

## **“Sleep/Wake Cycles and Performance of ATC Operators”**

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### ***Abstract***

Concerns surrounding the effects of work schedules on employee fatigue, performance, and well-being in settings that require 24-7 service are not new. Internationally, scientists and organizational personnel have sought to identify ideal scheduling practices for many decades. This is a critical concern in air traffic control and the rest of the transportation industry given the safety critical nature of the job duties. CAMI scientists have investigated the effects of the rotating shift schedules of controllers in the US since 1973, a majority of the laboratory and field research occurred in the 1990s, with a focus on the identification of fatigue countermeasures. While controllers work a variety of shift schedules, considerable attention has been focused on the counterclockwise rapidly rotating 2-2-1 shift schedule. Results indicate the primary concerns associated with the 2-2-1 involve the short turn around between shifts and the amount of time available for sleep prior to the start of the night shift. A laboratory study comparing a counterclockwise with a clockwise rotating 2-2-1 schedule revealed that the amount of sleep obtained prior to the night shift on the two schedules did not differ, even though additional time off between shifts was available for those on the clockwise rotating schedule. Obtaining adequate rest during daylight sleep is a primary concern. Our research also suggests that individuals who are working straight early morning shifts may incur as much of a sleep debt during the week as those who work a

rapidly rotating shift schedule. Results of a recent laboratory study revealed that two 20 minute naps obtained during the night shift were sufficient to improve alertness and performance on a cognitive task. Caution is necessary however, to avoid sleep inertia following napping. Outcomes from our research and other research reveal that there is no ideal shift schedule. Scheduling practices need to be adjusted to ensure adequate rest time for employees and schedulers and employees need to be educated regarding shiftwork and fatigue. Adjustments to shift schedules are often difficult given the need to have sufficient personnel available to meet traffic demands and provide sufficient flexibility for employees to adjust their schedules to meet their home and family needs. Scheduling tools can be used to assist personnel in adjusting the proposed schedules.

### ***Main Points***

- Provide an overview of FAA shiftwork-related research
- There is no ideal shift schedule to cover 24-7 operations
- There are positive and negatives associated with the counterclockwise rapidly rotating shift schedule employed in many ATC facilities in the US
- Shift rotation time should be no less than 10 hours
- Laboratory investigations have demonstrated that short naps (20

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minutes) may be sufficient to improve alertness and attention during the night shift

- Schedulers and employees need to be educated concerning issues surrounding shiftwork and fatigue
- Modeling and scheduling tools can be used to assist in mitigating fatigue promoting schedules

A copy of Dr. David Schroeder's biographical information and presentation slides are provided in Appendix B