Office of Inspector General

Audit Report

FAA'S CONTROLLER SCHEDULING PRACTICES CAN IMPACT HUMAN FATIGUE, CONTROLLER PERFORMANCE, AND AGENCY COSTS

Federal Aviation Administration

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Memorandum

U.S. Department of Transportation
Office of the Secretary of Transportation
Office of Inspector General

Subject: ACTION: FAA's Controller Scheduling Practices Can Impact Human Fatigue, Controller Performance, and Agency Costs
Federal Aviation Administration
Report No. AV-2013-120

Date: August 27, 2013

From: Jeffrey B. Guzzetti
Assistant Inspector General
for Aviation Audits

Reply to Attn. of: JA-10

To: Federal Aviation Administrator

The United States has one of the best air safety records in the world, due in part to the actions of the nation's air traffic controllers. However, on March 23, 2011, the first in a series of highly publicized incidents occurred during which air traffic controllers either fell asleep on duty or became unresponsive. These events raised questions about the impact of the Federal Aviation Administration's (FAA) scheduling practices, particularly during overnight shifts, on controller performance and the consequences of performance problems on air traffic safety.

The FAA Modernization and Reform Act[1] of 2012 directed our office to review the considerations of safety, controller performance, and cost effectiveness when controller schedules are developed. Accordingly, our audit objectives were to (1) determine the impact that controller scheduling practices have on safety and air traffic controller performance, (2) evaluate the cost effectiveness of controller scheduling practices, and (3) assess air traffic control facility compliance with FAA scheduling policies.

We conducted this review in accordance with generally accepted Government auditing standards. As part of this audit, we selected a statistical sample of controller work schedules, which allowed us to project the total percentage of controller work shifts that violated FAA's scheduling policies. Exhibit A provides more details on our scope and methodology.

[1] FAA Modernization and Reform Act of 2012. Public Law 112-95.

RESULTS IN BRIEF

Scientific research has shown that air traffic controller scheduling practices impact controller performance and aviation safety. Controllers generally work rotating schedules during which the start and stop times vary between day, evening, and night times. Reviews by the National Transportation Safety Board (NTSB), FAA's Civil Aerospace Medical Institute (CAMI), the National Aeronautics and Space Administration (NASA), and FAA's Fatigue Risk Management (FRM) Work Group have shown that individuals working erratic schedules experience fatigue, which can negatively impact controller performance and safety. In response to a number of incidents of sleeping or unresponsive controllers in 2011, FAA took action to mitigate the impact of fatigue on controller performance by revising its controller scheduling policies. For example, the Agency increased the minimum rest periods between shifts, established a fatigue risk management system, and increased the number of controllers assigned to midnight shifts. In addition, FAA began to allow "recuperative breaks" on overnight shifts to lessen the risk of fatigue experienced by working controllers. However, facility managers raised concerns about whether the new scheduling policies actually reduce fatigue. We could not determine the extent to which these new policies impact fatigue because FAA does not have metrics to measure the effect of its scheduling practices. In addition, fatigue research, which is still ongoing, may prompt additional revisions to FAA's scheduling practices to mitigate fatigue.

FAA's new policies requiring a second overnight controller at 30 facilities[2] cost the Agency approximately $1.9 million per year.[3] Although not a significant increase relative to FAA's annual budget for operations, these costs could be offset by additional cost-saving measures. For example, FAA has opportunities to reduce costs related to its overnight operations. FAA records indicate that 72 facilities do not meet the Agency's minimum traffic guidelines for continuous overnight operations; yet, these facilities are still staffed with a minimum of 2 controllers during the midnight shift. By reducing services at these facilities during the midnight shift, the Agency could reduce costs. However, FAA has not yet determined the potential total cost savings. Additionally, FAA plans to enhance cost efficiency by implementing its Operational Planning and Scheduling (OPAS) tool, a new system created to help managers design more efficient shift schedules.

Controllers are working schedules that do not always comply with FAA's scheduling policies on the minimum amount of time required between shifts. During our review, we examined a statistical sample of 32,814 shifts for 403 controllers at 20 facilities over a 16-week period. We found 279 cases where controllers did not have the required 9 hours of off-duty time between an evening shift and the following day shift. We also found another 102 cases where

[2] See exhibit C.
[3] According to data provided by FAA's Office of Financial Services.

controllers did not have the minimum required 8 hours off between all shifts. The majority of these violations were less than 15 minutes in length. In response, FAA committed to improving compliance with its policies and the Agency continued to take steps to reduce the number of violations, such as conducting regular audits. To further address this issue, FAA recently implemented a new feature into its timekeeping system that will alert users to potential violations. However, the feature can be bypassed by employees without supervisory approval, which could result in continued violations.

BACKGROUND

FAA's scheduling policies are codified in FAA Orders and in the negotiated collective bargaining agreement (CBA) with the National Air Traffic Controllers Association (NATCA). Under the CBA, local facility management and NATCA representatives negotiate a basic watch schedule (BWS) annually.[4] To establish a starting point for the BWS, FAA established three core shifts for the work day: day, evening, and midnight shifts.[5] In addition, local managers and NATCA representatives can negotiate supplementary or ancillary shifts in order to better align staffing with the local air traffic.

Prior to beginning annual BWS negotiations, facility managers determine the number of controllers that are needed on each schedule shift for safe operations, based on previous watch schedule staffing and anticipated air traffic levels. According to facility managers interviewed during this audit, bidding for assignments to the BWS and for annual leave slots are accomplished according to the seniority of controllers within the union.[6] Because each facility manager and NATCA representative negotiate the local BWS based on the operational needs and workforce preferences at each air traffic facility, there is no standardization for controller schedules. For example, facilities can elect to run daily rotating shifts (a different shift every day), weekly rotations (a different shift each week), straight shifts (permanent assignment to the same shift), or any combination of shift variations that works best for each facility workforce.

According to FAA scheduling policies, individual work schedules must meet the following requirements:

- Controllers cannot have more than 10 operational hours in a shift.
- There must be at least an 8-hour break from the time work ends to the start of any subsequent shift and a minimum 9-hour break preceding the beginning of a day shift.

[4] According to the CBA between FAA and NATCA, the BWS is defined as the days of the week, hours of the day, rotation of shifts worked by air traffic controllers, and regular days off.
[5] Core shifts are generally defined as: Day Shift (0700 – 1500), Evening or Swing Shift (1500-2300), Midnight Shift (2300-0700).
[6] Article 83, 2009 FAA-NATCA Collective Bargaining Agreement.

- Controllers must have an off-duty period of at least 12 hours following a midnight shift.
- Controllers cannot work more than 6 consecutive days without a day off.

Although we found that FAA does not mandate a pattern for controller schedules, some schedule types are more prevalent than others nationwide. For instance, figure 1 shows the "2-2-1" counter-clockwise rotating schedule.

Figure 1. Generic Counter-Clockwise Rotating 2-2-1 Controller Schedule

Shift	2-2-1	Time Between
1	3:00 p.m. – 11:00 p.m.	15 hours
2	2:00 p.m. – 10:00 p.m.	9 hours
3	7:00 a.m. – 3:00 p.m.	14 hours
4	6:00 a.m. – 2:00 p.m.	8 hours
5	10:00 p.m. – 6:00 a.m.*	

* Note that Shift 5 begins at 10:00 p.m. on day 4 and ends at 6:00 a.m. on day 5.

Source: FAA

This 2-2-1 schedule is a *counter-clockwise* rotating schedule that is characterized by rotating shifts with progressively earlier start times throughout the work week. Rotating schedules involve a change of shift start times. This change can be either slow (e.g., 2 weeks of the same shift before changing) or rapid (e.g., 2 days of the same shift before changing to another shift start time). This schedule differs from a *clockwise* rotation that is characterized by progressively later start times. In general, many air traffic control facilities use counterclockwise, rapidly rotating schedules. That means that controllers work different shifts (e.g., afternoon, morning, and midnight) within one work week (rapidly rotating), and start times for the different shifts are progressively earlier (counterclockwise). These features act to compress the work week, providing more time-off between work weeks.

FAA'S SCHEDULING PRACTICES MAY CONTRIBUTE TO CONTROLLER FATIGUE

Scientific studies and investigations conducted by NTSB, CAMI, and FAA-affiliated fatigue experts indicate that fatigue is a major risk factor in controller performance and aviation safety, particularly on the midnight shift. In response to controller conduct issues involving controllers sleeping while on duty in 2011, FAA took steps to address controller fatigue and improve controller performance, including developing a fatigue risk management system and changing scheduling policies. However, facility managers expressed the need for more clarity about the extent of activities allowed for fatigue mitigation during "recuperative breaks" on midnight shifts.

Controller Shift Work Can Lead to Fatigue and Diminished Performance

Air traffic control generally requires shift work, which means controllers must work at times when they would normally sleep. In addition, controller schedules frequently change to adapt to the operational needs of facilities, which often operate 24 hours a day. Research by NTSB, CAMI, and FAA's FRM Work Group has shown that individuals working erratic schedules experience conflicts between their biological circadian rhythms and environmental time cues and work demands. This physiological conflict can cause drowsiness, mood changes, performance degradation, and physiological upset, all of which negatively impact controller performance and safety. This research is described in further detail below.

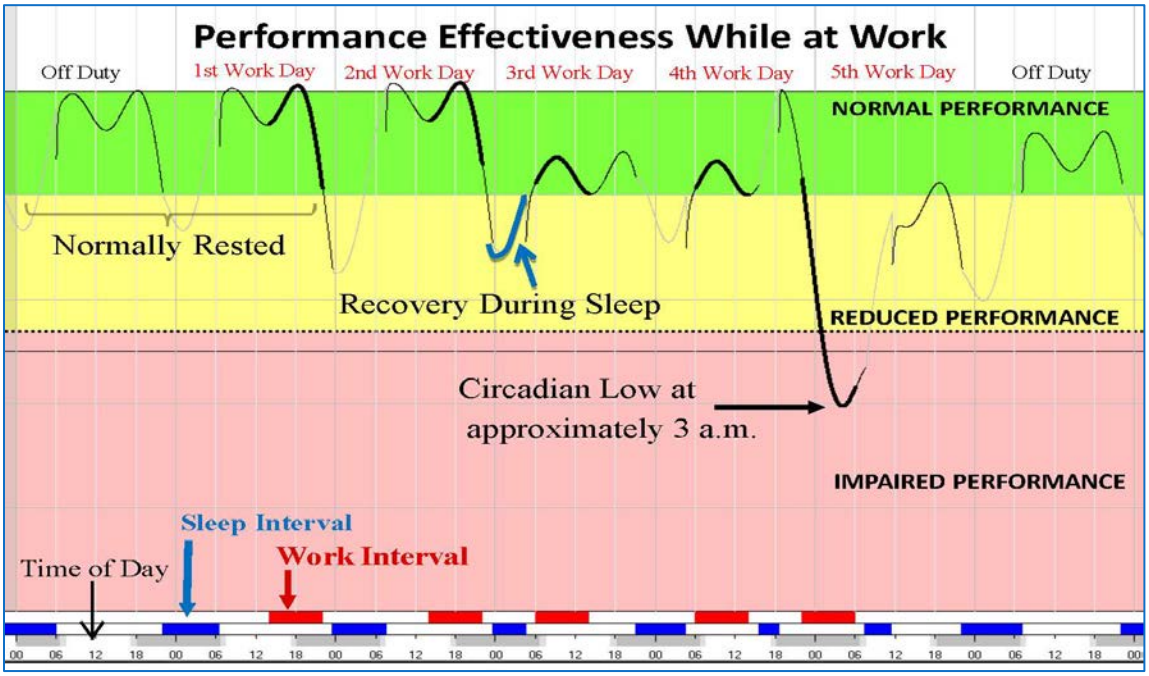
Shift Workers Experience "Shiftlag" and Other Fatigue-Related Problems

Fatigue is generally defined as a physiological state in which there is a decreased capacity to perform cognitive tasks and an increased variability in performance. The disruptive effects of shift work negatively impact sleep, performance, circadian rhythms, and social and family relations, and can cause long-term health problems.

Circadian rhythms are physiologically-based rhythms found in many measures of human biology. Circadian means 'about a day,' so these rhythms tend to cycle about every 24 hours. Body temperature is a commonly studied example. For day-oriented individuals, core body temperature rises over the course of the day until evening, when it falls until about 3 a.m. in the early morning. Cognitive functions, performance, sleep, and alertness also demonstrate circadian variations. Figure 2 demonstrates how these rhythms tend to track the day/night environmental cycle for day-oriented individuals. As a result, when it is daylight, an individual feels awake and alert. When it gets dark, the individual feels sleepy and less alert. Day-oriented individuals working a night shift must not only fight sleep but must also function when their performance rhythms are at the circadian low point. For

example, figure 2 displays a 7-day period of sleep and wakefulness that includes an example of circadian patterns incurred during an overnight work period from late on the 4th work day into the early morning of the 5th work day.

Figure 2. Human Circadian Measurements as They Correlate to Controller Performance Levels During Work and Sleep Intervals



Source: FAA's *Article 55 Fatigue Risk Management Work Group Recommendations,* slide 8.

Figure 2 demonstrates that performance degrades significantly during overnight shifts, though the exact synchronization of this rhythm with the clock varies somewhat from individual to individual.

Additionally, fatigue caused by prolonged wakefulness has been shown to cause reactions similar to what one may experience through alcohol consumption. A June 1999 study[7] provided by CAMI shows that the degree by which performance decreased from staying awake for 21 consecutive hours is nearly identical to the performance loss experienced at a 0.08 percent blood alcohol level. According to the National Highway Traffic Safety Administration, it is illegal to operate a motor vehicle at a 0.08 percent blood alcohol level in all 50 States.[8]

[7] *How Do Prolonged Wakefulness and Alcohol Compare in the Decrements They Produce on a Simulated Driving Task?* by Todd Arnedt, Gerald S. Wilde, Peter W. Munt, Alistair W. MacLean. Accident Analysis and Prevention, vol. 33, (2001), pp. 337-344, 2000.
[8] DOT HS 811 673. October 2012.

CAMI research[9] also reveals that "shiftlag," or the physical, mental, and emotional effects of shift work, is similar to jetlag. Shiftlag can result in physical symptoms such that the individual does not feel well and, therefore, may frequently use sick leave in an attempt to cope. These effects have implications for safety-related occupations as well as organizational and individual costs. The disruptions may result in a situation where an individual is not at peak performance during duty hours. Overall, CAMI research specifies that there is no single optimum shift system. However, shift schedule designs can either minimize or exacerbate disruptions experienced by a shift worker.

Longstanding NTSB Work Identified Controller Fatigue as a Safety Risk

NTSB has long been concerned with identifying and mitigating the factors that create an inherent risk of controller fatigue. According to NTSB, limited sleep can degrade alertness, vigilance, and judgment. NTSB has cited controller fatigue, caused by physically demanding work schedules and poorly managed utilization of rest periods between shifts, as contributing factors in several high profile operational incidents. For example:

- On August 27, 2006, Comair Flight 5191 crashed during takeoff from Blue Grass Airport, Lexington, KY, at 6:07 a.m. after the crew attempted to take off from an incorrect runway. The air traffic controller who cleared the airplane for takeoff stated that his only sleep in the 24 hours before the accident was a 2-hour nap the previous afternoon between shifts.

- More recently, NTSB investigated an air traffic control service interruption at Ronald Reagan Washington National Airport (DCA) that occurred on the night of March 23, 2011. At the time, two air carrier aircraft approaching DCA, and controllers at FAA's Potomac Terminal Radar Approach Control, were unable to establish contact with the supervisory controller working alone in the DCA tower. According to NTSB, the controller on duty at the time of the incident had been working his fourth consecutive midnight shift (10 p.m. to 6 a.m.) and indicated that he fell asleep.

Because of the important safety role air traffic control plays in the NAS, NTSB issued recommendations for changes to controller work-scheduling policies and training requirements in April 2007. According to NTSB, these safety recommendations were issued as a result of the Board's concern about the effects of fatigue on persons performing critical functions in all transportation industries, including the effects of fatigue on air traffic controllers' performance. These recommendations and FAA's actions are detailed in table 1 below.

[9] "Shiftwork and Air Traffic Control: Transitioning Research Results to the Workforce," *Human Factors Impacts in Air Traffic Management,* ed. Barry Kirwan, Mark D. Rodgers and Dirk Schaefer (Aldershot etc.: Ashgate, 2005), pp. 243-78. Pamela S. Della Rocco and Thomas E. Nesthus, p. 2.

Table 1. NTSB Fatigue-Related Controller Scheduling and Training Recommendations, 2007

NTSB Recommendation	FAA's Actions	Status
Work with NATCA to reduce the potential for controller fatigue by revising controller work-scheduling policies and practices to provide rest periods that are long enough for controllers to obtain sufficient restorative sleep and by modifying shift rotations to minimize disrupted sleep patterns, accumulation of sleep debt, and decreased cognitive performance.[10]	• Assembled the Article 55 Fatigue Risk Management Work Group to research the impact of fatigue on controller performance and aviation safety.	Open (as of Jan. 2013)
Develop a fatigue awareness and countermeasures training program for controllers and for personnel who are involved in the scheduling of controllers for operational duty that will address the incidence of fatigue in the controller workforce, causes of fatigue, effects of fatigue on controller performance and safety, and the importance of using personal strategies to minimize fatigue.[11]	• Developed a fatigue awareness training program for FAA Academy students. • Created a 30-minute computer based instruction (CBI) lesson for refresher training • Published an informational brochure.	Closed (Jan. 2010)

Source: NTSB and FAA

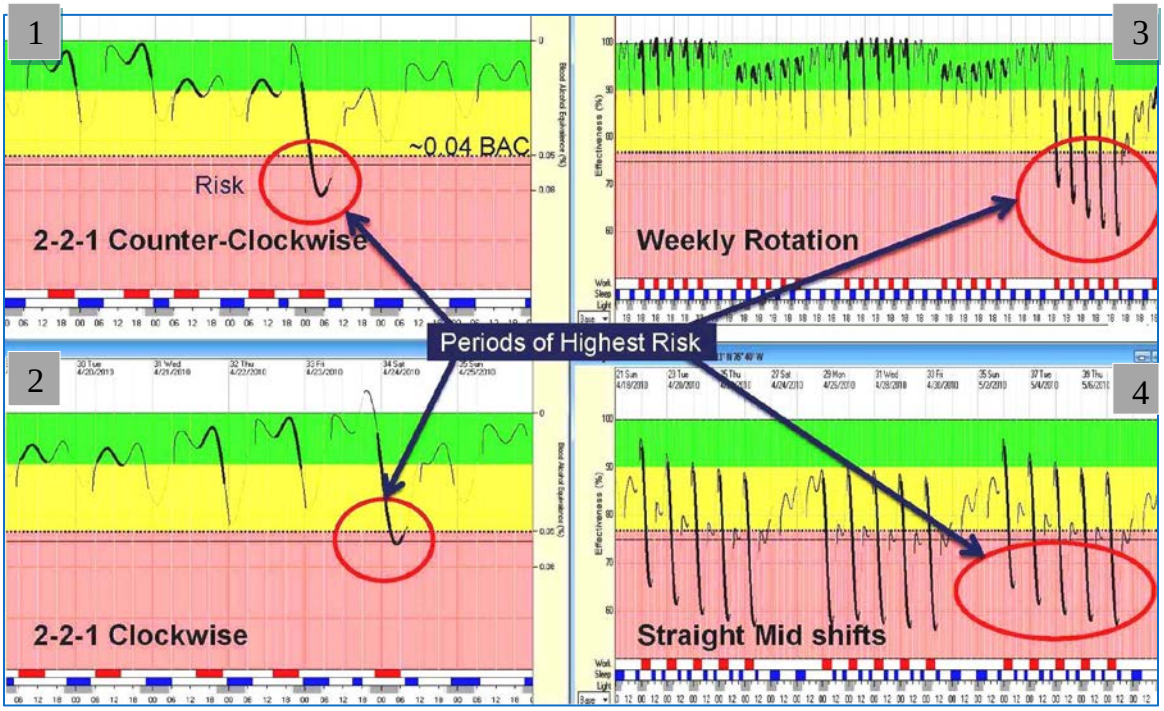
Some Controller Schedules Carry More Fatigue Risk Than Others

In response to NTSB's fatigue-related safety recommendations, FAA, NATCA, and CAMI scientists and fatigue experts began collaboration in November 2009 on the Article 55 FRM Work Group to identify the causes of controller fatigue, associated hazards and risks, and appropriate mitigations to reduce fatigue risk in the National Airspace System.[12] The FRM Work Group was tasked to develop a fatigue management system, to identify and mitigate workplace fatigue concerns, and to develop and refer recommendations for action to FAA. FRM's research aimed to assess (1) to what degree controller schedules induce fatigue, and (2) which of the most common schedules provide increased cognitive performance and the best opportunity for restorative rest over a 6-week timeframe.

The FRM Work Group modeled 110 schedule permutations of work and sleep intervals for 4 common schedules (2-2-1 counter-clockwise rotation, 2-2-1 clockwise rotation, weekly straight rotation, and straight shifts). The results of FAA's comparative analyses have been diagrammed in figure 3.

[10] NTSB Safety Recommendation A-07-30.
[11] NTSB Safety Recommendation A-07-31.
[12] The complete list of Work Group contributors is listed in Appendix D.

Figure 3. Fatigue Risks in Four Examples of Controller Schedules



Source: FAA's *Article 55 Fatigue Risk Management Work Group Recommendations*, slide 10.

The Work Group discovered that regardless of the type of schedule rotation, all schedules demonstrate varying degrees of inherent fatigue risk. The one common factor shared by all of the schedules was that controllers face a sharp increase in fatigue risk while working midnight shifts. For example:

- The 2-2-1 counter-clockwise rotating schedule shown in the top left chart of figure 3 incorporates alternating start and stop times throughout the work week, as is demonstrated in figure 4. The quick-turn-around from one shift to the next offers as little as 8 hours off between shifts. This arrangement has the potential to result in cumulative partial sleep loss during the week, as well as circadian rhythm disruption.

Figure 4. Generic Counter-Clockwise Rotating 2-2-1 Controller Schedule

Day	Shift	Start Time	End Time
1	Evening	3:00 PM	11:00 p.m.
2*	Evening	2:00 PM	10:00 p.m.
3	Day	7:00 AM *	3:00 p.m.
4*	Day	6:00 AM	2:00 p.m.
5	Midnight	10:00 PM on day 4 *	6:00 a.m. on day 5

* Quick turn between shifts with an 8 or 9 hour off-duty period.

Source: FAA

This particular schedule also packs five 8-hour work shifts into a period of only 88 consecutive hours of time from the beginning of the first shift to the end of the last shift. Alternatively, a typical 5-day work week is 104 hours in length from 9 a.m. of the first work day to 5 p.m. at the end of the last work day. Controllers like this schedule because it results in 3 days and 9 hours off duty before the beginning (3 p.m.) of their next shift. Notably, the period of highest risk for this midnight shift is much greater than the same period depicted in the 2-2-1 clockwise rotation shown in the lower left chart of figure 3.

- **The 2-2-1 clockwise rotating schedule**, shown as an example in the lower left chart of figure 3, involves controllers that work two day shifts followed by two evening shifts and again ending in the midnight shift. While this schedule seems to cause the least fatigue risk, it is probably the least desirable for controllers, because it requires 5 days and 6 hours to complete the work full rotation. Although controllers working this schedule seem to experience less fatigue risk, even during their midnight shifts, it reduces the amount of time off duty between work weeks.

- **"Straight shift"** examples are shown in the right side charts of figure 3 and involve controllers that work one shift for an entire week or throughout the period of the watch schedule. These schedules disprove the commonly held opinion that if people work midnight shifts long enough, their bodies will adjust. Rather, the charts illustrate that with each succeeding midnight shift worked, the level of impairment increases.

FAA Recently Took Steps To Mitigate Controller Fatigue

The March 2011 air traffic control service interruption at DCA was the first in a series of incidents that involved controllers who either fell asleep or were

unresponsive to communications from either aircraft or other air traffic control facilities. Additional fatigue-related incidents occurred at air traffic facilities in Nevada, Texas, Washington, and Florida. In response to these incidents, between April 2011 and August 2012, FAA instituted the following changes to controller scheduling policies:

- An additional controller was added to the midnight shift at 30 facilities that were staffed with only one controller during that time.
- FAA mandated that controllers have a minimum of 9 hours off between shifts, which was later amended to apply only to the time off duty prior to the beginning of the next day shift.[13]
- Controllers were no longer able to switch to an unscheduled midnight shift following a day off.
- FAA managers were directed to schedule shifts in a way that ensures greater supervisory coverage in the early morning and late night hours.

In addition to the policy changes, FAA also allowed controllers to engage in several fatigue mitigation methods, workload permitting. For example, between the hours of 10:00 p.m. and 6:00 a.m., radios and "appropriate" printed material are now permitted in operational areas. Midnight shift workers are also permitted to take up to a 2.5-hour break from their assigned duties to recuperate from the effects of fatigue.

Research Indicates That Fatigue Can Be Mitigated With Napping

Researchers have, for many years, reported the disruptive effects of shift work on sleep, performance, circadian rhythms, social and family relations, and longer-term health status. With advances in understanding of the circadian clock and the importance of sleep, researchers and practitioners have begun to focus on the challenge to mitigate the undesirable effects and to minimize conditions that are conducive to error. In fiscal year 1999, FAA's congressional appropriations mandated a study of air traffic controller shift work issues. Coincidentally, Article 55 of the NATCA 1998 Collective Bargaining Agreement with the FAA also called for a CAMI study of fatigue and shift work issues. The Air Traffic Service (ATS) established the Article 55 Human Factors Work Group to address the CBA requirements. As a result, CAMI researchers now have a forum to work toward the goal of applying research findings to practical human factors solutions.

Sleep, like eating, is a physiological need. Sleep is required to maintain alertness, concentration, and performance, as well as health. People differ in the amount of sleep they need as individuals. However, the common rule of thumb is that 8 hours

[13] According to CAMI officials, the FRM Work Group originally planned to recommend 10 hours of rest between all shifts. However, the policy was amended to 9 hours prior to day shifts when the FRM Work Group determined that increasing the time off duty from 8 to 9 hours provided greatest marginal benefit.

is average, although there is a wide variability. Shift work disrupts sleep in a number of ways. It may shorten sleep duration, disturb the sleep architecture, and lead to fragmentation. If a person needs 8 hours and only gets 6, they experience sleep loss. Consecutive days of restricted sleep periods will result in cumulative sleep debt. Sleep-deprived individuals find it difficult to fight sleep and may doze off unintentionally. In fact, research suggests that losing as little as 2 hours of sleep will degrade performance and alertness. Yet, only sleep effectively fights sleep loss.[14]

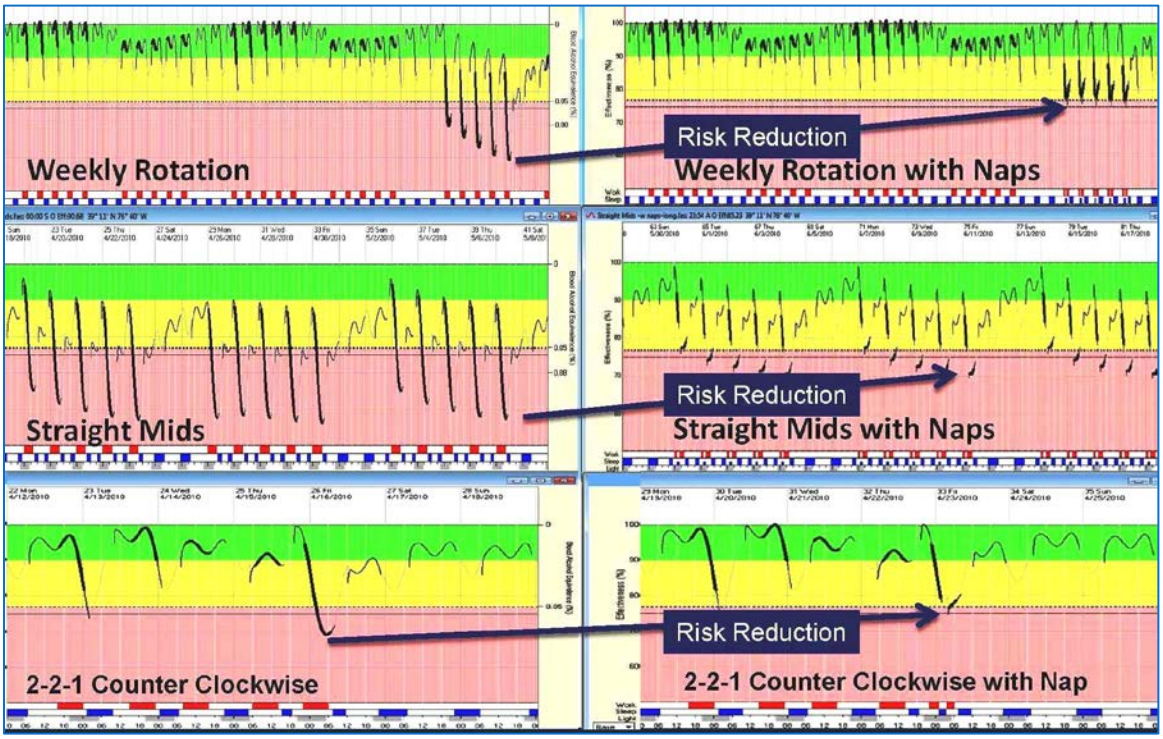
In 2000, CAMI participated in a collaborative effort with the U.S. Army Aeromedical Research Laboratory to study the effectiveness of 1- or 2-hour naps during a midnight shift at maintaining performance and alertness, as a potential countermeasure to sleepiness during the shift.[15] According to CAMI officials, the purpose of the investigation was to examine the patterns of performance degradation, along with observing the subjective measures of mood, sleep quality, and sleepiness, as a function of napping and time on task during the midnight shift. The study concluded that both a 2-hour nap and a shorter 45-minute nap significantly limited performance degradation during the midnight shift. In fact, the longer nap resulted in more consistent findings, indicating that naps are effective countermeasures to performance loss and sleepiness on the midnight shift.

More recently, officials in FAA's FRM Program reiterated that research reveals that there are no optimum shifts that will totally eliminate fatigue. However, additional actions, such as napping during the midnight shift, can be taken in conjunction with the implementation of the new scheduling policies to mitigate fatigue risk. Figure 5, which is based on work accomplished by FAA's Article 55 FRM Work Group, illustrates the effect of naps taken during the midnight shift for three of the more common controller schedules (weekly straight rotation with one week of midnight shifts every 5 weeks, straight midnight shifts, and the 2-2-1 counter-clockwise rotation).

[14] "Shiftwork and Air Traffic Control: Transitioning Research Results to the Workforce," *Human Factors Impacts in Air Traffic Management,* ed. Barry Kirwan, Mark D. Rodgers and Dirk Schaefer (Aldershot etc.: Ashgate, 2005), pp. 243-78. Pamela S. Della Rocco and Thomas E. Nesthus, p. 3.

[15] *The Effects of Napping on Night Shift Performance* (DOT/FAA/AM-00/10), Della Rocco, P.S., et al. (2000). Washington, DC: Federal Aviation Administration, Office of Aviation Medicine.

Figure 5. Fatigue Risk Is Mitigated by Napping in Three Examples of Air Traffic Controller Schedules



Source: FAA's *Article 55 Fatigue Risk Management Work Group Recommendations*, slide 12.

In figure 5, the left column depicts the three work schedules that were used in the comparison. The right half of the chart demonstrates how napping significantly reduced the impact of fatigue on controller performance in the case of all three schedule types.

FAA Policies on Recuperative Breaks Lack Clarification

According to the new controller scheduling policies,[16] employees should take breaks during the midnight shift to avoid becoming overly fatigued. During these breaks, controllers may leave their work areas and are encouraged to "apply fatigue mitigation techniques." However, these techniques are not explicitly defined in the new scheduling policies. While some facility managers told us that sleeping during recuperative breaks was explicitly allowed, other facility managers were less certain about what activities were or were not allowed. Overall, facility managers told us that they were not interested in what controllers did when they were on their break time, only that they were "fit for duty" when recalled to control air traffic.

FAA's written guidance does not explicitly state whether or not controllers may sleep during their recuperative breaks on the overnight shift. To illustrate, FAA's

[16] FAA Memorandum: Subject: Short-Term Guidance for the Interim Procedures, April 17, 2011.

current facility operation policy states, "Personnel performing watch supervision duties must not condone or permit individuals to sleep *during any period duties are assigned.*"[17] This is a change from the preceding order[18] which stated, "Personnel performing watch supervision duties shall not condone or permit individuals to sleep *while on duty*." However, FAA has not provided clarification regarding the difference between being "on duty" versus "in a period when duties are assigned." As a result, facility managers are left to interpret the guidance on their own.

Facility managers that we interviewed were generally supportive of the idea that controllers be allowed to sleep on recuperative breaks, since they considered breaks as time when "*duties are not assigned.*" However, they were concerned about the lack of explicit guidance regarding what activities are allowed during these breaks. Specifically, they expressed concern regarding the ability to recall employees on their breaks and the legality of allowing employees to sleep while on duty.

FAA's New Rest Requirement Lacks Metrics and May Not Reduce Fatigue

Some facility managers expressed reservations with the new requirement that controllers have at least 9 hours of off-duty time prior to a day shift. While most of the managers admitted that they had sufficient staffing levels to fill out the watch schedule, some expressed concern that the new rule might not reduce fatigue. For example, we were told that even when schedules were rearranged to accommodate the 9-hour requirement, controllers reported to work early in order to avoid long commute times in urban areas and were forced to wait until they had at least 9 hours of off-duty time to start working, even if they were already at the facility.

Despite these concerns, we could not determine the extent to which these new policies impact fatigue because FAA does not have metrics to directly measure the effect of its scheduling practices. Additionally, according to officials in FAA's FRM Group, because FAA does not measure a direct correlation between operational events and fatigue, it is difficult to quantify the effect of current efforts and new policy changes on aviation safety. Ultimately, because the new controller scheduling policies were implemented a little more than 2 years ago and because fatigue research is ongoing, it is uncertain to what extent FAA's scheduling policies actually reduce fatigue, improve controller performance, and enhance aviation safety.

[17] FAA Order JO 7210.3X, February 9, 2012.
[18] FAA Order JO 7210.3W, February 11, 2010.

THE COSTS OF FAA'S NEW CONTROLLER SCHEDULING POLICIES COULD BE OFFSET BY SAVINGS MEASURES

During this review, we found that FAA's new policies requiring a second overnight controller at 30 facilities[19] cost the Agency approximately $1.9 million per year.[20] Although not a significant increase relative to FAA's annual budget for operations, these costs could be offset by additional cost-saving measures. According to FAA, reducing service during the midnight shift at facilities where a second controller was added has the potential to save the Agency as much as $11 million per year. Additionally, FAA identified 72 terminal facilities that do not meet the minimum requirements for 24-hour operations and are candidates for reduced operating hours during a part of or the entire midnight shift.

Scheduling Policy Changes Increased FAA's Operating Costs

According to FAA's Office of Financial Services, increasing the midnight shift staffing at 30 facilities from one controller to two increased operational costs, though not significantly. FAA's Office of Financial Services estimated that adding a second controller on the midnight shift would cost the Agency approximately $1.9 million per year. In fiscal year 2012, $1.9 million represented only a 0.02 percent cost increase in FAA's Operations budget of $9.653 billion. These costs were primarily due to extending the work hours for the existing controllers. While FAA could not easily isolate facility-specific changes, such as increases in traffic that could require additional staffing on a given shift, the increased midnight shift staffing was primarily accomplished by the existing workforces at the 30 facilities, rather than by wholesale staffing increases.

Conversely, increasing the rest requirement from 8 hours to 9 hours had almost no impact on FAA's operating costs. According to FAA officials, although the 1-hour increase in required rest time created schedule changes by moving day shift start times, most facilities were able to adequately manage local traffic volumes without a measurable increase in staffing. Moreover, although the cost impact to non-coverage activities, such as providing spot leave, was not specifically analyzed, FAA concluded that these costs have also been negligible.

FAA's Efforts To Improve the Efficiency of Local Controller Scheduling Could Potentially Reduce Operating Costs

Maximizing the efficiency of its controller scheduling provides one opportunity to reduce FAA's operating costs. To improve its scheduling practices, FAA is preparing to implement the Operational Planning and Scheduling (OPAS) software tool to improve and standardize how controller work schedules are developed. The intent of OPAS is to provide FAA with the ability to create and

[19] See exhibit C.
[20] According to data provided by FAA's Office of Financial Services.

maintain optimized schedules based on traffic, local staffing, and FAA scheduling requirements. OPAS will develop work schedules by taking the demand (i.e., the number of positions needed per shift) and allocating controllers to cover the demand more efficiently. This may allow the Agency to reduce the number of controllers needed at individual facilities.

Because OPAS uses multiple factors such as historical staffing data, employee qualifications, training needs, workgroup participation, and special events to determine how many controllers are needed to work a given shift, the system should allow facilities to schedule controllers more efficiently. For example, OPAS will be able to demonstrate how different schedule types (8-hour versus 10-hour shifts) affect time on position, overtime, and overall controller availability. OPAS will also support management decisions concerning what shift structures they choose to discuss in their negotiations with NATCA. FAA plans to implement OPAS at 15 FAA facilities by the end of fiscal year 2013, and achieve nationwide implementation in the fiscal year 2016–2017 timeframe.

Overnight Operations at Some Small Facilities May Not Be Necessary and a Reduction in the Hours of Operation Could Result in Cost Savings

According to FAA, the Agency furthered opportunities to reduce costs by identifying facilities that do not have sufficient air traffic activity to warrant services during a portion of the midnight shift.[21] For example, FAA's Office of Financial Services determined that in fiscal year 2012, 27 of the 30 facilities where a second controller was added to the midnight shift in early 2011, plus Fairbanks Tower in Alaska, averaged only 1.82 operations per hour between midnight and 6:00 a.m., far short of the minimum traffic criteria for 24-hour operations. By reducing the hours of operation at these facilities, FAA estimated that taxpayers could be saved up to $11 million per year. However, according to FAA, at least two of these facilities are important for operational safety or national security, and are therefore likely to remain open on the midnight shift regardless of traffic levels.

FAA also identified 72 terminal facilities[22] that do not meet the minimum traffic criteria required to justify 24-hour operations. This list includes 20 of the 30 facilities that had a second controller added to the midnight shift in April 2011. To date, FAA has not analyzed the preliminary list of all 72 facilities to estimate the potential cost savings. The total savings will depend on the number and type of facilities that have their operations time reduced, as well as for what duration.

[21] According to FAA Order JO 7232.5G, Changing Operating Hours For Terminal Facilities, June 13, 2008, a facility is a candidate for reduced operating hours when its average hourly operations are 4 or fewer over a representative 90-day period. If the facility is operating 24 hours daily and a reduction is proposed, the average of 4 or fewer operations an hour should be for 5 or more consecutive hours over the 90-day representative period.

[22] Terminal facilities include air traffic control towers and TRACONs (terminal radar approach control facilities).

Additionally, reducing the hours of operation for selected air traffic control towers does not mean that the airports will be closed to all operations. Though the air traffic control towers will not be actively controlling takeoffs and landings and other flight operations in the immediate vicinity of the airfield, flights to and from the airport can continue using "uncontrolled field" operating procedures that are well documented in the Federal Aviation Regulations[23] and Aeronautical Information Manual.[24]

COMPLIANCE WITH FAA'S NEW SCHEDULING POLICIES CAN BE IMPROVED

FAA has not ensured full compliance with its new scheduling policies, particularly its minimum rest requirements. Both FAA's internal reviews as well as our review found violations of the new 9-hour controller rest requirement between the end of evening shifts and the beginning of the following day shifts. While FAA's increased attention and workforce outreach resulted in a steady decline in violations, additional measures are needed to ensure full compliance with these policies.

Controller Schedules Do Not Always Meet Minimum Rest Requirements

Some controllers continue to work schedules that do not meet FAA's new requirements for the minimum amount of rest required between shifts. Originally, FAA conducted a self-initiated audit of controller work shifts nationwide between January 1, 2012, and May 20, 2012, and found 8,973 violations of the new 9-hour rest requirement between evening shifts and the following day shifts during that timeframe. However, the audit did not account for shifts when controllers did not work on operational duty following the end of preceding evening shifts, such as participating in workgroups, taking part in training, or going on annual leave.

While we found some violations of the 8- and 9-hour required rest policies during our review, most (more than 73 percent) of them were less than 15 minutes in length. We also found two incidents involving the same controller who worked more than 6 consecutive days. However, we found no violations of the 12-hour rest requirement after the end of a midnight shift or of controllers working more than 10 consecutive operational hours.

[23] Code of Federal Regulations, Title 14, Part 91.
[24] Aeronautical Information Manual (published by FAA) is nonregulatory and contains the fundamental procedures required in order to fly in the United States NAS.

During this audit, we reviewed a statistical sample of 32,814 shifts out of an estimated 599,749 for 403 CPCs at 20 facilities over a 16 week period.[25] Table 2 shows the results of our statistical analysis of required rest policy compliance.

Table 2. Results of OIG Statistical Analysis of 8-Hour and 9-Hour Required Rest Policy Violations

Sample Results and Shift Incident Projections	9 Hour Incidents	8 Hour Incidents
Shifts With Incidents Found In Sample	279	102
Projected Shifts with Incidents in Universe for all 7,500 CPCs	4,235[26]	1,296[27]
Projected Shifts With Incidents in Universe % of Estimated Shifts in Universe	0.7%	0.2%

Source: OIG analysis.

We found that 279 shifts had 9-hour violations. Based on our analysis, we project that the 7,500 CPCs in our universe had 4,235 shifts with 9-hour violations, which is 0.7 percent of an estimated 599,749 shifts in our universe. As for 8-hour violations, we found 102 shifts that had 8-hour incidents. Based on our findings, we project that the 7,500 CPCs in our universe had 1,296 shifts with 8-hour incidents, which is 0.2 percent of an estimated 599,749 shifts in our universe.

According to FAA facility managers and union representatives, some of the common causes of violations included flexing eligible shifts earlier or later, shift swaps, or controllers forgetting when they signed out of their evening shift.

FAA Reduced the Number of Scheduling Violations, But Additional Measures Would Promote Greater Policy Compliance

To its credit, FAA is taking actions to increase compliance with its scheduling policies. For example, FAA conducts recurring audits to track instances where controllers work with less than 9 hours between evening and day shifts. These audits review data obtained through the Agency labor distribution system known as CRU-ART.[28] However, CRU-ART cannot identify the cause or circumstances surrounding the potential violations. Consequently, each incident must be manually reviewed for validity at the local facility level. Finally, CRU-ART can also register "false" violations of the required rest policies when a midnight shift crosses from the end of one pay period to the beginning of the next, because

[25] Pay periods 9 through 16, which cover April 8, 2012 through July 28, 2012.
[26] This estimate has a precision of +/- 24 at the 90% confidence level.
[27] This estimate has a precision of +/- 13 at the 90% confidence level.
[28] CRU-X/ART is ATO's time recording system for all employees. The ATO Resource Tool ("CRU-ART") is used by air traffic facilities for recording the time used by bargaining unit employees (i.e., air traffic controllers).

controllers are required to sign out at the end of a pay period, then sign back in for the new pay period.

FAA has also increased controller workforce awareness of the required rest policy changes. In June 2012, FAA and NATCA jointly issued a memorandum reminding facility managers and controllers of the shared responsibility to ensure required rest compliance. However, we found that there is still some confusion at the facility level regarding what qualifies as a violation. Nonetheless, FAA's internal audits show a steady reduction in 9-hour violations, although they have not audited potential violations of the required 8-hour rest period between all shifts. Similarly, our own scheduling analysis found that both 9- and 8-hour violations have declined significantly (69 percent and 75 percent respectively) throughout our sample period from pay period 9 to pay period 16 of fiscal year 2012.

FAA also recently implemented a new feature in CRU-ART's timekeeping software that will alert users of potential 9-hour violations. An electronic flag is activated when controllers or supervisors attempt to sign-in on duty with less than the required 9 hours of rest since the end of the last evening shift. Facility managers we interviewed stated that the CRU-ART flag is an effective method for mitigating required rest violations. However, the flag is informational only and can be overridden by the persons reporting for duty, which may facilitate continued violations.

CONCLUSION

Air traffic controllers are an important component to the safe operation of our nation's air traffic system. Ensuring a well rested, alert controller workforce is essential to the safe and efficient operation of the NAS. Therefore, it is critical that FAA establish proper staffing levels and effectively oversee the new scheduling policies at each air traffic control facility in order to reduce the impact of controller fatigue. FAA's recent policy changes are positive steps to improve safety and mitigate the risks of controller fatigue. However, FAA can take further action to improve the cost effectiveness of its controller scheduling, clarify its policies, and enhance compliance with these policies. In addition, FAA can use research and science to guide further revisions to its scheduling policies and procedures.

RECOMMENDATIONS

To supplement the work FAA has accomplished to date regarding air traffic controller scheduling policies, we recommend that FAA:

1. Identify the terminal air traffic facilities that do not meet the established minimum criteria for midnight shift operations, and (a) evaluate the safety risks

and benefits of reducing their hours of operation, and (b) develop milestones for implementation of the reduction of operating hours at the selected facilities and report the status and justification for each selected facility to the OIG in 180 days.

2. Update the CRU-ART automated "flag" to require supervisory approval for controllers to sign on duty before the required time off has expired.

3. Expand the required rest audits of 9-hour rest requirement violations to include the 8-hour rest requirements, and continue the audits until the automated "flag" has been implemented nationwide.

4. Develop guidance for air traffic facility managers and workforce that specifically defines the criteria for compliance with rest policies, including an emphasis that the rest requirements only apply between operational shifts, and policies governing "recuperative breaks" during the midnight shift.

AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

We provided FAA with our draft report on June 13, 2013, and received its formal response on August 7, 2013. FAA's response is included in its entirety as an appendix to this report. In its response, FAA fully concurred with all four of our recommendations. For recommendations 1, 2, and 3, FAA provided reasonable timeframes for completing the appropriate planned actions, and we consider these recommendations resolved pending completion of the planned actions.

For recommendation 4, FAA concurred and stated that guidance relating to required rest periods can be found in FAA Order 7210.3, and that guidance has also been provided to all facilities through joint memoranda and labor agreements with the controllers union. However, the policies and documents cited by FAA are the same ones that we address in this report. As we reported, these policies and documents lack clarity, especially regarding how controllers may use their recuperative breaks on the midnight shift. Therefore, we request that FAA provide us with written policy that addresses what specifically is permissible during recuperative breaks taken by controllers.

ACTIONS REQUIRED

FAA's planned actions for recommendations 1, 2, and 3 are responsive and we consider these recommendations resolved but open pending completion of the planned actions. We are requesting additional information for recommendation 4, as detailed above. In accordance with DOT Order 8000.1C, please provide this information within 30 days of issuance of this report.

We appreciate the courtesies and cooperation of FAA and NATCA representatives during this audit. If you have any questions concerning this report, please contact me at (202) 366-0500 or Bob Romich, Program Director, at (202) 366-6478.

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cc: DOT Audit Liaison, M-1
FAA Audit Liaison, AAE-001

EXHIBIT A. SCOPE AND METHODOLOGY

We conducted this audit in accordance with generally accepted Government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

The audit was conducted between June 2012 and June 2013, and included site visits to FAA Headquarters, 17 Terminal Services facilities (ATCTs and TRACONs), and 5 Air Route Traffic Control Centers. In addition, we interviewed officials in FAA's Fatigue Risk Management Group, officials from CAMI's Aerospace Human Factors Research Division, and communicated via email with officials from FAA's Office of Financial Services. A full list of the 22 air traffic control facilities and additional organizations that we visited or contacted during this audit can be found in exhibit B. Twenty facilities were selected as a part of a statistical sample to evaluate controller compliance with FAA's new scheduling policies. The remaining two terminal facilities, Youngstown Airport Air Traffic Control Tower (ATCT) and Akron-Canton Airport ATCT/TRACON, were originally a part of the list of 30 facilities that had their midnight shift staffing increased from one to two controllers after the incidents involving sleeping controllers occurred in March and April 2011.

To determine the impact that controller scheduling practices have on air traffic controller performance and on aviation safety, we reviewed previous audits and investigations about controller scheduling practices conducted by the OIG, the Government Accountability Office, and NTSB. We interviewed officials from FAA's Fatigue Risk Management Group and CAMI's Aerospace Human Factors Research Division, as well as reviewed scientific reports about research conducted on fatigue risk, and evaluations of the various controller shift rotations currently in use. Lastly, we interviewed management and NATCA officials (when available) at the 22 air traffic control facilities visited during this audit concerning the local impact of the new scheduling policies, as well as the effect of these policies on aviation safety.

To evaluate the cost effectiveness of controller scheduling practices, we contacted officials at FAA's Office of Financial Services and requested a financial analysis of FAA's policy increasing the midnight shift staffing at 30 terminal facilities from one controller to two. We also acquired an analysis of the financial impact of increasing the required rest period between the end of an evening shift and the beginning of the following day shift. We also interviewed management officials concerning overtime trends resulting from implementation of the new controller scheduling policies.

To assess air traffic control facility compliance with FAA's scheduling policies, we designed a statistical 4-stage stratified probability proportional to size sample. For Stage 1 we grouped 96 ATC facilities into 23 geographical locales where a given locale was comprised of facilities within 50 miles of a Center. We selected 5 out of 23 geographical locales with the probability proportional to the number of CPCs in the locale. There were 25 facilities in the 5 selected locales. For Stage 2 we stratified by the 5 locales and selected a total of 20 out of 25 facilities with probability proportional to the number of CPCs in a facility. There were 2,184 CPCs in the 20 selected facilities. For Stage 3 we stratified by the 20 facilities and selected a simple random sample of a total of 403 CPCs out of 2,184. For Stage 4 we reviewed a total of 32,814 shifts which were all the shifts for the 403 CPCs in our sample between pay period 9 and pay period 16 of fiscal year 2012. We also interviewed officials from the ATO offices of Terminal and En Route and Oceanic Services, as well as managers and NATCA representatives at local facilities concerning facility policy compliance trends and compliance strategies.

EXHIBIT B. ORGANIZATIONS VISITED OR CONTACTED

FAA Organizations

- Air Traffic Organization (ATO)
- Office of Financial Services
- Fatigue Risk Management Group
- FAA's Civil Aerospace Medical Institute, Aerospace Human Factors Research Division

Air Traffic Control Facilities

- Washington ARTCC
- Potomac TRACON
- Dulles International Airport ATCT
- Ronald Reagan Washington National Airport ATCT
- Rocky Mountain Airport ATCT
- Denver International Airport ATCT
- Denver ARTCC
- Denver TRACON
- Cleveland Hopkins International Airport ATCT/TRACON
- Cleveland ARTCC
- Youngstown Airport ATCT/TRACON
- Akron-Canton Airport ATCT/TRACON
- Chicago O'Hare International Airport ATCT
- Chicago Midway International Airport ATCT
- Chicago TRACON
- Chicago ARTCC
- Palwaukee Airport ATCT
- New York ARTCC
- New York TRACON
- Westchester County Airport ATCT
- Republic Airport ATCT
- LaGuardia Airport ATCT

Other Organizations

- National Air Traffic Controllers Association

EXHIBIT C. FACILITIES BY SERVICE AREA WITH SINGLE STAFFED MIDNIGHT SHIFT BEFORE APRIL 2011 (30 TOTAL)

11 in Central Service Area (CSA):

- Akron-Canton, OH Tower (CAK)
- Duluth, MN Tower (DLH)
- DuPage, IL Tower (DPA)
- Fargo, ND Tower (FAR)
- Fort Worth Meacham, TX Tower (FTW)
- Kansas City Downtown, MO Tower (MKC)
- Omaha, NE Tower (OMA)
- Terre Haute, IN Tower (HUF)
- Willow Run, MI Tower (YIP)
- Youngstown, OH (YNG)
- Omaha TRACON (R90)

11 in Eastern Service Area (ESA):

- Allegheny, PA Tower (AGC)
- Andrews, MD Tower (ADW)
- Fort Lauderdale, FL Tower (FLL)
- Fort Lauderdale Executive, FL Tower (FXE)
- Manchester, NH Tower (MHT)
- Richmond, VA Tower (RIC)
- San Juan, Puerto Rico Tower (SJU)
- Teterboro, NJ Tower (TEB)
- Windsor Locks, CT (BDL)
- Pensacola TRACON (P31)
- Washington National (DCA) (Known Instance of Sleeping Controller)

8 in Western Service Area (WSA):

- Burbank, CA Tower (BUR)
- Grant County, WA Tower (MWH)
- Ontario, CA Tower (ONT)
- Reno, NV Tower (RNO) (Known Instance of Sleeping Controller)
- Sacramento, CA Tower (SMF)
- San Diego, CA Tower (SAN)
- Tucson, AZ Tower (TUS)
- High Desert TRACON (EIO)

EXHIBIT D. FATIGUE RISK MANAGEMENT WORK GROUP CONTRIBUTORS

Article 55[29] Core Membership:

- FAA Officials
- NATCA Officials

FAA Support Groups:

- Office of Aerospace Medicine
- ATO Human Factors Research and Engineering Group
- ATO Office of Safety
- ATO Office of Technical Training
- CAMI
- Flight Standards
- SUPCOM

Expert Support:

- NASA
- Air Force Research Laboratory
- Fusion Sleep
- Institutes for Behavior Resources
- Virtual Flight Surgeons
- MITRE
- DB&A
- CSSI
- SENTEL

[29] FAA / NATCA 2009 Collective Bargaining Agreement, Article 55: *Human Factors*.

EXHIBIT E. MAJOR CONTRIBUTORS TO THIS REPORT

Name	Title
Robert Romich	Program Director
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Federal Aviation Administration

Memorandum

Date: August 7, 2013

To: Jeffrey B. Guzzetti, Assistant Inspector General for Aviation and Special Program Audits

From: H. Clayton Foushee, Director, Office of Audit and Evaluation, AAE-1

Subject: Federal Aviation Administration's (FAA) Response to the Office of Inspector General (OIG) Draft Report: FAA's Air Traffic Controller Scheduling Policies

In recent years, the FAA has re-focused its efforts on ensuring that controllers are receiving the proper amount of off-duty time between shifts. Automated reports are now produced that allow managers to monitor the time between shifts, and software was implemented that alerts controllers when they are attempting to sign-in prior to the proper rest period. These changes have dramatically reduced the number of instances where controllers reported to work without an adequate off-duty period.

FAA senior management continues to monitor facility compliance with policy-mandated rest periods on a monthly basis to ensure compliance at all facilities. The FAA will implement additional steps, as needed, to ensure proper rest periods and adherence to established policies. Additionally, the FAA and the National Air Traffic Controllers Association (NATCA) continue to cooperate in on-going fatigue discussions, as well as research which may identify future corrective actions that should be implemented.

RECOMMENDATIONS AND RESPONSES

Recommendation 1: Identify the terminal air traffic facilities that do not meet the established minimum criteria for midnight shift operations, and (a) evaluate the safety risks and benefits of reducing their hours of operation, and (b) develop milestones for implementation of the reduction of operating hours at the selected facilities and report the status and justification for each selected facility to the OIG in 180 days.

FAA Response: Concur. The FAA has conducted a detailed analysis of all the air traffic facilities operating 24 hours per day and has identified 72 facilities that do not meet the minimum criteria. These are continuously operating facilities that average less than 4 operations per hour for 4 or more consecutive hours. For these 72 facilities, the FAA has produced various staff studies, currently under review at FAA headquarters, outlining the potential opportunities and risks. The FAA continues to evaluate these studies, their risks and potential mitigation

strategies. A determination of any adjustments to operating hours for each of these facilities will occur by February 28, 2014.

Recommendation 2: Update the CRU-ART automated "flag" to require supervisory approval for controllers to sign on duty before the required time off has expired.

FAA Response: Concur. An alert in CRU-X/ART was established for all facilities in September 2012 to inform users if they are attempting to sign-in without the required time between shifts. A lock-out feature has not been included because it has the potential to interfere with NAS operations; however, as indicated in response to recommendation 3, FAA is working to further enhance CRU-X alerts. In the meantime, all employees will be reminded of their responsibility to adhere to FAA "alert" requirements. FAA requests that this recommendation be closed.

Recommendation 3: Expand the required rest audits of 9-hour rest requirement violations to include the 8-hour rest requirements, and continue the audits until the automated "flag" has been implemented nationwide.

FAA Response: Concur. The FAA is working with NATCA to identify additional alerts that should be added to CRU-X/ART as enhancements to current capabilities and address all the time-off between shift requirements. These changes are expected to be implemented by July 31, 2014. Reports have been created in Business Objects to allow Facility Managers/Supervisors to review violations by shift/person. These reports are reviewed nationally every four weeks to ensure proper attention is being paid to this issue. Trends over the last two years have indicated a significant reduction across all terminal and en-route facilities, and violations are now only occurring on an infrequent basis.

Recommendation 4: Develop guidance for air traffic facility managers and workforce that specifically defines the criteria for compliance with rest policies, including an emphasis that the rest requirements only apply between operational shifts, and policies governing "recuperative breaks" during the midnight shift.

FAA Response: Concur. Guidance regarding required rest periods has been provided to all facilities through joint memos with the union, in labor agreements, and codified in FAA Order 7210.3 (Para. 2-6-7), which can be found at: http://www.faa.gov/documentLibrary/media/Order/FAC.pdf. Additional reminders will be provided on an as-needed basis, such as memos from the En Route and Terminal Service Units. Having completed this action, FAA requests that this recommendation be closed.