



Human Factors Group: Engineering (HFG:E)
**Guidance Paper - Military Maintainer & Groundcrew Working Hours and
Fatigue Risk Management**

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Note: The guidance expressed in this paper has been developed by the author for use within a military working environment. It is endorsed by the HFG:E, in that context.

1. **Introduction.** The European Working Time Directive, Working Time Regulations (1998) and their application in both civilian and military life are, now, fairly well understood. Fatigue Risk Management, however, is a complex subject, often leading to intricate, almost incomprehensible, guidance material and regulation. The military has identified the need for simple and practicable guidance. This guidance makes recommendations on, what can be seen as, three 'Bands' of working hours and activity. Bands A and B both have direct read across into the civilian world. Band C, while specifically talking to a military audience, provides 'true' fatigue risk guidance based upon time spent asleep or awake; not on shift patterns or working hours.

2. **Activity Bands and Recommended Guidance.**

Band A. Working Time Regulations (1998) and MOD 2008DIN01-050 describe all Routine and Special Circumstances working hours. These ensure a LOW Fatigue Risk Level. Of note the MOD DIN is to be applied on a worldwide basis.

Band B. Working Time Regulations 'Opt-Out' working, as was, or Military Exemptions (e.g. Exercises). Here, the guidance is that working hours should comply with CAA CAP 716. This will ensure a LOW or MEDIUM Fatigue Risk Level.

Band C. Military Operations and Warfighting. Here, extremely long working hours should comply with the Prior Sleep Wake Model. This can objectively derive a Fatigue Likelihood Score and thus, a Fatigue Risk Level. This Fatigue Risk can then be actively managed.

BAND A - European Working Time Directive, Working Time Regulations (1998) & MOD 2008DIN01-050

4. **European Working Time Directive/Working Time Regulations (1998).** These Regulations are straight forward and clear. Employers, both civilian and military, must comply with them. They are oversimplified and presented in Band A of the attached Fatigue Risk Management Guide, simply to provide context with respect to Bands B & C.

BAND B - CAA CAP 716

5. **CAA CAP 716 and Professor Folkard.** This guidance material is comprehensive, if a little complex, and should be complied with. Given the loss of the Working Time Regulations 'Opt Out' for many employers, this material may be of value to self employed or contract staffs. Appendix P to the CAP, including Professor Folkard's Guidelines at Sect 3 are, again, oversimplified and presented in Band B of the attached Fatigue Risk Management Guide.

BAND C - Prior Sleep Wake Model.

6. **Prior Sleep Wake Model.** This model has been developed by Professor Dawson at the University of South Australia. It has been adopted by both the Australian Defence Forces and the Western Australian Transport Authority; where a simple, practical, fatigue risk management tool is required. It goes beyond the crudeness of shift patterns or working routines and focuses on time awake or asleep. The model covers the difference between being tired and fatigued, by looking at sleep in the last 24 hours (tired) and in the last 48 hours (fatigued). It then goes on to deal with how long an individual can remain awake and alert. The rationale is that an individual is at significantly elevated risk of fatigue related error when they have:

- a. obtained less than 5 hours sleep in the last 24 hours;
- b. obtained less than 12 hours sleep in the last 48 hours; and
- c. currently been awake for longer than the amount of sleep had in the last 48 hours.

7. **Fatigue Likelihood Score.** Remember, individuals are incredibly poor at judging their own level of fatigue. The Prior Sleep Wake Model above is used to derive an objective score of an individual's fatigue level. It provides a Fatigue Likelihood Score for the completion of a complex task, based upon the following thresholds:

- a. in the last 24 hours, for each hour of sleep less than 5 hours, add 4 points;
- b. in the last 48 hours, for each hour of sleep less than 12 hours, add 2 points; and
- c. for every hour awake, beyond the total sleep obtained in the last 48 hours, add 1 point.

Notes: The points are based upon the alertness level required to complete tasks requiring diligent attention, such as driving a vehicle. Clearly the points can be tailored to balance risk aversion or task complexity. While these calculations are not difficult, a simple MS Excel tool has been created to generate an individual's Fatigue Likelihood Score¹ and is attached to electronic copies of this paper.

8. Based upon the current or predicted Fatigue Likelihood Score an individual, commander or manager can then carry out a risk assessment. The ability to predict a Fatigue Likelihood Score by doing the calculation forward (in a given number of hours from now), is particularly useful. The attached Fatigue Risk Management Guide marries up: a Fatigue Likelihood Score, a Military 'Rule of Thumb', as well as an indicative level of authority required to sanction working at each Fatigue Risk Level.

9. **Fatigue Risk Level.** The risk levels are:

- a. **Low Risk (Green) - Acceptable.** Manage by routine procedure.
- b. **Medium Risk (Amber) - Tolerable with periodic review.** This level may be maintained provided it has been appropriately assessed and mitigated² against. The decision to tolerate this risk level can be made at Sub-Unit/Flt Command level.
- c. **High Risk (Red) - Tolerable with continual review.** This level should be discontinued as soon as it is reasonably practical and continued only in exceptional circumstances. The decision to tolerate this risk level should be made at Ship/Unit/Sqn or Force Command level.
- d. **Extreme Risk (Black) - Intolerable without treatment.** This level MUST be discontinued as soon as practicable. The decision to tolerate this risk level should be made at Theatre Command level.

Fatigue Risk Management Guide

10. Having described the bands of working hours and Fatigue Risk Levels, this guide should act as an Aide Memoir. The Band C notes to be highlighted are:

- a. **Fatigue Likelihood Score.** The Scores relate to the fatigue risk associated with complex tasks.
- b. **Military 'Rule of Thumb.'** This crude line simplifies the Prior Sleep Wake Model to match 24 hour Awake/Sleep 'crews' to Fatigue Risk Levels.
- c. **Authority Level.** Individuals are very poor at determining their own fatigue risk or level. Working maintainers & groundcrew beyond a low Fatigue Risk Level is a command decision requiring the application of appropriate risk management.

Conclusion

11. Fatigue Risk Management is a complex subject often leading to intricate, almost incomprehensible, guidance material and regulation. This guide is an attempt to educate and advise engineers, managers and commanders, at all levels, on how to mitigate the effects of fatigue.

¹ Handheld Fatigue Calculators are not expensive and are available from MB Solutions (Aust) Pty Ltd

² Some suggested mitigations: Accommodation - quiet, dark, cool and as comfortable as practicable; Naps - allow for a 20min nap, plus 30min to recover; Scheduling - difficult tasks first; Breaks - at least every 90min