



Understanding the fatigue risk potential on maintenance tasks

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Overview



- Introduction
 - My background
 - Work I've done with non-aviation companies
 - Why it's of relevance to you
- Exercises to explore how to understand and manage fatigue risk

Human Factors Specialist



- Psychology (BSc), Occupational Psychology (MSc)
- Fellow of the Chartered Institute of Ergonomics and Human Factors (CIEHF)
- Fatigue and human error since 1994
 - Providing scientific support to HSE
 - Expert witness statements (e.g. Buncefield Fuel Storage explosion 2005)
 - Working with commercial companies to develop fatigue risk management systems

Fatigue: What is it?

“Fatigue is the decline in mental and/or physical performance that results from prolonged exertion, lack of quality sleep or disruption of the internal body clock.”



Think about your own experiences

Have you ever

- Done something that was risky because you were feeling tired?
- Made an error because you were tired?

2 minutes to think about what happened and why



Why is fatigue a H&S issue?

Fatigued people are more prone to

- slips & lapses (distractions)
- mistakes because it is more difficult to
 - remember & recall detail
 - think laterally and analytically
 - handle information especially under time pressure
- being clumsy as hand-eye co-ordination poor
- drowsiness, micro-sleeps
- violating procedures because risk perception is poor



which all increase the risk of incidents and accidents

Why is fatigue a H&S issue? Continued



Fatigued people are less

- vigilant
- responsive because reaction times are slower
- able to concentrate because attention span is reduced
- able to detect change e.g. when monitoring
- able recall events and time accurately
- communicate effectively
- able to control emotions and stress



which all increase the risk of incidents and accidents

Work with non-aviation companies

- Working with companies to develop fatigue risk management systems – focus on maintenance periods
- When is somebody too tired to work?
- Explore the steps we go through to manage fatigue



Maintenance scenario



- Planned work to be carried out in a fixed time frame
 - Emergent issues can be identified in the course of the planned work
 - Work requires shift work, particularly during the night when demand for equipment is low

- Maintenance is safety and time critical
 - Loss of revenue due to prolonged downtime
 - Financial penalties
 - Potential for loss of life

Nature of the maintenance work



- Much is routine in nature
 - Procedural based tasks
 - Rule based reasoning
- Emergent work
 - Diagnostic / problem solving
- Attention to detail
- Time / production pressure
- Environmental conditions (not optimal)
- **Night shifts for extended periods**
 - extra hours
 - extra shifts



Understanding fatigue risk

Alertness consideration tool (ACT)

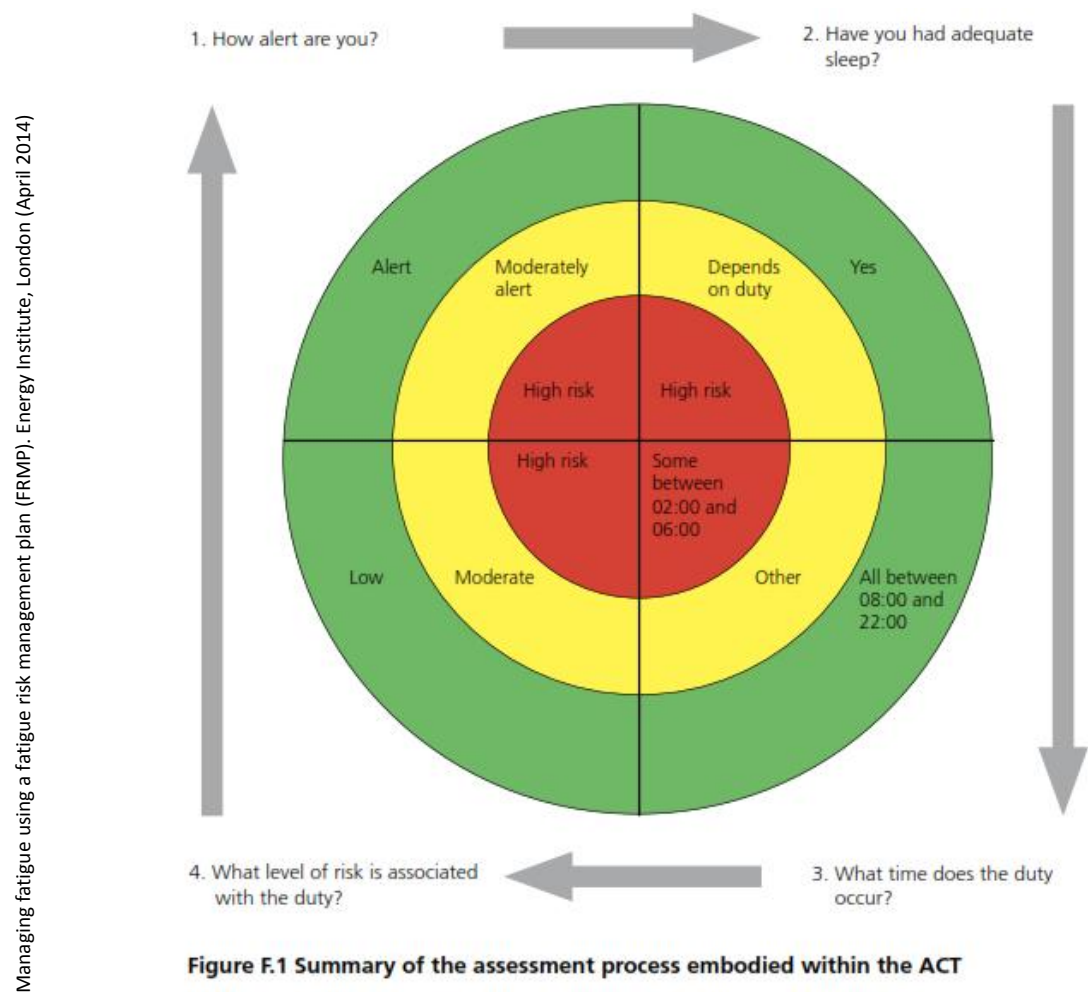


Figure F.1 Summary of the assessment process embodied within the ACT

ACT risk assessment questions



1. How alert are you? (rate just prior to the start of duty)		Result ①			
2. Have you had adequate sleep?					
1) At start of duty how much sleep will you have had last 24 hours? (this is value 'x')		Points			
x = ____ hours → x: ≤ 3h 4h 5h 6h Points: 12 8 4					
2) At start of duty how much sleep will you have had last 48 hours? (this is value 'y')		Points			
y = ____ hours → y: ≤ 8h 9h 10h 11h Points: 10 8 6 4					
3) At end of planned duty how many hours will you have been awake? (this is value 'z') z = ____ hours		Points			
4) If y < z, subtract hours of sleep obtained in last hours awake (z - y). Convert the resulting figure (1 hour = 1 point). Enter points in box →					
Add points above to determine your score					
Score	Result ②				
1 - 4	Low				
5 - 8	Moderate				
9+	High				
If 'high risk' is indicated consider risk controls, such as napping, task rotation or advising the operator you are not fit for duty.					
3. What time does the duty occur?		Result ③			
All hours of the duty occur between 08:00 - 22:00		Low			
Other					
Part of the duty occurs between					
4. What level of generic risk? (Consider role, activities, experience, the site features)					
Description					
All factors rated low risk					
At least one factor rated moderate					
At least one factor rated high					
5. Based on the results for ① ② ③ and ④ use the table below to determine what you may need to consider when determining whether to undertake this duty.					
Results	Example				Adequate alertness for duty?
	①	②	③	④	
High for Q1 or Q2	Red	Grey	Grey	Grey	High risk: Discuss with your supervisor why your alertness level may not be sufficient for this duty and consider a rostering alternative to manage the risk (e.g., augmented crew, longer rest periods).
All moderate and high	Yellow	Yellow	Yellow	Red	
Any combination of low, moderate and high	Yellow	Yellow	Green	Red	Moderate risk: Discuss with your supervisor whether your alertness level is suitable for this duty and consider the use of additional mitigation strategies (e.g. napping, task rotation).
2 low, 2 high	Green	Green	Red	Red	
All moderate	Yellow	Yellow	Yellow	Yellow	Low risk: Discuss with your supervisor whether your alertness level is suitable for this duty and consider beneficial fatigue risk controls for this duty (e.g. caffeine use).
Any combination of low and moderate	Yellow	Yellow	Green	Green	
3 low and 1 high	Green	Green	Green	Red	
All low	Green	Green	Green	Green	

Energy Institute: Fatigue Risk Management Plan (FRMP) 2014

Alertness: What are indicators of fatigue?



10 minutes to think about how you might recognise somebody might be fatigued. Think about the individual's

- Physical signs
- Behavioural signs
- Work history
- Personal circumstances

How risky is the activity?: Id. the risks



10 minutes to think about what tasks need individuals to be optimally alert and focused?

Try to divide them into

- Tasks that have no room for error (high risk), and
- Tasks where errors can be tolerated (low risk)

Try to identify 5 – 10 tasks for the purposes of this **exercise** (if you don't have aviation specific examples use ones from general life)

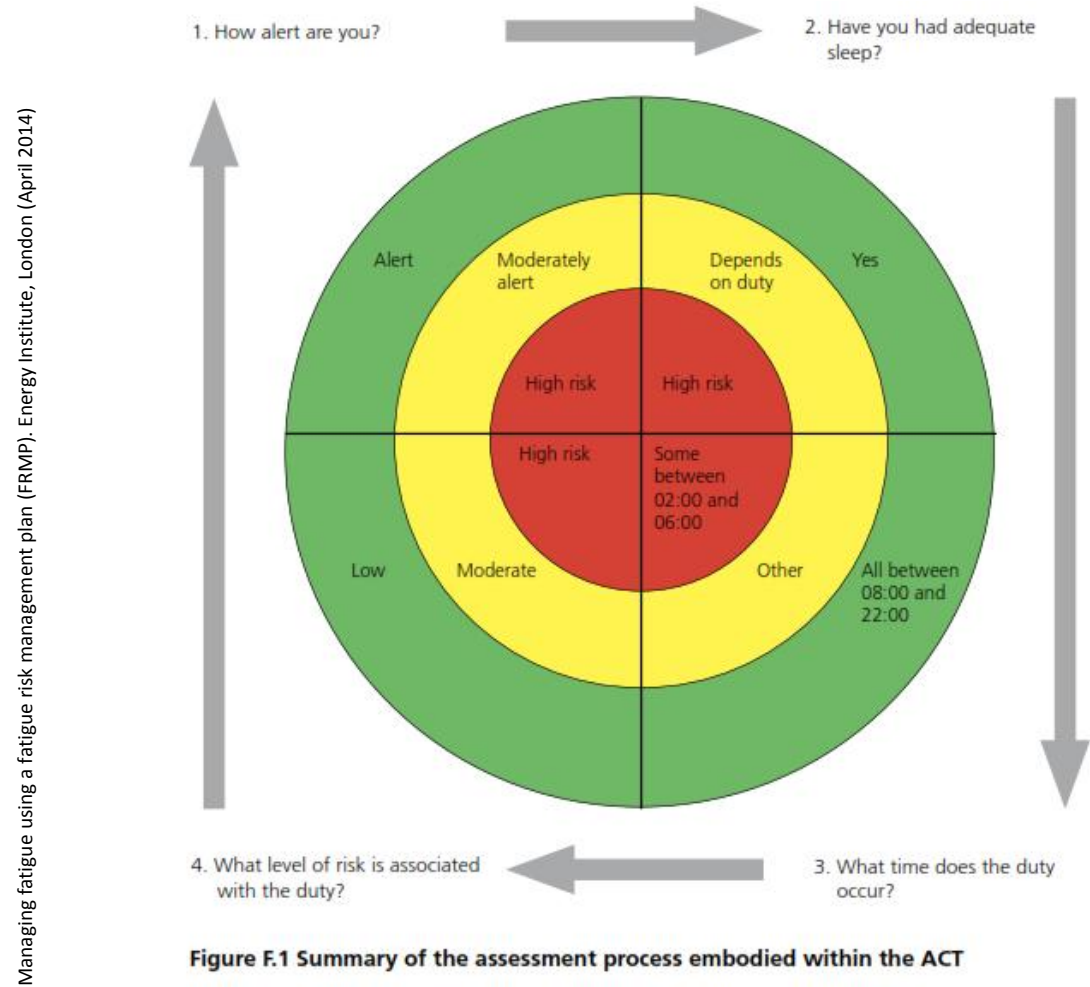
What mitigation measures are possible?



10 minutes to think about what can be to remove or minimise the fatigue risk?

Consider the indicators of fatigue and the tasks you have identified, what options are there to be used **before, during** and **after** the task is completed.

Information to tailor the ACT to specific context



A scenic landscape photograph showing a golf course in the foreground, a large building complex on a hillside in the middle ground, and a prominent rock formation in the background under a cloudy sky. A stone wall runs across the middle ground.

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- Any points for discussion?
- Clarifying questions?