

Scientific Research & Studies Relevant to Air Crew Fatigue

Note: This list, provided by ECA and ETF, compiles a wide range of scientific evidence on air crew fatigue that is publicly available, has been peer-reviewed and has informed national and international regulators and authorities, companies and aviation stakeholders over the past years and decades.

The Terms of Reference of EASA task OPS.055 mandate the drafting group to 'take account of all relevant recent and publicly available scientific and/or medical studies/evaluations'. One of the most recent such evaluations is the so-called 'Moebus Report' whose authors assess a wide range of issues, using existing relevant scientific and medical evidence.

This report should therefore be the starting point and central basis for the drafting group's work, complemented by selected relevant and publicly available other studies that fill areas not considered by the Moebus Report and/or that are more recent and update previous studies.

A) Bibliographical References used in Moebus Aviation Final Report "Scientific and Medical Evaluation of Flight Time Limitations" (TS.EASA.2007.OP.08, Final Report, 30 Sept. 2008)

1. Åkerstedt T, Folkard S & Portin C (2004). Predictions from the three-process model of alertness. *Aviation, Space and Environmental Medicine*, 75 (Supplement 1): A75-A83.
2. Belenky G, Wesensten NJ, Thorne DR, Thomas ML, Sing HC, Redmond DP, Russo MB, & Balkin TJ (2003). Patterns of performance degradation and restoration during sleep restriction and subsequent recovery: A dose-response study. *Journal of Sleep Research*, 12(1): 1-12.
3. Belyavin AJ & Spencer MB (2004). Modelling performance and alertness: the QinetiQ approach. *Aviation, Space and Environmental Medicine*, 75(3 Suppl): A93-103.
4. Bourgeois-Bougrine S, Cabon P, Mollard R, Coblenz A, & Speyer J-J (2003). Fatigue in aircrew from short-haul flights in civil aviation: the effects of work schedules. *Human Factors and Aerospace Safety*, 3(2): 177-187.
5. Folkard S & Barton J (1993). Does the "forbidden zone" for sleep onset influence early shift sleep duration? *Ergonomics*, 36: 85-91.
6. Folkard S & Tucker P (2003). Shiftwork, safety and productivity. *Occupational Medicine*, 53: 95-101.
7. Folkard S (2008). Do permanent night workers show circadian adjustment? A review based on the endogenous melatonin rhythm. *Chronobiology International*, 25(2): 215-224.
8. Folkard S, Robertson KA & Spencer MB (2007). A Fatigue/Risk index to assess work schedules. *Somnology*, 11: 177-185.
9. Goode JH (2003). Are pilots at risk of accidents due to fatigue? *Journal of Safety Research*, 34: 309-313.
10. Graeber RC (1986). Sleep and wakefulness in international aircrews. *Aviation Space and Environmental Medicine*, 57: B1-B64.
11. Kantermann T, Juda M, Meroow M, & Roenneberg T (2007). The human circadian clock's seasonal adjustment is disrupted by daylight saving time. *Current Biology*, 17(22): 1996-2000.
12. ICAO. Fatigue Risk Management Systems. ICAO Working paper OPSP-WG/WHL/8-WP/4 dated 28/4/08.
13. Lowden A & Åkerstedt T (1998). Sleep and wake patterns in aircrew on a 2-day layover on westward long distance flights. *Aviation, Space and Environmental Medicine*, 69(6): 596-602.
14. Mollard P, Woorons X, Letournel M, Cornolo J, Lamberto C, Beaudry M, & Richalet JP (2006). Role of maximal heart rate and arterial O₂ saturation on the decrement of VO₂max in moderate acute hypoxia in trained and untrained men. *International Journal of Sports Medicine*, 2006 Oct 6; [Epub ahead of print]
15. Muza SR, Fulco CS, & Cymerman A (2004). Altitude acclimatization guide. USARIEM Technical Note, Report number TN04-05. US Army Research Institute of Environmental Medicine, Natick, MA, USA. Commercial in Confidence Page 42 of 47 FTL Study Final Report

16. Nesthus T, Schroeder D, Connors M, Rentmeister-Bryant H, & DeRoshina C (2007). Flight attendant fatigue. Report DOT/FAA/AM-07/21, Federal Aviation Administration, Office of Aerospace Medicine, Washington, DC.
17. Nicholson AN & Stone BM (1987). Influence of back angle on the quality of sleep in seats. *Ergonomics*, 30(7): 1033-1041.
18. Niederl T, Vejvoda M, Maass H, & Samel A. Cumulative fatigue and work load effects on pilots during short-haul operations: subjected to work schedules and rosters. Submitted to *Aviation, Space and Environmental Medicine*, 2008.
19. Pascoe PA, Johnson MK, Robertson KA, & Spencer MB. (1995). Sleep in rest facilities on board aircraft: Field studies. DRA Report No DRA/CHS/A&N/CR/95/002, Farnborough, UK.
20. Powell DMC, Spencer MB, Holland D, Broadbent E & Petrie KJ (2007). Pilot fatigue in short-haul operations: Effects of number of sectors, duty length, and time of day. *Aviation, Space, and Environmental Medicine*, 78: 698-701.
21. Roach GD, Rodgers M, & Dawson D (2002). Circadian adaptation of aircrew to transmeridian flight. *Aviation, Space and Environmental Medicine*, 73(12): 1153-1160.
22. Rosekind MR, Gregory KB, Co EL, Miller DL, & Dinges DF. (2000). Crew factors in flight operations XII: a survey of sleep quantity and quality in on-board crew rest facilities. NASA Report no. NASA/TM-2000-209611. NASA Ames Research Center, Moffett Field, CA.
23. Samel A, Wegmann HM, Summa W, & Naumann M (1991). Sleep patterns in aircrew operating on the polar route between Germany and East Asia. *Aviation, Space and Environmental Medicine*, 62(7): 661-669.
24. Samel A, Wegmann HM, & Vejvoda M (1997a). Aircrew fatigue in long-haul operations. *Accident Analysis and Prevention*, 29(4): 439-52.
25. Samel A, Wegmann H-M, Vejvoda M, Drescher J, Gundel A, Manzey D, & Wenzel J (1997b). Two-crew operations: Stress and fatigue during long-haul night flights. *Aviation, Space and Environmental Medicine*, 68 (8): 679-687.
26. Signal L, Gander P, & van den Berg M. (2003). Sleep during ultra-long range flights: a study of sleep on board the 777-200ER during rest opportunities of 7 hours. Technical report. Sleep/Wake Research Centre, Massey University, Wellington, New Zealand.
27. Simons M & Spencer M (2007). Extension of flying duty period by in-flight relief. Report TNO-DV 2007 C362. TNO Defence and Security, Soesterberg, Netherlands.
28. Simons M, Valk PJJ, de Ree JJD, Veldhuijzen van Zanten OBA & D'Huyvetter K (1994). Quantity and quality of onboard and layover sleep: effects on crew performance and alertness. Report RD-31-94. Netherlands Aerospace Medical Centre, Soesterberg, Netherlands.
29. Spencer MB & Robertson KA (1999). The Haj operation: alertness of aircrew on return flight between Indonesia and Saudi Arabia. DERA Report No. DERA/CHS/PPD/CR980207/1.0, Farnborough, UK. Commercial in Confidence Page 43 of 47 FTL Study Final Report
30. Spencer MB & Robertson KA (2000). A diary study of aircrew fatigue in short-haul multi-sector operations. DERA Report No. DERA/CHS/PPD/CR00394, Farnborough, UK.
31. Spencer MB & Robertson KA (2002). Aircrew alertness during short-haul operations, including the impact of early starts. QinetiQ Report No. QINETIQ/CHS/PPD/CRO10406/1.0, Farnborough, UK.
32. Spencer MB & Robertson KA (2004). Aircrew alertness on the Singapore–Los Angeles route: final report. QinetiQ Report No. QINETIQ/KI/CHS/CR050022/1.0, Farnborough, UK.
33. Spencer MB & Robertson KA (2007). Aircrew fatigue: A review of research undertaken on behalf of the UK Civil Aviation Authority. CAA Paper 2005/04. Available at: http://www.caa.co.uk/docs/33/CAAPaper2005_04.pdf
34. Spencer MB & Robertson KA, & Folkard S (2006). The development of a fatigue/risk index for shift workers. Health and Safety Executive Report No. 446. Available at: www.hse.gov.uk/research/rrhtm/rr446.htm
35. Spencer MB, Robertson KA, & Foster SP (2004). A fatigue study of consecutive nights and split-night duties during air cargo operations. QinetiQ Report No. QINETIQ/KI/CHS/CR040976/Version 1.1, Farnborough, UK.
36. Spencer MB, Stone BM, Rogers AS, & Nicholson AN. (1990). Circadian rhythmicity and sleep of aircrew during polar schedules. RAF IAM Report No. 679, Farnborough, UK.

37. Torsvall L & Åkerstedt T (1988). Disturbed sleep while being on-call: an EEG study of ships' engineers. *Sleep*, 11: 35-38.
38. Tucker P (2003). The impact of rest breaks upon accident risk, fatigue and performance: a review. *Work & Stress*, 17: 123-137.
39. Tucker P, Folkard S & Macdonald I. (2003). Rest breaks and accident risk. *Lancet*, 361; 680.
40. Vejvoda M, Samel A, Maaß H, Luks N, Linke-Hommes A, Schulze M, Mawet L & Hinninghofen H. (2000). Untersuchung zur Beanspruchung des Kabinenpersonals auf transmeridianen Strecken. Report DLR-ME-FP-32-2000, Cologne, Germany.
41. Wright N & McGown A (2001). Vigilance on the civil flight deck: incidence of sleepiness and sleep during long-haul flights and associated changes in physiological parameters. *Ergonomics*, 44(1); 82-106.

B) References used by UK Civil Aviation Authority: CAA PAPER 2005/04, Aircrew Fatigue: A Review of Research Undertaken on Behalf of the UK Civil Aviation Authority; UK CAA 2005/07:

- [1] CAP 371 *The Avoidance of Fatigue in Aircrews: Guide to Requirements*. Civil Aviation Authority, January 2004.
- [2] Nicholson AN. *Sleep Patterns of an Airline Pilot Operating World-wide East-west Routes*. *Aerospace Med*, 41(6), 626-632, 1970.
- [3] Nicholson AN. *Duty Hours and Sleep Patterns in Aircrew Operation World-wide Routes*. *Aerospace Med*, 43(2), 138-141, 1972.
- [4] Graeber RC, Dement WC, Nicholson AN, Sasaki M, Wegmann HM. *International Cooperative Study of Aircrew Layover Sleep: Operational Summary*. *Aviat Space Environ Med*, 57(12, Suppl), B10-B13, 1986.
- [5] Nicholson AN, Pascoe PA, Spencer MB, Stone BM, Green RL. *Nocturnal Sleep and Daytime Alertness of Aircrew after Transmeridian Flights*. *Aviat. Space Environ. Med.*, 57(12, Suppl.), B42-B52, 1986.
- [6] Stone BM, Spencer MB, Rogers AS, Nicholson AN, Barnes R, Green R. *Influence of Polar Route Schedules on the Duty and Rest Patterns of Aircrew*. *Ergonomics*, 36, 1465-1477, 1993.
- [7] Spencer MB, Stone BM, Rogers AS, Nicholson AN. *Circadian Rhythmicity and Sleep of Aircrew During Polar Schedules*. *Aviat. Space Environ. Med.*, 62, 3-13, 1991.
- [8] Pascoe PA, Johnson MK, Montgomery JM, Robertson KA, Spencer MB. *Sleep in Rest Facilities On-board Aircraft: Questionnaire Studies*. RAF IAM Report No. 778, August 1994.
- [9] Pascoe PA, Johnson MK, Robertson KA, Spencer MB. *Sleep in Rest Facilities Onboard Aircraft: Field Studies*. DRA Report No. DRA/CHS/A&N/CR/95/002, March 1995.
- [10] Robertson KA, Spencer MB, Stone BM, Johnson MK. *Scheduling the On-board Rest of Aircrew*. DERA Report No. DERA/CHS/PP5/CR97095/1.0, 1997.
- [11] Minors DS, Nicholson AN, Spencer MB, Stone BM, Waterhouse JM. *Irregularity of Rest and Activity: Studies on Circadian Rhythmicity in Man*. *J Physiol* 381:279-295, 1986.
- [12] Wechsler D. *A Manual for the Wechsler Adult Intelligence Scale (Revised)*. Psychological Corporation, New York, 1981.
- [13] Spencer MB. *The Influence of Irregularity of Rest and Activity on Performance: A Model based on Time since Sleep and Time of Day*. *Ergonomics* 30:1275-1286, 1987.
- [14] Gundel A, Spencer MB. *A Mathematical Model of the Human Circadian System and its Application to Jet Lag*. *Chronobiol Int* 9:148-159; 1992.
- [15] Folkard S, Åkerstedt T. *Towards the Prediction of Alertness on Abnormal Sleep Wake Schedules*. In: Coblenz, ed. *Vigilance and Performance in Automated Systems*. Dordrecht, Kluwer; 1989.
- [16] Daan S, Beersma DGM, Borbely AA. *Timing of Human Sleep: Recovery Process Gated by a Circadian Pacemaker*. *Am J Physiol* 246: R161-R178, 1984.
- [17] Spencer MB, Wilson AL, Bunting AJ. *The CHS Alertness Model and the Prediction of Performance*. DERA Report DERA/CHS/PPD/CR980191: August 1998.
- [18] Comstock JR, Arnegard RJ. *The Multi-attribute Task Battery for Human Operator Workload and Strategic Behavior Research*. NASA Technical Memorandum 104174, 1992. December 2007

CAA Paper 2005/04 Aircrew Fatigue: A Review of Research Undertaken on Behalf of the UK Civil Aviation Authority Page 52

- [19] Dawson D, Reid K. *Equating the Performance Impairment Associated with Sustained Wakefulness and Alcohol Intoxication*. J Centre Sleep Res 2:1-8, 1997.
- [20] Nicholson AN, Pascoe PA, Spencer MB, Stone BM, Roehrs T, Roth T. *Sleep after Transmeridian Flights*. Lancet 2(8517): 1205-8, 1986.
- [21] Rogers AS, Spencer MB, Stone BM. *The Effect of a 7 hour Eastward Time Zone Change on Sleep, Performance and Circadian Rhythms*. PLSD Report No PLSD/CHS5/CR/96/008, June 1996.
- [22] Spencer MB, Rogers AS, Pascoe PA. *The Effect of a Large Eastward Time Zone Change on Sleep, Performance and Circadian Rhythms*. DRA Report No DRA/CHS/A&N/CR/95/011, December 1995.
- [23] Spencer MB, Montgomery JM. *Sleep Patterns of Aircrew on Long-haul Routes*. DRA Report No DRA/CHS/A&N/CR/95/020, October 1995.
- [24] Spencer MB, Montgomery JM. *Sleep Patterns of Aircrew on Charter/Air Haulage Routes*. PLSD Report No PLSD/CHS5/CR/96/082 January 1997.
- [25] Samel A, Wegmann H-M, Vejvoda M. *Aircrew Fatigue in Long-haul Operations*. Accid Ann & Prev 29, 439-452, 1997.
- [26] Samel A, Wegmann H-M, Vejvoda M, Drescher J, Gundel A, Manzey D, Wenzel J. *Two Crew Operations: Stress and Fatigue during Long-haul Night Flights*. Aviat Space Environ Med 68: 679-687, 1997.
- [27] Spencer MB. *Initial Validation of the CHS Alertness Model with Respect to Selected Long-haul Routes*. DERA Report No DERA/CHS/PPD/CR980192/1.0 July 1998.
- [28] Spencer MB, Robertson KA. *The Alertness of Aircrew on the London-Sydney Route: Comparison with Predictions of a Mathematical Model*. DERA Report No. DERA/CHS/PPD/CR/990261/1.0, November 1999.
- [29] Spencer MB, Robertson KA. *The Haj Operation: Alertness of Aircrew on Return Flights between Indonesia and Saudi Arabia*. DERA Report No. DERA/CHS/PPD/CR980207/1.0, June 1999.
- [30] Spencer MB, Robertson KA. *The Haj Operation: Comparison of the Benefits of Inflight Rest in a Crew Seat and a Bunk*. DERA Report No. DERA/CHS/PPD/CR000008, January 2000.
- [31] Robertson KA, Spencer MB, Petrie KJ, Powell D. *Aircrew Alertness during the Haj 2000 Operation and the Benefit of Bunk Sleep*. DERA Report No. DERA/CHS/PPD/CR000501/1.0, January 2001.
- [32] Spencer MB, Robertson KA. *A Diary Study of Aircrew Fatigue in Short-haul Multisector Operations*. DERA Report No. DERA/CHS/PPD/CR000394, October 2000.
- [33] Spencer MB, Robertson KA. *Aircrew Alertness during Short-haul Operations, Including the Impact of Early Starts*. QinetiQ Report No. QINETIQ/CHS/PPD/CR010406/1.0, February 2002.
- [34] Robertson KA, Spencer MB. *Aircrew Alertness on Night Operations: An Interim Report*. QinetiQ Report No. QINETIQ/CHS/PPD/CR021911/1.0, March 2003.
- [35] Spencer MB, Stone BM, Robertson KA, Hosegood I, Howell R. *Aircrew Alertness on Outward and Return Flights Across Four Time Zones*. QinetiQ Report No QINETIQ/KI/CHS/CR03236/2.0, January 2004.
- [36] Robertson KA, et al. *Predicting Alertness in Future Ultra Long-range Operations: A Validation Study by ECASS*. QinetiQ Report No. QINETIQ/KI/CHS/CR021119/2.0, September 2002. December 2007 CAA Paper 2005/04 Aircrew Fatigue: A Review of Research Undertaken on Behalf of the UK Civil Aviation Authority Page 53
- [37] Robertson KA, Spencer MB. *Comparison between Two 12-hour Shift Patterns in Police Helicopter Operations*. DERA Report No. DERA/CHS/PPD/CR000329, May 2000.
- [38] Spencer MB, Robertson KA, Foster SP. *A Fatigue Study of Consecutive Nights and Split-night Duties during Air Cargo Operations*. QinetiQ Report No. QINETIQ/KI/CHS/CRO40976/1.1, May 2004.
- [39] Robertson KA, Stone BM, Gillibrand SB. *Implications of Disturbed Daytime Sleep for Aircrew*. DERA Report No. DERA/CHS/PPD/CR000017, May 2000.
- [40] Holmes SR, Robertson KA, Rogers AS, Spencer MB, Stone BM. *A Review of In-flight Napping Strategies - Updated 2003*. QinetiQ Report No. QINETIQ/KI/CHS/CRO30028/1.1, 2003.
- [41] Robertson KA, Stone BM. *The Effectiveness of Short Naps in Maintaining Alertness on the Flightdeck: A Laboratory Study*. QinetiQ Report No. QINETIQ/CHS/P&D/CRO20023/1.0, February 2002.

[42] Wright NA, McGown AS. *Vigilance on the Civil Flight Deck: Incidence of Sleepiness and Sleep during Long-haul Flights and Associated Changes in Physiological Parameters*. Ergonomics, 44(1), 82-106, 2001.

[43] NA Wright and AS McGown. *Involuntary Sleep during Civil Air Operations: Wrist Activity and the Prevention of Sleep*. Aviat Space Environ Med 75(1): 37-45, 2004.

[44] Goode JH. *Are Pilots at Risk of Accidents due to Fatigue?* J Safety Res 34(3): 309-313, 2003.

C) References used by UK Civil Aviation Authority: CAA PAPER 2003/8; A Review of In-flight Napping Strategies - Updated 2003

1 Åkerstedt T, and Gillberg M. *The circadian variation of experimentally displaced sleep*. Sleep, 4:159-169, 1981.

2 Åkerstedt T, and Lanström U. *Workplace countermeasures of nightshift fatigue*. Int J Indust Ergonomics, 21:322 - 327, 1998.

3 American Sleep Disorders Association. *The International Classification of Sleep Disorders Diagnostic and Coding Manual*. Rochester, MN, 77 - 80, 1990.

4 Baker B, Pascoe PA, and Rogers AS. *The quality of sleep in aircrew rest quarters: Laboratory and preliminary inflight studies*. RAF IAM Report No. 733, 1992.

5 Balkin TJ, and Badia P. *Relationship between sleep inertia and sleepiness: cumulative effects of four nights sleep deprivation/restriction on performance following abrupt nocturnal awakenings*. Biol Psychol, 27:245-258, 1988.

6 Banderet LE, Stokes JW, Francesconi R, Kowal DM, and Naitoh P. *Artillery teams in simulated sustained combat: performance and other measures*. In: Biological rhythms, sleep and shift work. Johnson LC, Tepas DI, Colquhoun WP, and Colligan MJ (eds), Advances in sleep research Vol 7, Spectrum Publications, New York. 459-479, 1981.

7 Bliwise DL. *Normal Ageing*. In: Principles and Practice of Sleep Medicine. Kryger MH, Roth T, and Dement WC (eds), 26-39, 1994.

8 Bonati M, Latin R and Galletti F. *Caffeine disposition after oral doses*. Pharmacol. Therap. 32:98-106, 1982.

9 Bonnet MH. *Memory for events occurring during arousal from sleep*. Psychophysiol, 20:81-87, 1983.

10 Bonnet MH. *Performance and sleepiness as a function of frequency and placement of sleep disruption*. Psychophysiol, 23:267-271, 1986.

11 Bonnet MH, and Rosa RR. *Sleep and performance in young adults and older insomniacs during acute sleep loss and recovery*. Biol Psychol 25:153-172, 1987.

12 Bradley CM, and Robertson KA. *Combined stressors and performance: A review*. DERA Report No. DERA/CHS/PP5/WP980083/1.0, 1998.

13 Broughton, RJ. *Chronobiological Aspects and Models of Sleep and Napping*. In: Sleep and Alertness: Chronobiological, Behavioural and Medical Aspects of Napping. Dinges DF, and Broughton RJ (eds), Raven press, New York, 71-98, 1989.

14 Bruck D, and Pisani DL. *The effects of sleep inertia on decision-making performance*. J Sleep Res, 8:95-103, 1999.

15 Civil Aviation Publication 371. *The avoidance of fatigue in aircrew - guide to requirements*. 3rd edition. Civil Aviation Authority, London, 1989.

16 Carskadon MA, and Dement WC. *Sleepiness and sleep state on a 90 minute schedule*. Psychophysiol 14:127-133, 1977.

17 Carskadon MA, and Dement WC. *Effects of total sleep loss on sleep tendency*. Percept Mot Skills 48:495-506, 1979.

18 Carskadon MA, and Roth T. *Sleep restriction*. In: Sleep, Sleepiness and Performance. Monk TH (ed), Wiley, Chichester, 155-167, 1991. 1 September 2003

- 19 Costa G, Lievore F, Casaletti G, Gaffuri E, and Folkard S. *Circadian characteristics influencing interindividual differences in tolerance and adjustment to shiftwork*. Ergonomics 32(4):373-385, 1989.
- 20 Czeisler CA, Weitzman ED, Moore-Ede MC, Zimmerman JC, and Knauer RS. *Human sleep: Its duration and organisation depend on its circadian rhythm*. Science 210:1264-1267, 1980.
- 21 Daan S, Beersman DGM, and Borbely AA. *Timing of human sleep: recovery process gated by a circadian pacemaker*. Am J Physiol, 246:R161-R178, 1984.
- 22 Dahlgren K. *Adjustment of circadian rhythms and EEG sleep functions to day and night sleep among permanent nightworkers and rotating shiftworkers*. Psychophysiol 18(4):381-391, 1981.
- 23 Di Milia L. *Exploring the utility of using longitudinal single subject case studies to examine the sleep of shiftworkers involved in a change from 8 to 12 hour rotating shifts*. Shiftwork Int Newsletter 12(1):12, 1995.
- 24 Dinges DF. *Napping Patterns and Effects in Human Adults*. In: Sleep and Alertness: Chronobiological, Behavioural and Medical Aspects of Napping. Dinges DF, and Broughton RJ (eds), Raven press, New York, 171-204, 1989.
- 25 Dinges DF. *Adult napping and its effects on ability to function*. In: Why We Nap. Evolution, Chronobiology, and Functions of Polyphasic and Ultrashort Sleep. Stampi C(ed), Birkhauser, Boston:118-136, 1992.
- 26 Dinges DF, Orne EC, Evans FJ, and Orne MT. *Performance after naps in sleep conducive and alerting environments*. In: Biological Rhythms, Sleep and Shiftwork. Advances in Sleep Research, Vol. 7. Johnson IC, Tepas DI, Colquhoun WP, and Collinghan MG, (eds) Spectrum Pub. Inc., 539-580, 1981.
- 27 Dinges DF, Orne MT, and Orne EC. *Sleep depth and other factors associated with performance upon abrupt awakening*. Sleep Res, 14:92, 1985.
- 28 Dinges DF, Orne MT, Whitehouse WG, and Orne EC. *Temporal placement of a nap for alertness. Contributions of circadian phase and prior wakefulness*. Sleep, 10(4):313-329, 1987.
- 29 Dinges DF, Whitehouse WG, Orne EC, and Orne MT. *The benefits of a nap during prolonged work and wakefulness*. Work and Stress, 2:139-153, 1988.
- 30 Downey R, and Bonnet MH. *Performance during frequent sleep disruption*. Sleep 10:354-363, 1987.
- 31 Englund CE, Ryman DH, Naitoh P, and Hodgdon JA. *Cognitive performance during successive sustained physical work episodes*. Behav Res Meth Instr Comp, 17:75-85, 1985.
- 32 Flin RH, Ellis AX, Wynn VE, and Skriver J. *The effect of sleep deprivation and long duration operations on command decision making*. DERA/CHS-7381, 1998.
- 33 Folkard S, and Barton J. *Does the forbidden zone for sleep onset influence morning shift sleep duration?* Ergonomics, 36:85-91, 1993.
- 34 Fort A and Mills JN. *Influence of sleep, lack of sleep and circadian rhythm on short psychometric tests*. In Aspects of Human Efficiency, Colquhoun WP (ed). Oxford University Press, 115-127, 1972.
- 35 Gander PH, Rosekind MR, and Gregory KB. *Flight crew fatigue VI: a synthesis*. Aviat Space Environ Med, 69(9, Suppl.):B49-60, 1998. 1 September 2003 CAA PAPER 2003/8 A Review of In-flight Napping Strategies - Updated 2003 Page 29
- 36 Gander PH, Nguyen DE, Rosekind MR, and Connell LJ. *Age, circadian rhythms and sleep loss in flight crews*. Aviat Space Environ Med, 64:189-195, 1993.
- 37 Gillberg M, Kecklund G, Axelsson J, and Åkerstedt T. *The effects of a short daytime nap after restricted night sleep*. Sleep 19(7):570-575, 1996.
- 38 Griefahn B. *Critical loads for noise exposure during the night*. In: Jonasson HG, Ed, Proceedings of Internoise '90 (Vol 2), Gotteburg, Sweden 1163-1166, 1990.
- 39 Harrison Y, and Horne JA. *Sleep loss and human decision making: a review*. DERA/CHS-7380, 1998.
- 40 Haslam DR. *Sleep loss, recovery sleep, and military performance*. Ergonomics 25(2):163-178, 1982.
- 41 Hayashi M, Watanabe M, and Hori T. *The effects of a 20 min nap in the mid afternoon on mood, performance and EEG activity*. Clin Neurophysiol 110: 272-279, 1999.
- 42 Holmes SR. *Summary of experimental research into the effects of sleep loss on decision making*. DERA/CHS/PPD/WP000230, 2000.
- 43 Holmes, SR, Robertson KA, and Stone BM. *The effect of sleep deprivation on the cognitive processes involved in decision making*. Sleep Res Online 2(suppl 1):536, 1999.

- 44 Hoppen KE. *The effects of light on alertness and performance in relation to melatonin secretion*. Thesis, University of Surrey, October 2001.
- 45 Hoppen K, Middleton B, Stone B, Spencer M, Arendt J. *The effects of caffeine on sleep inertia and performance after a one hour nocturnal nap*. J Sleep Res 9 (suppl 1): 84, 2000.
- 46 Horne JA, and Reyner LA. *Counteracting driver sleepiness: Effects of napping, caffeine and placebo*. Psychophysiol, 33:306-309, 1996.
- 47 Jeanneret PR, and Wilse WB. *Strength of grip on arousal from full nights' sleep*. Percept Mot Skills, 17:759-761, 1963.
- 48 Jewett ME, Wyatt JK, Ritz-de Cecco A, Khalsa SB, Dijk DJ, and Czeisler CA. *Time course of sleep inertia dissipation in human performance and alertness*. J Sleep Res 8:1-8, 1999.
- 49 Karacan L, Williams RL, Finley WW, and Hirsch CJ. *The effects of naps on nocturnal sleep: Influence of the need for stage 1 REM and stage 4 sleep*. Biolog Psychiat, 2:391-399, 1970.
- 50 Kelly RJ, and Schneider MF. *The 12h shift revisited: recent trends in the electric power industry*. J Hum Ergol 11(suppl):155-164, 1982.
- 51 Knauth P, Landau K, Droge C, Schwittek M, Widynski M, and Rutenfranz J. *Duration of sleep depending on the type of shift work*. Int Arch Occupat Environ Health, 46:167-177, 1980.
- 52 Lavie P. *Ultrashort sleep-waking schedule III. 'Gates' and 'forbidden zones' for sleep*. Electroencephalog Clin Neurophysiol, 63:414-425, 1986.
- 53 Libert JP, Bach V, Johnson LC, Ehrhart J, Wittershiem G, and Keller D. *Relative and combined effects of heat and noise exposure on sleep in humans*. Sleep 14(1):24-31, 1991.
- 54 Lubin A, Hord D, Tracy ML, and Johnson LC. *Effects of exercise, bedrest and napping on performance decrement during 40 hours*. Psychophysiol, 13(4):334-339, 1976. 1 September 2003 CAA PAPER 2003/8 A Review of In-flight Napping Strategies - Updated 2003 Page 30
- 55 Lumley M, Roehrs T, Zorick F, Lamphere J, and Roth T. *The alerting effects of naps in sleep-deprived subjects*. Psychophysiol, 23(4):403-408, 1986.
- 56 May J, and Kline P. *Measuring the effects upon cognitive abilities of sleep loss during continuous operations*. Brit J Psych 78:443-455, 1987.
- 57 McGown AS, Wright NA, and Montgomery JM. *Wakefulness on the civil flight deck: An investigation of wrist activity*. CAA Paper 97001, 1997.
- 58 Mullaney J, Kripke DF, Fleck PA, and Johnson LC. *Sleep loss and nap effects on sustained continuous performance*. Psychophysiol, 20:643-651, 1983.
- 59 Muzet A, Nicolas A, Tassi P, Dewasmes G, and Bonneau A. *Implementation of napping in industry and the problem of sleep inertia*. J Sleep Res 4 (S2):67-69, 1995.
- 60 Naitoh P. *Sleep loss and its effects on performance*. Navy Medical Neuro-Psychiatric Research Unit Technical Report. No.68-3, 1969.
- 61 Naitoh P. *Circadian cycles and the restorative power of naps*. In: Biological Rhythms, Sleep and Shiftwork. Advances in Sleep Research, Vol. 7. Johnson IC, Tepas DI, Colquhoun WP, and Collinghan MG, (eds) Spectrum Pub. Inc., 553-580, 1981.
- 62 Naitoh P. *Minimal Sleep To Maintain Performance: The Search for Sleep Quantum in Sustained Operations*. In: Why We Nap. Evolution, Chronobiology, and Functions of Polyphasic and Ultrashort Sleep. Stampi C (ed), Birkhauser, Boston:199-216, 1992.
- 63 Naitoh P, and Angus RG. *Napping and Human Functioning During Prolonged Work*. In: Sleep and Alertness: Chronobiological, Behavioural and Medical Aspects of Napping. Dinges DF, and Broughton RJ, (eds), Raven press, New York, 221-246, 1989.
- 64 Nicholson AN, Pascoe PA, Spencer MB, and Stone BM. *Sleep after transmeridian flights*. The Lancet, Nov. 22nd:1205-1208, 1986.
- 65 Nicholson AN, Pascoe PA, Spencer MB, Stone BM, and Green RL. *Sustained performance with short evening and morning sleeps*. Aviat Space Environ Med, 56:105-114, 1985.
- 66 Nicholson AN, and Stone BM. *Influence of back angle on the quality of sleep in seats*. Ergonomics, 30(7):1033-1041, 1987.
- 67 Ohrstrom E. *Effects of low levels of road traffic noise during the night: A laboratory study on number of events, maximum noise levels and noise sensitivity*. J Sound & Vib, 179(4):603-615, 1995.

- 68 Ohrstrom E. *The effects of noise on sleep*. In: Institute for Environment and Health Report on the non-auditory effects of noise. Report R10, 66-67, 1997.
- 69 Ohrstrom E, Bjorkman M, and Rylander R. *Effects of night time road traffic noise – an overview of laboratory and field studies on noise dose and subjective noise sensitivity*. J Sound Vib 127:441-448, 1988.
- 70 Opstad PK, Ekanger R, Nummestad M, and Raabe N. *Performance, mood and clinical symptoms in men exposed to prolonged physical work and sleep deprivation*. Aviat. Space Environ Med, 49:1065-1073, 1978.
- 71 Pascoe PA, Johnson MK, Robertson KA, and Spencer MB. *Sleep in rest facilities onboard aircraft: field studies*. DRA Report No. DRA/CHS/A&N/CR/95/002, 1995.
- 72 Pascoe PA, Johnson MK, Montgomery JM, Robertson KA, and Spencer MB. *Sleep in rest facilities onboard aircraft: questionnaire studies*. RAF IAM Report No. 778, 1994. 1 September 2003
- CAA PAPER 2003/8 A Review of In-flight Napping Strategies - Updated 2003 Page 31
- 73 Purnell MT, Feyer A-M, Herbison GP. *The impact of a nap opportunity during the night shift on the performance and alertness of 12-h shift workers*. J Sleep Res 11: 219-227, 2002.
- 74 Robertson KA, Rogers AS, and Stone BM. *A review of the use of on-board rest*. DERA Report No. DERA/CHS/PP/5/CR/97136/1.0, 1997.
- 75 Robertson KA, Spencer MB, Stone BM, and Johnson MK. *Scheduling the on-board rest of aircrew*. DERA Report No. DERA/CHS/PP5/CR97095/1.0, 1997.
- 76 Robertson KA, Stone BM, Gillibrand SB. *Implications of disturbed daytime sleep for aircrew*. DERA Report No. DERA/CHS/PPD/CR00017, 2000.
- 77 Robertson KA, Stone BM. *The effectiveness of short naps in maintaining alertness on the flightdeck: a laboratory study*. QinetiQ Report No. QINETIQ/CHS/P&D/CR020023/1.0, 2002.
- 78 Roehrs T, Zorick F, and Roth T. *Transient and Short-Term Insomnias*. In Principles and Practice of Sleep Medicine. Kryger MH, Roth T, and Dement WC (eds), 486-493, 1994.
- 79 Rogers AS, Spencer MB, Stone BM, and Nicholson AN. *The influence of a 1h nap on performance overnight*. Ergonomics, 32(10):1193-1205, 1989.
- 80 Rogers AS, Robertson KA, and Stone BM. *A land force's guide to the management of irregular work/rest schedules*. DERA 1996.
- 81 Rosa R, Colligan MJ, and Lewis P. *Extended workdays: effects of 8-hour and 12-hour rotating shift schedules on performance, subjective alertness, sleep patterns, and psychosocial variables*. Work and Stress 3(1):21-32, 1989.
- 82 Rosa R, Bonnet MH, and Warm JS. *Recovery of performance during sleep following sleep deprivation*. Psychophysiol, 20:152-157, 1983.
- 83 Rosekind MR, Graeber C, Dinges DF, Connell LJ, Rountree MS, Spinweber CL, and Gillen KA. *Crew factors in flight operations IX: effects of planned cockpit rest on crew performance and alertness in long-haul operations*. NASA Technical Memorandum 108839, September 1994.
- 84 Salamé P, Otzenberger H, Ehrhart J, Dewasmes G, Nicolas A, Tassi P, Libert J, and Muzet A. *Effects of sleep inertia on cognitive performance following a 1 hour nap*. Work and Stress, 9(4):528-539, 1995.
- 85 Sallinen M, Härmä M, Åkerstedt T, Rosa R, and Lillqvist O. *Promoting alertness with a short nap during a night shift*. J Sleep Res, 7:240-247, 1998. 86 Shariff A, Strong R, and Rich K. *The User's Guide to Work, Rest and Choice of Royal Navy Watchkeeping Schedules*. INM Technical Report, No. 97037, Portsmouth: Institute of Naval Medicine, 1997.
- 87 Simons RM, de Ree HJD, Valk PJJ, Veldhuijzen van Zanfen BOA, and d'Huyuetter. *K. NAMC - Aircrew Alertness Programme III: onboard crew rest study: quantity and quality of onboard layover sleep: effects on aircrew performance and alertness*. Technical Memorandum RD-31-94. Netherlands Aerospace Medical Centre, 1994.
- 88 Simons M, Valk PJJ. *Effects of controlled rest on the flight deck on crew performance and alertness*. Netherlands Aerospace Medical Centre Report No. NLRGC 1997-B3, 1997.
- 89 Spencer MB. *The influence of irregularity of rest and activity on performance: a model based on time since sleep and time of day*. Ergonomics, 30(9):1275-1286, 1987.

- 90 Spencer MB. *Modelling of aircrew alertness in future ultra long-range schedules, based on a city pair*. QinetiQ Report No. QINETIQ/CHS/P&D/CR020047/1.1, 2002. 1 September 2003 CAA PAPER 2003/8 A Review of In-flight Napping Strategies - Updated 2003 Page 32
- 91 Spencer MB, and Montgomery JM. *Sleep patterns of aircrew on charter/air haulage routes*. DERA Report No. PLSD/CHS5/CR96/082, 1997.
- 92 Spencer MB, and Robertson KA. *The Haj operation: alertness of aircrew on return flights between Indonesia and Saudi Arabia*. DERA Report No. DERA/CHS/PPD/CR98207, 1999.
- 93 Spencer MB, and Robertson KA. *The Haj 99 operation: comparison of the benefits of in-flight rest in a crew seat and a bunk*. DERA Report No. DERA/CHS/PPD/CR000080, 2000.
- 94 Speyer JJ, and Eelsey A. *Towards the integration of pilot guard systems for monitoring attentiveness in flight*. Airbus Industrie, 1995.
- 95 Stampi C. *Polyphasic and ultra short sleep and their effects on performance*. In: Why We Nap. Evolution, Chronobiology, and Functions of Polyphasic and Ultrashort Sleep. Stampi C (ed), Birkhauser, Boston:137-180, 1992.
- 96 Takahashi M, Arito H. *Maintenance of alertness and performance by a brief nap after lunch under prior sleep deficit*. Sleep 23(6): 813-819, 2000.
- 97 Tassi P, Nicolas A, Dewasmes G, Eschenlauer R, Ehrhart J, Salamé P, Muzet A, and Libert JP. *Effects of noise on sleep inertia as a function of circadian placement of a one-hour nap*. Percept Mot Skills, 75:291-302, 1992.
- 98 Taub JM, Tanguay PE, and Clarkson D. *Effects of daytime naps on performance and mood in a college student population*. J Abnorm Psychol 85:210-217, 1976.
- 99 Taub JM. *Effects of habitual variations in napping on psychomotor performance, memory and subjective states*. Int J Neurosci 9:97-112, 1979.
- 100 Taub JM and Berger RJ. *Sleep stage patterns associated with acute shifts in the sleep-wakefulness cycle*. Electroencephalog Clin Neurophysiol, 35:613-619, 1973.
- 101 Tietzel AJ, Lack LC. *The short-term benefits of brief and long naps following nocturnal sleep restriction*. Sleep 24(3): 293-300, 2000.
- 102 Tietzel AJ, Lack LC. *The recuperative value of brief and ultra-brief naps on alertness and cognitive performance*. J Sleep Res 11: 213-218, 2002.
- 103 Tilley AT, and Wilkinson RT. *The effects of a restricted sleep regime on the composition of sleep and on performance*. Psychophysiol, 21:406-412, 1984.
- 104 Torii S, Okudaira N, and Fukuda H. *Effects of night shift on sleep patterns of nurses*. J Hum Ergol, 11:(Suppl.):233-244, 1982.
- 105 Torsvall L, and Åkerstedt T. *Disturbed sleep while being on-call: An EEG study of ships' engineers*. Sleep 11(1):35-38, 1988.
- 106 Torsvall L, Åkerstedt T, Gillander K, and Knuttson A. *Sleep on the night shift: 24-hour EEG monitoring of spontaneous sleep/wake behaviour*. Psychophysiol, 26(3):352-358, 1989.
- 107 Webb WB. *Experiments on extended performance: Repetition, age and limited sleep periods*. Behav Res Meth Instr Comp, 17:27-36, 1985.
- 108 Webb WB. *The proximal effects of two and four hour naps within extended performance without sleep*. Psychophysiol, 24:426-429, 1987.
- 109 Wever R. *The Circadian System of Man*. New York, Springer Verlag, 1979.
- 110 Wilkinson RT. *Sleep deprivation*. In: The physiology of human survival. Edholm OG and Bacharach AL (eds). New York: Academic Press, 399-430, 1965. 1 September 2003 CAA PAPER 2003/8 A Review of In-flight Napping Strategies - Updated 2003 Page 33
- 111 Williams RL, Karacan I, and Hirsch CJ. *Electroencephalography (EEG) of Human Sleep: Clinical Applications*. John Wiley & Sons, New York, 1974.
- 112 Zulley J, and Campbell S. *Napping behavior during 'spontaneous internal desynchronisation': Sleep remains in synchrony with body temperature*. Hum Neurobiol, 4:123-126, 1985.

D) References used in FAA Rulemaking Process:

[Note: The FAA did not yet make public its list of scientific studies & research used in developing the upcoming proposal for new, science-based FTL rules. Once available, this list will be updated]

The FAA held a fatigue management symposium in June 2008. Presentations are available at:

http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs200/media/aviation_fatigue_symposium/aviation_fatigue_symposium.pdf

E) References used in Flight Safety Foundation Work on Ultra-long-range Operations:

[Note: FSF does not have a definitive list or document files of scientific research and studies on the topics of pilot fatigue / ultra-long-range and flight time limitations. Following is a list of reports and articles that have appeared in recent FSF publications. Reports and articles contain references to supporting documents and names of committee members, where appropriate.]

- 1) Flight Safety Digest (Feb 1997). "Special FSF Fatigue Countermeasures Task Force Report: Final Report: Principles and Guidelines for Duty and Rest Scheduling in Corporate and Business Aviation." http://www.flightsafety.org/fsd/fsd_feb97.pdf
- 2) Flight Safety Digest (May-June 2003). "Consensus Emerges From International Focus on Crew Alertness in Ultra-long-range Operations." http://www.flightsafety.org/fsd/fsd_may-june03.pdf
- 3) Flight Safety Digest (Aug-Sept 2005). ULR Crew Alertness Steering Committee and FSF Editorial Staff. "Lessons From the Dawn of Ultra-Long-Range Flight." http://www.flightsafety.org/fsd/fsd_aug-sept05.pdf; incl.:
 - TNO, TNO Report: 'Extension of Flying Duty Period by In-flight Relief', July 2007.
 - Australian and International Pilots Association: Rest Facilities for Flight Crew in Flight. 1998.
 - Australian and International Pilots Association: Flight Crew Noise Exposure and In-flight Rest Facilities, 1998
- 4) AeroSafety World (Nov 2006). "If You Don't Snooze, You Lose." http://www.flightsafety.org/asw/nov06/asw_nov06_p13-17.pdf
- 5) AeroSafety World (Sept 2007). "Perchance to Dream: Crew Rest Facilities Assume Critical Importance When Flights Exceed 16 Hours." <http://www.flightsafety.org/asw/sept07/dream.html>
- 6) AeroSafety World (Aug 2008). "Working to the Limit." http://www.flightsafety.org/asw/apr08/asw_apr08_p14-18.pdf
- 7) AeroSafety World (Oct 2008). "The Science of Fatigue." http://www.flightsafety.org/asw/oct08/asw_oct08_p38-42.pdf
- 8) AeroSafety World (Mar 2009). "Easing Fatigue." http://www.flightsafety.org/asw/mar09/asw_mar09_p22-27.pdf
- 9) Testimony of William Voss before a U.S. Senate subcommittee on fatigue, Dec, 1, 2009. <http://www.flightsafety.org/media-center/speeches-and-presentations/voss-testimony-on-pilot-fatigue>

F) Additional Studies / Research:

[1] Sleep during ultra-long range flights: a study of sleep on board the 777-200 ER during rest opportunities of 7 hours. Dr. Leigh Signal; Prof. Philippa Gander; Margo van den Berg

Research School of Public Health Massey University Private Box 756 Wellington, New Zealand May 2003.

- [2] Principles and guidelines for duty and rest scheduling in commercial aviation. David F. Dinges, R. Curtis Graeber, Mark R. Rosekind, Alexander Samel and Hans M. Wegmann . NASA TPM 1100404 May 1996.
- [3] Crew factors in Flight Operations I: Effects of 9- hour time zone changes on fatigue and the circadian rhythms of sleep/wake and core temperature. P.H. Gander, G. Myhre, R. C. Graeber, H.T. Andersen and J.K. Lauber. NASA TM-88197 December 1985.
- [4] Crew factors in Flight Operations II: Psychophysiological responses to short-haul air transport operations. Philippa H. Gander, R. Curtis Graeber, H. Clayton Foushee, John K. Lauber, Linda J. Connell. NASA TM 108856 November 1994.
- [5] Crew factors in Flight Operations III: The operational significance of exposure to short-haul air transport operations. H. Clayton Foushee, John K. Lauber, Michael M. Baetge and Dorothea B. Acomb. NASA TM 88322 August 1986.
- [6] Crew factors in Flight Operations IV: Sleep and wakefulness in international aircrews. R. Curtis Graeber. NASA TM 88231 February 1986.
- [7] Crew factors in Flight Operations VII: Psychophysiological responses to overnight cargo operations. Philippa H. Gander, Kevin B. Gregory, Linda J. Connell, Donna L. Miller, R.Curtis Graeber and Mark R. Rosekind. NASA TM 11380 February 1996.
- [8] Crew factors in Flight Operations VIII: Factors influencing Sleep Timing and subjective sleep quality in commercial long-haul flight crews. Philippa H. Gander, Kevin B. Gregory, Linda J. Connell, and R.Curtis Graeber. NASA TM 103852 December 1991.
- [9] Crew Factors in Flight Operations XI: A Survey of Fatigue Factors in Regional Airline Operations . Elizabeth L. Co, Kevin B. Gregory, Julie M. Johnson, and Mark R. Rosekind.
NASA TM 208799 October 1999.
- [10] Crew Factors in Flight Operations XIII: A Survey of Fatigue Factors in Corporate/Executive Aviations Operations . Elizabeth L. Co, Kevin B. Gregory, Donna L. Miller, and Mark R. Rosekind. NASA TM 209610 September 2000.
- [11] Flight Crew Stress and Fatigue in Low-Cost Commercial Air Operations - an appraisal. Dr Simon A. Bennett, University of Leicester (2003).
- [12] Age, Circadian Rhythms, and Sleep Loss in Flight Crews. Philippa H. Gander, De Nguyen, Linda J. Connell, and Mark R. Rosekind. Aviation, Space and Environmental Medicine. March 1993.
- [13] Fatigue Factors of Concern for Current Air Transport Pilots. Tammy T. Nguyen^{1,3}, Laura M. Colletti², & Melissa M. Mallis. San Jose State University, QSS Group, Inc. & NASA Ames Research Center. 2003
- [14] Extended working Hours in Australia: Counting the Costs Commissioned by the Department of Industrial Relations. Professor Drew Dawson, Kirsty McCulloch & Dr Angela Baker. The Centre for Sleep Research, The University of South Australia. 2001.
- [15] Predicting Total Sleep Time During Layovers. Lucia Arsintescu¹, Tammy Nguyen^{1*}, Laura M. Colletti², Megan Jewett³ and Melissa M. Mallis⁴. ¹San Jose State University Foundation, Moffett Field, CA; ²QSS Group, Inc., Moffett Field, CA; ³Brigham and Women's Hospital and Harvard Medical School, Boston, MA; ⁴NASA Ames Research Center, Moffett Field, CA; *Posthumously. 2004
- [16] The Impact of Layover Length on the Fatigue and Recovery of Long-Haul Flight Crew. Nicole Lamond, Renee Petrilli, Drew Dawson, Gregory D Roach. Centre for Sleep research, The university of South Australia. Seattle Fatigue Symposium 2005.
- [17] Fatigue Management in Aviation: The effects of timing on in-Flight Sleep. Tracey I. Sletten, Greg D. Roach, David Darwent, Drew Dawson. Fatigue Symposium 2005
- [18] Recommendations for Maintaining Aircrews' Alertness on long-Haul Tours of Duty. Simon Folard, Philippe Cabon, Regis Mollard and Veronique Normier, Jean-Jacques Speyer. Laboratoire d'Anthropologie Appliquée, Université René Descartes, Paris. Fatigue Symposium 2005.

- [19] Flight Crew Scheduling, Performance and Fatigue in a UK Airline – Phases 1 & 2. Simon Stewart. EasyJet. Fatigue Symposium 2005.
- [20] Policy Guidelines for a Risk Management Approach for Shiftwork. The Centre for Sleep Research. The University of South Australia. Angela Baker, Adam Fletcher and Drew Dawson. July 1999.
- [21] The Parliament of the Commonwealth of Australia House of Representatives Standing Committee on Communication, Transport and the Arts. October 2000.
- [22] ETSC “Meeting to discuss the role of EU FTL legislation in reducing cumulative fatigue in civil aviation” in Brussels on Wednesday 19th February 2003 by T. Akerstedt, R. Mollard, A. Samel, M. Simons, M. Spencer, with preface by N. McDonald.
- [23] Safety Of European Civil Aviation: Air Crew Duty Times And Cockpit Automation. November 1994 European Transport Safety Council
- [24] Concept design for supporting rest or sleep in public environments. AnnSofie Börjesson. *A Master’s project in Human computer interaction, at the Royal Institute of Technology (KTH) and Smart Studio, The Interactive Institute, 2002.*
- [25] Impact of Fatigue Related Scheduling Factors on Sleepiness in Aviators (2004) . Lucia Arsintescu¹, Tammy T. Nguyen^{1*}, Laura M. Colletti², Amy Pritchett³, Melissa M. Mallis⁴, 5. ¹San Jose State University Foundation; ²QSS Group, Inc; ³Georgia Institute of Technology; ⁴NASA Ames Research Center; ⁵Alertness Solutions *Posthumously.
- [26] David Powell, Mick Spencer, David Holland, Elizabeth Broadbent, Keith Petrie: Study for Air New Zealand: Factors associated with aircrew fatigue in two-crew operations. 2007[?]
- [27] POWELL DMC, SPENCER MB, HOLLAND D, BROADBENT E, PETRIE KJ. Pilot fatigue in short-haul operations: effects of number of sectors, duty length, and time of day. *Aviat Space Environ Med* 2007; 78: 698–701.
- [28] Bennett, Simon, FOG Watch Human Factors: ‘Managing Pilot Fatigue – a way forward’. *The Aerospace Professional*, Feb. 2008.
- [29] Jet lag and sleepiness in air crew. By Samel, Wegman, Vejvoda; in: *J. Sleep Research* (1995) 4, Suppl. 2, pp. 30-36.
- [30] Early Starts: Effects on Sleep, Alertness and Vigilance. By Simons, Falk; Paper presented at the AGARD AMP. Sept. 1997.
- [31] Prevalence of fatigue among commercial pilots, by Craig A. Jackson, Laurie Earl, *Occupational Medicine* 2006;56:263–268.
- [32] Caldwell JA, Mallis MM, Caldwell JL, Paul MA, Miller JC, Neri DF, Aerospace Medical Association Aerospace Fatigue Countermeasures Subcommittee of the Human Factors Committee. *Fatigue countermeasures in aviation. Aviat Space Environ Med* 2009; 80:29 – 59.

* * *

07/01/2009