use of such measures should be considered during development of the safety case.

The operator cannot simply install a fatigue risk management system developed for another operator but must be able to demonstrate knowledge of fatigue risks unique to his organisation.

Rostering Tools

A number of computer based or spreadsheet tools are being developed to enable the levels of fatigue in a standard individual to be determined or projected. Such tools will enable preparation of rosters within established fatigue limits and will enable estimation of peak levels of fatigue during and on completion of a roster period. However, to date, these tools only take into account the 'body clock' factors affecting fatigue, such as hours of being

awake and propensity to sleep correlating to time-of-day (circadian rhythm effects). These do NOT consider the range of activities and nature of or fatigue effect of each activity performed in a roster cycle. The fatigue risk assessment and relevant control measures must manage these activity and life-style issues.

It is important to remember that a person's work history for the previous seven days must be considered when constructing a roster, as this will influence the fatigue state of the individual when entering the roster.

Fatigue level benchmark

A fatigue level benchmark is a rostering tool comprising a maximum predicted level of fatigue acceptable for planning purposes. Thus, a roster can be developed with a fatigue level benchmark beyond which a pilot must not be rostered. This benchmark will not be the same for all operations but will be lower where an operator determines that the risk to the operation from a pilot or crewmember with a particular level of fatigue is unacceptable. Conversely, a higher fatigue risk level or fatigue level benchmark may be acceptable in a less demanding operation. Employee consultation and involvement is an essential element in the process of setting the benchmark.

The topic of benchmark setting must be addressed in the safety case.

Excursions

There will always be contingency situations requiring extension of work periods. Excursions of fatigue beyond the benchmark are acceptable provided that the operator has strategies in place to manage the consequent increased level of fatigue risk. Such strategies may involve:

- the establishment of excursion limits;
- limiting the number of times an excursion may be permitted in a roster period;
- prescribing the maximum level of excursion over which mandatory action would be necessary;
- prescribing duties and responsibilities of staff following occurrence of an excursion;
- limiting the availability of the crewmember for future rostering following an excursion.

Lifestyle guarantee

Dislocation of family and social life as a result of unsatisfactory rostering practices may result in pressures on relationships, domestic workloads and community activities. As with sleep and fatigue, this has implications for task performance, health and safety, morale, absenteeism, productivity and attrition rates. A lifestyle guarantee is a set of prescriptive limits applied to a rostering system designed to provide a degree of predictability to a crewmember's time free of duty to allow a satisfactory social and family life. At a minimum, a lifestyle guarantee should provide the following:

- minimum time constituting a rest period
- maximum time constituting a work period
- minimum number of days free of duty per roster period
- maximum number of consecutive work days in a roster period.

Some operators may prefer to adopt the limits detailed in CAO 48 or their current exemption as their lifestyle guarantee while others may prefer to negotiate an acceptable arrangement with staff.

Together with rostering tools, lifestyle guarantees are the key elements in a fatigue risk management system.

Obligations

An FRMS is jointly owned by staff and management, accordingly each are jointly responsible and accountable for the effective implementation, operation and administration of the system. All have a duty of care to ensure that information recorded is timely, accurate and honest. Management must ensure that the FRMS is applied fairly and within acceptable limits while staff must undertake to abide by the limits and take the opportunity for rest when it is offered.

In addition, staff have an obligation to report circumstances relating to adverse performance of an FRMS such as fatigue excursions, adverse operational factors or physiological factors such as illness or sleep disorders which will have an adverse effect on fatigue levels.

Monitoring and Review

The performance of an FRMS must be monitored to ensure compliance with the approved criteria and that limits and levels are reasonable and do not lead to excessive fatigue levels in aircrew.

There should be a mechanism within the FRMS for review of benchmark levels and acceptable excursion limits. A quarterly review will enable the operator to detect trends in FRMS performance. Where adverse trends become evident, the FRMS must have strategies in place to address not only the trends but also excursions above benchmark and limit levels.

Such strategies may involve the use of reduced work periods or additional time free of duty, increased staffing levels, or amended route profiles or work practices.

Audit and Reporting

As well as review, an operator's FRMS will be subject to audit by CASA. It must therefore have the capacity for retrospective analysis for a 15 month period at a minimum. Furthermore, CASA will require reports of action in the event of major excursion so each FRMS must have a mechanism for both internal and external reporting.

Education and training

An operator is responsible for educating staff on the nature of an FRMS. The training program must provide for induction of new employees and regular refresher training for existing employees. The program should be competency based, utilise qualified instructional staff and must provide a comprehensive understanding and working knowledge of the FRMS to all affected personnel. An assessment of staff's knowledge and understanding must be carried out. An FRMS training syllabus should cover the following topics:

- the nature and cause of fatigue in individuals;
- fatigue in the workplace, and its possible adverse effects;
- duties of employers and employees;
- recording and reporting;
- contingencies;
- circadian rhythms and their relationship to work scheduling.
- flexible work schedules and design principles.
- hazards associated with flexible work and extended hours.
- the impact of flexible work and extended hours on health and safety, including lifestyle issues.
- individual strategies for managing disrupted rest periods.
- education material for family members.

Contingency planning

An FRMS must include instructions to employees regarding action in the event of contingency circumstances. Such circumstances may include such events as:

- what to do if an employee considers him/herself fatigued and therefore unfit to work;
- action in event of excursions from agreed levels;
- unavailability of sleeping or resting accommodation;
- unavailability of transport to accommodation;
- remote location operations;
- rostering computer failure; etc.

What is FAID?

Fatigue Audit InterDyne (FAID) is a program that derives assessment of an individual's fatigue score. Essentially, the model allocates fatigue or recovery value to work and break periods based on three factors: duration, timing and recency. In simple terms, FAID is interested in the length of each work or break period, the time of day at which the work or break occurred and how far back in the past that work or break occurred. The work shift start and finish times are entered into the program, and the biological limits in regard to sleep length at specific times of day are accounted for by the program. InterDynamics has formed a collaborative partnership with the Centre for Sleep Research at the University of South Australia, which allows the incorporation of their fatigue formulae and related factors into FAID.

However, simply having and using FAID does not mean that you have an effective FRMS. Because FAID calculations only consider the following four factors:

- The time of day of work and breaks;
- The duration of work and breaks;
- Work history in the preceding seven days;
- The biological limits on recovery sleep,

there are limitations on the value of its fatigue score, should FAID be used stand-alone. Consequently, FAID should only be used as a 'tool', within a risk management framework. An effective FRMS must consider all factors which impact on fatigue risk, such as job/task demand and individual factors, as well as the four factors considered by FAID.

(FAID is a proprietary product of InterDynamics Pty Ltd)

Other tools

Note that CASA is currently working with the CFSR to develop a simple statistical program within MS Excel that will enable flight crew members to keep a running tally of the sleep they received over the previous night, previous two nights, and previous seven nights. Flight crew would then be required to adhere certain predetermined sleep rules, such as the 6 in 24 and 13 in 48 rules that are currently used in the road transport industry FRMSs. It is intended that this Excel program will be provided at little or no cost to operators, and will be accepted by CASA as a reputable computer based modelling tool for use within Fatigue Management Systems. For more information, [email](#) the Fatigue Management Systems Team.

Beyond the Midnight Oil Dealing with the risks of fatigue

The costs of fatigue are a major human and financial burden to workers, their families and the wider community. In recognition of this burden, the Minister for Transport and Regional Services, John Anderson, called for a federal inquiry into fatigue in transportation. The terms of reference for this federal inquiry were:

1. Causes of, and contributing factors to, fatigue.
2. Consequences of fatigue in air, sea, road and rail transport.
3. Initiatives in transport addressing the causes and effects of fatigue.
4. Ways to achieving greater responsibility by individuals, companies, and governments to reduce the problems related to fatigue in transport.

In a submission to the Senate inquiry into fatigue in the transport industry, the Department of Transport and Regional Services determined that 7% of air transport accident occurrences categorised as "serious" were fatigue related.

The report produced by this inquiry, [**Beyond the Midnight Oil - Managing fatigue in transport**](#) states that:

Human fatigue is now recognised around the world as being the main cause of accidents in the transport industry. It is increasingly being recognised as a safety issue of the highest priority. The issue of fatigue in the workplace in all modes of transportation and even beyond transportation is something that is exploding as a priority issue across the industrialised world. Fatigue is not just an industrial issue to be negotiated between employers and employees. It is also an occupational health and safety issue, a commercial issue, a public safety issue and, at times, an environmental issue. Individuals and organisations that fail to manage human fatigue sensibly, risk having or creating accidents with a broad range of damaging and enduring consequences.

However, managing the risk of fatigue is about more than just accident prevention. Under Australia's Occupational Health and Safety Act 1983, employers have a duty of care for the health and safety of employees in the workplace. This means that employers must take care to ensure that everyone in their workplace is aware of potential workplace hazards (such as fatigue for shiftworkers), and subsequently take steps to prevent workplace accidents, injuries, and illnesses that may arise from these hazards. Fatigue management is about managing the risk of fatigue within your organisation, as opposed to managing the flight and duty times of your flight crew. It is not about pushing the limits and taking inappropriate risks. It is about ensuring that flight crew members are fit to make the best decision when that decision needs to be made. Therefore, fatigue management is about continuously monitoring fatigue, being aware of its consequences, and planning accordingly.

Recommendations from the report

Beyond the Midnight Oil made a number of recommendations relevant to civil aviation in Australia:

Recommendation 4

The Civil Aviation Safety Authority should ensure that the proposed new Civil Aviation Safety Regulations relating to Air Operator Certification (CASR Part 119) clearly state that the maintenance of sound fatigue management practices is an essential component of an air operator's safety system.

Recommendation 5

The Civil Aviation Safety Authority should implement a Fatigue Risk Management System to regulate flight and duty times for aircrew as soon as it is feasible to do so.

Recommendation 6

The Civil Aviation Safety Authority should take urgent action to ensure that, while developing new rules for aircrew flight and duty times, the current rules for regulating flight and duty times are consistently and fairly applied until such time as they are replaced by new rules; and the

practice of issuing exemptions to the current rules is reviewed, refined and administered consistently.

Recommendation 7

The Civil Aviation Safety Authority should be required to develop hours of duty rules for aircraft maintenance engineers, incorporating fatigue management principles and auditable fatigue risk management systems.

Recommendation 41

Fatigue and fatigue management training should be incorporated into management training programs for all those engaged in a management role in all sectors of the transport industry, whether they be a private company or a government entity which is responsible for contracting transport related services.