Fatigue Risk Management System (FRMS)

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Fatigue

• Fatigue can alter the alert status of a member of the crew and their ability to operate safely an aircraft or performing safety related functions (ICAO)

• Fatigue is more than just feeling tired
What causes fatigue?

- Sleep debt or sleep disorders
- Repetitive, short or Trans-Meridians Flights
- Excessive physical or mental work
- Effort to perform a task
- Time since awakened (TSA)
- Working at night (WOCL) and shift workers
- Alcohol, drugs, nicotine, caffeine
- Bad nutrition
- Lack of regular exercise
Is fatigue a concern in flight operations?

- NASA “Aviation Safety Reporting System” (ASRS)
- 21% of reported incidents mention fatigue-related factors
- National Transportation Safety Board (NTSB) "... It is time for an aggressive federal program that is aimed at addressing the problems of fatigue and sleepiness in transport safety."
  "... Educate pilots about the detrimental effects of fatigue and strategies to avoid and counteract its effects."
- Federal Aviation Administration (FAA)
- Fatigue is an objective of national plan for human factors in aviation
Fatigue symptoms and signs

- Memory loss
- Poor decisions
- Decrease in reaction time
- Reduced vigilance
- Poor communication
- Fixation

- Apathy, Lethargy
- Alteration on behavior
- Low performance
- Bad attitude
- Pitching
- Increased error possibilities
Who must work to counteract fatigue?

✈ The State?
✈ The airline?
✈ The industry?
✈ The individual?
• Fatigue must be managed and it must be a everyone’s responsibility.
• Education – both aircraft crews, ground maintenance personnel and company personnel responsible for scheduling and flight release.
• Everyone is jointly responsible- not just the regulated positions.
How the State could help

- Appropriate prescriptive laws, oversights and fatigue management programs:
- Maximum day, month, year flight hours, duty hours
- Minimum days off, consecutive assignments, group of days off
- Minimum time off between assignments
- Maximum legs in a day
- Vacations control
- Implementing FRMS for regulators
There are Six Parts in an FRMS

1. Fatigue Risk Management Policy
2. Education and Awareness Training Program
3. Fatigue Analysis and Reporting System
4. Monitoring Fatigue in Flight and Cabin Crew
5. Incident Reporting Process
6. Performance Evaluation
Measures from the Organization

• Implement Corporate Programs aimed at Risk Management Fatigue.
• Managing risk, through a comprehensive Safety System.
• Developing defenses against danger of Fatigue
• FRMS based on a formal risk assessment
• Reporting System to identify, control and Mitigate risk (FRMS / FRMP / SMS)
• Adjusted rosters to fatigue control programs
Help from the industry

• Studies to know Levels Of Fatigue
• Specialized Programs
• Forums - Training and Updates Facing the Dynamics of Fatigue Risk
• Programs with Alerts in Risk Identification
SAFTE
The Sleep, Activity, Fatigue, and Task Effectiveness (SAFTE) simulation, developed by Dr. Steven Hursh, offered by Fatigue Science. Analyzes sleep/wake and work schedule data to predict human performance levels. Scale 0 - 100, with 100 being full performance.

CAS
Circadian Alertness Simulation (CAS) developed by Dr. Martin Moore-Ede and offered by Circadian. Analyzes work schedules, sleep and alertness patterns to calculate a cumulative fatigue score. The risk assessment algorithms are based on physiological sleep/wake principles including homeostatic and circadian processes.
CPSS
The Circadian Performance Simulation Software (CPSS) developed by the Harvard University Division of Sleep Medicine. Predicts the effects of sleep/wake schedules and light exposure on the human circadian pacemaker, and the combined effects of circadian phase and homeostatic sleep pressure on cognitive performance and subjective alertness.

BAM
The Boeing Alertness Model (BAM) Boeing / Jeppesen. Analyses are based on the Three Process Model of Alertness – also known as the Sleep Wake Predictor.
Actigraph to fit all budget and protocol requirements. Various model Motion loggers offer applications that include basic sleep estimation, high resolution analog data collection, simultaneous environmental data collection, subjective wearer input features, and comprehensive sleep scoring and sleep distribution data on the wrist. A range of recording capabilities exist including four validated sleep algorithms, PLM analysis, and a suite of circadian rhythm analyses. Software for device operation and data analysis is available for Windows 2000/XP, and comparable systems – and ActMe Operational Software allows for quick, easy download of actigraph data into the Fatigue Avoidance Scheduling Tool (“FAST”) program. All models are Lithium battery powered for long use.
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<th>Key Features</th>
<th>Advantages</th>
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| ✔ Iterative Process Simulation Model                  | • Effects of any schedule down to the minute  
• Effects of any sleep pattern  
• Adaptive to actigraph or temperature data                                                            |
| ✔ Homeostatic                                         | • Declining sleep intensity during sleep period  
• Adaptive equilibrium of performance under less than optimal schedules of sleep                    |
| ✔ Multi-oscillator Circadian Process                  | • Asymmetrical cycle of performance                                                                |
| ✔ Clock Driven Circadian Process                      | • Mid-afternoon dip in performance  
• Predominant early morning nadir in performance                                                      |
| ✔ Event Driven Sleep-Wake Cycle                       |                                                                                                    |
| ✔ Circadian Variation in Sleep Propensity and Intensity| • Circadian variations in sleep quality.  
• Limits on performance with day time sleep                                                              |
| ✔ Sleep Fragmentation                                 | • Environmental effects on sleep quality  
• Sleep Apnea                                                                                           |
| ✔ Sleep Inertia                                       | • Post-awakening slowing of performance                                                              |
| ✔ Dynamic Adjusting Circadian Phase                   | • Shift schedules and “jet lag” effects  
• Duration of adjustment                                                                               |
| ✔ Accounts for over 90% of performance variance during sleep deprivation                                | • Performance at extremes of sleep deprivation  
• Expected levels of performance under any combination of sleep and sleep deprivation                  |
| ✔ Normal stable pattern of performance when rested     |                                                                                                    |
| ✔ Task Effectiveness Parameters                       | • Predict variations in any relevant aspect of operator performance of interest to the user          |
Intervention from the Individual

Commit to implement a program that includes:

• Self-Care
• Sleep Hygiene
• Relaxation
• Enhancing Physiological condition
• Nutrition
• Cognitive Exercises
Why some people fatigue less than others?

Individual protection
- Good attitude
- Personality characteristics
- Self-Esteem
- Perception of situations

Lifestyle and work perspective
- Time management
- Work Motivation
- Set to the task
- Working conditions
Program your brain to sleep 8 hours.

If you cannot sleep, start another activity.

Management of your time
3rd PAN AMERICAN AVIATION SAFETY SUMMIT

Time Management

- Sleep
- Work
- Family
- Hobbies
- Sports
- Couple

Hobbies
Sports
Sleep
Family
Couple
Work
MOTIVATED COLLABORATORS RESULTS IN LESS FATIGUED CREWS
FATIGUED CREW MEMBERS MAY BE INVOLVE IN OPERATIONAL EVENTS