

AIR TRAFFIC CONTROL: POTENTIAL FATIGUE FACTORS

Federal Aviation Administration

Report Number: AV-2009-065

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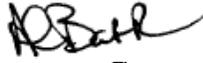
Memorandum

U.S. Department of
Transportation

Office of the Secretary
of Transportation
Office of Inspector General

Subject: **ACTION:** Report on Air Traffic Control:
Potential Fatigue Factors
Federal Aviation Administration
Report Number AV-2009-065

Date: June 29, 2009

From: Ann Calvaresi-Barr 
Principal Assistant Inspector General
for Auditing and Evaluation

Reply to
Attn. of: JA-1

To: Federal Aviation Administrator

This report presents the results of our audit of fatigue factors that could impact air traffic controllers. We conducted this review at three Chicago area air traffic control facilities: Chicago O'Hare International Airport Air Traffic Control Tower (Chicago O'Hare), Chicago Terminal Radar Approach Control Facility (Chicago TRACON), and Chicago Air Route Traffic Control Center (Chicago ARTCC). These 3 facilities are among the top 10 busiest air traffic control facilities in the United States. Nationwide, during 2007, Chicago O'Hare was the second busiest air traffic control tower with 927,000 airport operations, Chicago ARTCC the fourth busiest air route traffic control center with 2.8 million operations, and Chicago TRACON the sixth busiest TRACON with 1.4 million operations.

We conducted this audit at the request of Senator Richard Durbin of Illinois. Senator Durbin expressed specific concerns that staffing shortfalls, longer hours on the job, and a growing shortage of certified controllers may be causing controller fatigue at these critical facilities. He asked that we review factors that could potentially cause controller fatigue at these locations.

Consistent with Senator Durbin's request, our audit objectives were to (1) identify and evaluate key factors that could cause controller fatigue at Chicago O'Hare, Chicago TRACON, and Chicago ARTCC and (2) identify what measures FAA has taken to mitigate potential controller fatigue at these locations.

We conducted our audit between January 2008 and February 2009 in compliance with generally accepted government auditing standards. Exhibit A details our audit scope and methodology. Exhibit B lists locations visited or contacted.

BACKGROUND

Fatigue is defined as a mental weariness resulting from exertion. Fatigue can be mental or physical and can manifest as either somnolence (decreased wakefulness) or as a general decrease in attention. Fatigue can cause problems for individuals who perform tasks that require constant concentration, such as air traffic control. Additionally, the nature of air traffic control requires shift work, which can exacerbate fatigue because it often requires individuals to work at times when they would normally be sleeping or sleep at times when they would normally be awake.

Since the 1980s, the National Transportation Safety Board (NTSB) has been concerned about the effects of fatigue on individuals performing critical functions in all transportation industries, including air traffic control. The NTSB has made numerous fatigue-related safety recommendations addressing topics such as rest periods between shifts, scheduling practices, and fatigue awareness training for personnel working in the transportation industry. As part of its investigation into the August 2006 crash of Comair Flight 5191, the NTSB expressed concerns in April 2007 about the impact of fatigue on controllers working rotational shifts. In its investigative report, the NTSB noted that the lone controller on duty at the time of the accident had only 2 hours of sleep prior to his shift. Based on its Comair investigation, the NTSB made specific recommendations to FAA regarding fatigue for personnel performing air traffic control.

RESULTS IN BRIEF

We identified a number of factors at Chicago O'Hare, Chicago TRACON, and Chicago ARTCC that could create potential fatigue conditions for controllers. These factors include minimal hours between shifts and counter rotational shifts with progressively earlier start times; scheduled overtime; and on-the-job training (OJT), which requires a high level of concentration and focus. We conducted a series of statistical analyses using schedule information and time and attendance data and found that these factors are occurring at all three Chicago air traffic control facilities in varying degrees. For example, we found that most controllers at the three locations were scheduled to work at least one shift each week in which their rest period between shifts was less than 10 hours.

We also found that overtime hours at Chicago O'Hare and Chicago TRACON had increased significantly between fiscal year (FY) 2006 and FY 2007 (by 75 percent and 67 percent, respectively). However, the potential impact on fatigue was negligible because controllers did not always work all days of a scheduled 6-day (i.e., overtime) work week. For instance, at Chicago O'Hare, 18 of the 66 controllers in our sample were scheduled to work a 6-day work week during the 52-week period we reviewed, but only 8 controllers (less than 50 percent) actually worked all 6 days. This was because when scheduled for a 6-day work week,

controllers often took leave for shifts other than their scheduled overtime shift, thus working less than 6 days while still earning overtime pay.

Additionally, we found that certified controllers at all three facilities conducted OJT on a regular basis. The time spent conducting OJT in our samples ranged from 1 to 5 days per week, and officials at all three facilities cautioned that OJT is expected to increase significantly over the next several years as more trainees are added to the workforce.

While all three facilities have high traffic volumes and complex airspace, their staffing levels exceeded established staffing ranges for those locations. Those ranges do not, however, consider the ratio of trainees to certified controllers. The ratio of trainees to certified controllers at Chicago TRACON and Chicago O'Hare exceed FAA's national average of 27 percent (30 percent at Chicago TRACON and 40 percent at Chicago O'Hare).¹ In addition, we found that none of the three locations has established procedures for rotating controllers through more complex positions during scheduled shifts, even though the complexity of various facility positions can vary extensively.

Fatigue can have serious safety implications and has been identified by the NTSB as a potential contributing factor in several operational errors (where controllers fail to maintain required distances between aircraft). Yet, FAA does not consistently address human factors issues, such as fatigue and situational awareness, during either the preliminary or final operational error investigation process. For example, at Chicago ARTCC, final operational error reports indicated that a controller's work schedule was a "rotation," but there was no further information provided to determine the days or the shifts the controller actually worked.

FAA is taking several actions at the national level to address NTSB recommendations regarding fatigue. These actions include amending FAA Order 7210.3 to (1) increase the time available for rest (between shifts) from 8 hours to 10 hours, (2) increase the time available for rest after working a midnight shift on the fifth day of the week from 12 hours to 16 hours for facilities that utilize a 6-day work week, and (3) allow controllers to sleep or rest when not controlling traffic. FAA has also developed a 40-minute, computer-based instruction refresher training module on the effects of fatigue on controller performance. At the time of our review, however, none of these actions had been implemented at the three facilities.

Our report makes a number of recommendations to FAA on actions it needs to take to mitigate potential fatigue factors.

¹ As of December 2008.

FINDINGS

Controllers at All Three Facilities Were Scheduled To Work Shifts with Rest Periods of Less Than 10 Hours Between Each Shift

Based on our sample analysis, controllers at the three Chicago air traffic control facilities were scheduled to work at least one “quickturn”² between 66 and 86 percent of the time during the week. That is, controllers were scheduled to work at least one shift each week where the rest period between that shift and the next shift was less than 10 hours.³ At the three Chicago air traffic control facilities, controllers worked a type of schedule commonly referred to as a “2-2-1 rotation.” While the configuration of the 2-2-1 may vary, this particular scheduling practice usually consists of a work week with two consecutive evening shifts, followed by two consecutive day shifts, followed by one midnight shift, as shown in table 1.

Table 1. Example of a 2-2-1 Schedule

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

*Rest periods between shifts close to the 8-hour minimum required by FAA regulations.

As shown in table 2 below, we found that both Chicago O’Hare and Chicago ARTCC scheduled most controllers to have at least one quickturn during the week. We also found that controllers “traded into” quickturns by switching their assigned shift for another shift. Although controllers were scheduled to work quickturns or “traded into” quickturns, they did not always work those shifts because they either took leave or switched back to their originally scheduled shift.

² A “quickturn” is a schedule characterized by shifts with minimal rest periods between them.

³ FAA Order 7210.3 requires at least 8 hours between shifts for rest. For the purpose of our review, we considered a quickturn to be less than 10 hours between shifts because FAA is in the process of amending FAA Order 7210.3 to increase the time available for rest from 8 hours to 10 hours.

Table 2. Occurrence of Quickturns

Facility	Sample Size	Scheduled at Least One Quickturn	Quickturns Not Worked
Chicago O'Hare	66	57 (86%)	44%
Chicago TRACON	67	not applicable*	not applicable*
Chicago ARTCC	68	45 (66%)	27%

*Managers at the Chicago TRACON indicated that they too scheduled controllers to work the 2-2-1 schedule. However, we could not verify this information because the TRACON was unable to provide schedule data for all the weeks in our sample.

This type of work schedule offers minimal opportunity for sleep when the time required for commuting, eating, and other necessary daily activities is taken into account. The NTSB has expressed concern regarding this type of work schedule because it limits the amount of time for rest between shifts. However, it is ultimately the responsibility of each controller to ensure that he or she gets a sufficient amount of rest between shifts. Controllers we spoke with told us they generally like this schedule because it only requires them to work one midnight shift per week and allows more consecutive time off during the week (i.e., the equivalent of a 3-day weekend).

Controllers at All Three Facilities Worked Schedules That Required Overtime

All three Chicago air traffic control facilities needed and used overtime to meet their operational needs. Scheduled overtime occurs when controllers are scheduled, in advance, to work 6 days instead of 5 days during 1 week. However, the methods for assigning overtime varied from facility to facility. For example, Chicago TRACON and Chicago O'Hare used scheduled overtime (i.e., scheduled 6-day work weeks) to meet operational needs. In contrast, Chicago ARTCC primarily used call-up overtime (i.e., controllers are called in to work on a scheduled day off as needed).

Our results indicate that even though overtime hours have increased significantly at two of the three facilities,⁴ the potential impact on fatigue was negligible because controllers did not always work all days of a scheduled, 6-day work week (see table 3 below). For instance, at Chicago O'Hare, 18 of the 66 controllers in our sample were scheduled to work a 6-day work week during the 52-week period we reviewed, but only 8 controllers (less than 50 percent) actually worked all

⁴ Overtime hours at Chicago O'Hare increased by 75 percent from FY 2006 to FY 2007, while overtime hours at Chicago TRACON increased by 67 percent.

6 days. This was because when scheduled for a 6-day work week, controllers often took leave for shifts other than their scheduled overtime shift, thus working less than 6 days but still earning overtime pay. Nonetheless, when controllers actually work 6 days, the potential for fatigue can increase.

Table 3. Occurrence of Overtime at Chicago Area Air Traffic Control Facilities

Facility	Sample Size	Scheduled To Work a 6-day Week	Worked All 6 Days
Chicago O'Hare	66	18 (27%)	8 of 18 (44%)
Chicago TRACON	67	16 (24%)	12 of 16 (75%)
Chicago ARTCC	68	0 (0%)	not applicable

Controllers at All Three Facilities Conducted On-the-Job Training

We found that Certified Professional Controllers (CPCs) at all three facilities conducted OJT on a consistent basis. Facility training for new hires consists of several phases, the last of which is OJT. During OJT, a CPC oversees and instructs a trainee as they work a control position handling real-time air traffic. Officials at all three facilities agreed that conducting OJT can be fatiguing for the OJT instructor because it requires a high level of concentration and attention to monitor a trainee's actions and quickly correct potential errors, as the instructor is ultimately responsible for maintaining minimum separation between aircraft.

As shown in table 4 on the next page, the time CPCs spent conducting OJT in our samples ranged from 1 to 5 days per week during the 52-week period we reviewed. Specifically,

- at Chicago O'Hare, controllers in our sample conducted OJT at least 1 day during the week as much as 58 percent of the time.
- at Chicago TRACON, controllers in our sample conducted OJT at least 1 day during the week as much as 39 percent of the time.
- at Chicago ARTCC, controllers in our sample conducted OJT at least 1 day during the week as much as 43 percent of the time.

Table 4. Occurrence of OJT

Facility	Sample Size	OJT Conducted During at Least One Shift	Average OJT Conducted During the Work Week
Chicago O'Hare	66	38 (58%)	1 hour and 42 minutes
Chicago TRACON	67	26 (39%)	2 hours and 1 minute
Chicago ARTCC	68	29 (43%)	2 hours and 57 minutes

While the way FAA trains controllers has not significantly changed over the years, FAA expects to hire and train approximately 15,000 new controllers through 2018. As FAA hires more new controllers to compensate for the ongoing surge in attrition, the need for more OJT will increase and the potential for CPCs to experience fatigue from conducting OJT may increase as well. The number of controllers in training, the number of OJT instructors, and the time spent conducting OJT by location will all be significant watch items for FAA as it implements plans to hire and train the next generation of air traffic controllers.

Other Factors Can Also Create Fatigue Conditions for Controllers

Facility personnel also identified several other factors that could cause fatigue. These include inadequate staffing levels, increased work load (i.e., traffic volume and complexity), and extended time on position or lack of position rotation. However, these factors could not be easily measured or statistically validated. Therefore, we relied on evidence obtained from discussions with facility personnel and macro-level data provided by FAA to determine the extent to which these factors were occurring and to gauge the impact they could potentially have on controller fatigue.

Staffing Levels

As shown in table 5 below, as of December 2008, overall staffing levels at each of the three facilities exceeded established staffing ranges. Specifically, Chicago O'Hare had 5 more controllers than the authorized staffing range, Chicago TRACON had 3 more controllers, and Chicago ARTCC had 51 more controllers. Those ranges do not, however, consider the ratio of trainees to certified controllers.

Controllers in training now represent nearly 27 percent of the workforce nationwide (up from 15 percent in 2004). However, that percentage can vary

extensively by location—from as little as 0 percent (e.g., Pittsburgh air traffic control tower) to as much as 45 percent (e.g., Orlando International air traffic control tower). The ratio of trainees to total controller staff for all three Chicago air traffic control facilities ranged from 20 percent to 40 percent. In our view, including this information in reported staffing levels for FAA’s facilities is important as it could have a direct bearing on CPC fatigue and on-the-job training.

Table 5. December 2008 Staffing Levels

Facility	Authorized Staffing Range	Total on Board (CPCs + Trainees)	CPCs	Trainees	Percent in (Training/Total on Board)	Number of Facilities with Higher Percent in Training
Chicago O’Hare	56-68	73	44	29	40%	46 out of 314 (15%)
Chicago TRACON	82-100	103	72	31	30%	126 out of 314 (40%)
Chicago ARTCC	312-382	433	348	85	20%	224 out of 314 (71%)

FAA is now verifying (through a hired contractor) whether facility staffing ranges accurately reflect facility needs. FAA’s contractor has completed this process at Chicago O’Hare and Chicago ARTCC; however at the time of our review, the staffing ranges at Chicago TRACON had not been validated for accuracy.

Traffic Volume and Complexity

Facility personnel at all three locations told us that Chicago’s adverse weather conditions such as heavy snowfalls increase the complexity of its high-volume traffic, which could contribute to controller fatigue. Additionally, ongoing changes due to the O’Hare Modernization Project (OMP)⁵—such as added operational positions due to a new runway configuration and increased capacity—may increase operational intensity.

In anticipation of the added operational requirements due to the OMP, Chicago O’Hare has requested an additional 10 controllers. Once the OMP is fully implemented, FAA should reevaluate the staffing standard to ensure that the new range is appropriate.

⁵ The OMP is a plan to increase the efficiency and capacity of the airport by adding a new runway, extending two existing runways, and relocating three other runways.

Position Rotation

Time on position is the average amount of time a controller spends controlling traffic out of an 8-hour shift. The contract between FAA and the National Air Traffic Controllers Association (NATCA) states that it is a mutual goal that controllers should only work an operational position for 2 hours at a time before they are relieved. During an 8-hour shift, controllers may work several different positions but for no more than 2-hour increments. During the balance of their shifts, controllers generally are either taking breaks, conducting non-operational duties, attending briefings, or receiving recurrent training.

All three Chicago air traffic control facilities had an average time on position of approximately 4 to 4.5 hours per shift. While the length of time on position is important, not every control position can be equally compared. For example, controllers at Chicago O'Hare responsible for runway oversight often have to issue instructions to multiple aircraft, which requires a great deal of concentration and focus. In contrast, there are other air traffic control positions that are less complex, such as clearance delivery, which require no communication with moving aircraft. If controllers work demanding positions several times during an 8-hour shift, the potential for fatigue increases. We found that none of the Chicago facilities had written guidance in place to suggest how often or when controllers should rotate through more difficult positions.

FAA Does Not Consistently Include Human Factors Issues When Investigating Operational Errors

Fatigue can have serious safety implications and has been identified by the NTSB as a potential contributing factor in several operational errors. Yet, FAA's process for investigating operational errors does not require specific data regarding all the fatigue factors that we identified. An operational error occurs when an air traffic controller does not ensure that FAA separation standards are maintained between aircraft. FAA categorizes operational errors as categories A through D based on the severity level of the operational error, with category A and category B being the most severe forms of operational errors.

When an operational error occurs, an immediate investigation is conducted consisting of two phases.

- The first phase results in a preliminary operational error report. This fact finding investigation is conducted by the facility within 4 hours of the occurrence of the operational error.
- The second phase results in a final operational error report. The comprehensive final investigation identifies causal factors and recommends

corrective action. The facility has 30 days to complete the final phase of the investigation.

We examined the extent to which the six fatigue factors we identified (work schedule, overtime, OJT, staffing, traffic volume and complexity, and time on position) were addressed following an operational error. To determine this, we reviewed both the preliminary and final investigatory reports of all 41 category A and category B operational errors that occurred at the three facilities during FY 2007 and FY 2008 and interviewed quality assurance personnel from each of the facilities. We found that although the person investigating the operational error follows a checklist when conducting the investigation, that person is not limited to asking only the questions on the checklist. They may ask more detailed, probing questions to determine whether fatigue contributed to the operational error. There are, however, currently no required questions on human factors such as fatigue.

Of the six fatigue factors we identified, only information on two—traffic volume and complexity and time on position—was required on *both* the preliminary and final investigatory reports. Table 6 shows which fatigue factors are required for review as part of the preliminary operational error report and the final operational error report.

Table 6. Potential Fatigue Factors Requirements for Operational Error Reports

Potential Fatigue Factor	Preliminary Operational Error Report	Final Operational Error Report
<i>Work Schedule</i>	Not Required	Required
<i>Overtime</i>	Not Required	Not Required
<i>On-the-Job Training</i>	Not Required	Required
<i>Staffing</i>	Required	Not Required
<i>Traffic Volume and Complexity</i>	Required	Required
<i>Time on Position</i>	Required	Required

Because FAA does not require that the other factors be addressed on both reports, it does not accumulate data on human factors issues to determine if they contribute to operational errors, how often they occur, and if they present any systemic issues. FAA handles these remaining factors as follows:

Staffing Information: FAA requires staffing information (such as the number of controllers on duty, on position, and on break) at the time of the operational error on the preliminary investigative report but not the final report.

Work Schedule and OJT Information: Work schedule and OJT information is not required on the preliminary investigative report but is an element of the final

report. However, the work schedule information provided by the facility for the final report often does not provide enough information to identify the schedule actually worked by the controller for the entire week. For example, at Chicago ARTCC, the final report indicated that the controller’s work schedule was a “rotation” and identified the amount of time worked in the controller’s previous and current shifts prior to the operational error; however, there was no information to determine the days or the shifts the controller worked during the entire week. An example of an operational error investigative report is shown in the figure below.

Figure. Example of a Final Operational Error Report

Final Operational Error/Deviation Report		Report Number
		Z A U C 0 7 E 0 0 6
<p>20. Is a medical certification issue related to the incident?</p> <p><input type="checkbox"/> Yes</p> <p><input checked="" type="checkbox"/> No</p> <p>(If yes, explain in Block 65, Summary of Incident.)</p>	<p>21. Identify and describe the type of work schedule being worked at the time of the incident:</p> <p>ROTATION</p>	<p>22. Current and previous shift:</p> <p>Previous shift: Sign in 1400 Sign out 2200</p> <p>Current shift: Sign in 0550 Sign out 1350</p>

Although the final operational error report indicates whether OJT was in progress at the time of the operational error, it does not provide information on the length of time OJT was conducted during the shift. Our analysis found that 17 percent of the 41 operational errors occurred while the controller was conducting OJT.

Overtime Information: We found that overtime information was not documented on either the preliminary or the final operational error investigative report. In our opinion, if the controller worked overtime the previous day or worked more than 40 hours during the prior work week, this information should be identified in the final operational error report.

Although we found that the preliminary and final operational error reports did not always document the six fatigue factors we identified, we did find that some facilities tried to capture information on human factors during the investigation of operational errors. For example, Chicago O’Hare has developed and incorporated questions regarding human factors such as fatigue, work schedule, and overtime into the post-operational-error interview process. However, these efforts will remain inconsistent across facilities without FAA system-wide requirements.

FAA Has Convened National Workgroups To Address Fatigue Factors but Has Not Implemented Changes

The NTSB has made numerous fatigue-related safety recommendations addressing topics such as rest periods between shifts, scheduling practices, and fatigue awareness training. In terms of controller shift work and rest requirements, the NTSB specifically recommended in April 2007 that FAA take the following actions:

- “Work with the National Air Traffic Controllers Association 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.”
- “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. This training should be provided in a format that promotes retention, and recurrent training should be provided at regular intervals.”

While FAA took actions at the national level by forming a work group in 2007 to address these recommendations, most of these initiatives have not yet been implemented and therefore have not filtered down to the facility level. The work group recommended that FAA Order 7210.3 be amended to (1) increase the time available for rest (between shifts) from 8 hours to 10 hours, (2) increase the time available for rest after working a midnight shift on the fifth day of the week from 12 hours to 16 hours for facilities that utilize a 6-day work week, and (3) allow controllers to rest when not controlling traffic during their shift. FAA Labor Relations plans to send a letter to NATCA to inform it of the proposed changes to FAA Order 7210.3 and provide an opportunity for NATCA to comment on the proposed changes or request negotiations.

Although FAA has not finalized changes to its scheduling practices, it has made progress with fatigue training and awareness. Specifically, FAA (1) added a 1-hour lesson on the effects of fatigue to the air traffic initial qualifications training courses at the FAA Academy; (2) developed a 40-minute, computer-based instruction refresher training module on the effects of fatigue on controller performance (scheduled to be implemented later this year); (3) developed and distributed a brochure for controllers to help them better understand the effect of shift work on fatigue; and (4) held a fatigue symposium in June 2008.

CONCLUSION

A number of factors exist at Chicago O'Hare, Chicago TRACON, and Chicago ARTCC that could cause controller fatigue. While our review focused on only the three Chicago facilities, it is likely that the fatigue factors that we identified exist at other large air traffic control facilities throughout the Nation. Our recommendations focus on actions FAA needs to take at the national level to mitigate potential fatigue factors and enhance the level of safety of the National Airspace System.

RECOMMENDATIONS

We recommend that FAA:

1. Reevaluate the staffing ranges for Chicago O'Hare once the OMP is fully implemented to ensure that the range is appropriate and meets the new operational needs of the facility.
2. Approve the recommended changes to FAA Order 7210.3 and implement these changes at all air traffic control facilities. These changes include (a) increasing the minimum rest period between shifts from 8 to 10 hours, (b) increasing the time available for rest after working a midnight shift on the fifth day of a 6-day work week from 12 to 16 hours, and (c) allowing controllers to rest during their shift when not controlling traffic.
3. Provide mandatory refresher training to controllers annually to reinforce fatigue awareness and mitigation strategies. This training should include a comprehensive, multi-faceted approach to minimizing employee fatigue.
4. Expand operational error investigatory requirements to include more detailed information on fatigue factors, such as overtime, OJT, and work schedule that could create fatigue conditions to determine whether these factors are a contributory cause to operational errors, the frequency in which the factors are occurring, and whether or not the existence of the factors indicate a systemic problem. The reports should at a minimum include (a) whether the controller worked overtime during the previous day or worked more than 40 hours during the prior work week; (b) the length of time the controller conducted OJT, if applicable; and (c) the exact days and shifts worked by the controller during the week the operational error occurred.
5. Require all facilities to establish procedures to rotate controllers through challenging and less demanding positions during each shift to mitigate the potential for fatigue to occur.

AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

We provided FAA with our draft report on May 26, 2009, and received its response on June 24, 2009. FAA concurred with recommendations 1 through 4 and provided appropriate planned actions and target completion dates. FAA partially concurred with recommendation 5, stating that procedures for directing controller work assignments have been developed at the national level and are included in FAA directives such as FAA Orders 7210.3 and 1320.1. FAA also stated that additional guidance on providing relief breaks is contained in Article 33 of the Agency's contract with NATCA. FAA's response is included in its entirety in the appendix to this report.

We request that FAA clarify its response to recommendation 5 as we were unable to determine whether FAA Orders 7210.3 and 1320.1 specifically address controller rotation in relation to position complexity. Likewise, Article 33 of FAA's contract with NATCA only addresses time on position before relief breaks are given, not rotational requirements due to position complexity.

ACTIONS REQUIRED

FAA's planned actions and target dates for recommendations 1, 2, and 4 are responsive, and we consider these recommendations resolved pending completion. While FAA's actions to address recommendation 3 are also responsive, we request that FAA provide us with its target issuance date for its pending Order on "Air Traffic Technical Training." In accordance with DOT Order 8000.1C, we request that FAA clarify its response in writing regarding recommendation 5 within 30 days of this report.

We appreciate the courtesies and cooperation of FAA representatives during this audit. If you have any questions concerning this report, please contact me at (202) 366-1427 or Daniel Ravielle, Program Director, at (202) 366-1405.

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cc: FAA Deputy Administrator
FAA Chief of Staff
Martin Gertel, M-100
Anthony Williams, ABU-100

EXHIBIT A. SCOPE AND METHODOLOGY

We conducted this performance audit in accordance with generally accepted Government Auditing Standards prescribed by the Comptroller General of the United States. As required by those standards, we obtained evidence that we believe provides a reasonable basis for our findings and conclusions based on our audit objectives. We used the following scope and methodology in conducting this review.

We conducted this audit between January 2008 and February 2009. The audit included site visits to three major air traffic control facilities in the Chicago metropolitan area: Chicago O'Hare, Chicago TRACON and Chicago Air Route Traffic Control Center. We also conducted audit fieldwork at FAA Headquarters in Washington, DC; the FAA Training Academy in Oklahoma City, OK; and NATCA Headquarters in Washington, DC.

To identify key factors that may contribute to controller fatigue we conducted site visits at all three Chicago air traffic control facilities and conducted numerous interviews with facility management; administrative personnel responsible for quality assurance, training, and scheduling; and NATCA representatives.

To determine the extent to which the factors were occurring, the OIG statistician selected a simple random statistical sample of controllers and their work weeks for each of the three facilities. The universe consisted of 52 work weeks for each controller for a 1-year scheduling period beginning August 5, 2007, and ending August 2, 2008. Chicago O'Hare had 45 controllers and therefore a schedule with 2,340 controller work weeks (45 controllers x 52 weeks) from which a sample of 66 was selected. Chicago TRACON had 69 controllers and therefore a schedule with 3,588 controller work weeks (69 controllers x 52 weeks) from which a sample of 67 was selected. Chicago ARTCC had 334 controllers and therefore a schedule with 17,368 controller work weeks (334 controllers x 52 weeks) from which a sample of 68 was selected.

We reviewed work schedules and time and attendance records covering the time period August 5, 2007, to August 2, 2008, for each of the controllers in our sample. First, we analyzed the original or published work schedule for every controller in our sample to determine if the controller was scheduled to work any quickturns or any overtime (i.e., a 6-day work week).

Next, we compared the original or published work schedule to the amended work schedule to determine if the controller "traded into" any quickturns. Lastly, we compared the amended schedule to the time and attendance record to validate the hours actually worked covering a 52-week period. When a discrepancy existed,

we relied on the time and attendance record to determine what was actually worked as it represents the basis for controller official pay and leave. We also reviewed time and attendance records to determine if the controller conducted OJT during the shift.

We utilized the results of our statistical sample to project the frequency with which controllers were scheduled to work quickturns and overtime and the frequency with which controllers conducted OJT.

We also reviewed fiscal year 2007 and 2008 preliminary and final operational error reports for each of the three facilities. During our review, we focused on the most severe operational errors, classified as categories A and B by FAA. We reviewed the summary of the preliminary operational error report to determine if human factors, such as fatigue, were identified during the initial investigation of the operational error.

In addition, we determined the number of personnel involved in the operational error, the performance level of the employee involved in the operational error, any in-progress training at the time of the error, and the duration of the controller's time on position. Finally, we reviewed the time and attendance records of the primary employee involved in the operational error to determine (1) the extent to which the controller worked overtime (i.e., 6-day work week), (2) the extent to which the controller conducted OJT, and (3) the total number of hours the controller worked air traffic during the sample week.

To identify the measures FAA has taken to mitigate potential controller fatigue, we interviewed officials at the national level from the Air Traffic Organization, the Civil Aerospace Medical Institute, and NATCA. We also interviewed officials at the FAA Training Academy to identify current training methods and future training initiatives. Lastly, we attended an FAA-sponsored symposium geared toward identifying and mitigating fatigue within the aviation industry.

EXHIBIT B. ACTIVITIES VISITED OR CONTACTED

En Route Facilities (Air Route Traffic Control Center)

- Chicago Air Route Traffic Control Center

Terminal Facilities

- Chicago O'Hare Air Traffic Control Tower
- Chicago Terminal Radar Approach Control Facility

FAA Headquarters, Washington, DC

- FAA Air Traffic Organization, Safety
- FAA Air Traffic Organization, Terminal and Enroute
- FAA Training Academy, Oklahoma City, Oklahoma

Third Parties

- National Air Traffic Controllers Association Headquarters, Washington, DC
- FAA-Sponsored Fatigue Symposium in Vienna, Virginia

EXHIBIT C. MAJOR CONTRIBUTORS TO THIS REPORT

<u>Name</u>	<u>Title</u>
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APPENDIX. AGENCY COMMENTS



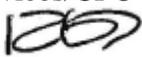
Federal Aviation Administration

Memorandum

Date: June 24, 2009

To: Lou E. Dixon, Assistant Inspector General for Aviation and Special Program Audits

From: Ramesh K. Punwani, Assistant Administrator for Financial Services/CFO

Prepared by: Anthony Williams, x79000 

Subject: OIG Draft Report: Air Traffic Control: Potential Fatigue Factors

Thank you for the opportunity to review and comment on the findings and recommendations of the subject draft report dated May 26. The Federal Aviation Administration (FAA) concurs with four recommendations and concurs in part with one recommendation.

The following is FAA's response to each of your recommendations:

OIG Recommendation 1: Re-evaluate the staffing ranges for Chicago O'Hare once the O'Hare Modernization Project is fully implemented to ensure that the range is appropriate and meets the new operational needs of the facility.

FAA Response: Concur. FAA performs yearly reviews of staffing ranges at every air traffic facility. If necessary, FAA adjusts those ranges. These ranges are published in the annual updated Controller Workforce Plan which this year was published on April 1. Controller staffing can be amended for significant changes in the operation regardless of the published ranges.

OIG Recommendation 2: Approve the recommended changes to FAA Order 7210.3 and implement these changes at all air traffic control facilities. These changes include (a) increasing the minimum rest period between shifts from 8 to 10 hours, (b) increasing the time available for rest after working a midnight shift on the fifth day of a 6-day work week from 12 to 16 hours, and (c) allowing controllers to rest during their shift when not controlling traffic.

FAA Response: Concur. The Notices and Document Change Proposals have been developed and are awaiting final internal approval. The FAA expects final action on these documents by September 30, 2009, and will provide copies to the OIG upon completion.

OIG Recommendation 3: Provide mandatory refresher training to controllers annually to reinforce fatigue awareness and mitigation strategies. This training should include a comprehensive, multi-faceted approach to minimizing employee fatigue.

FAA Response: Concur. In response to the National Transportation Safety Board's Recommendation A07-31, the FAA's Controller Training and Development Group, AJL-11 developed and implemented training on fatigue awareness and countermeasures. A one hour lesson was added to the Terminal and En Route initial qualification training program on May 20, 2008. All initial qualification students receive this training. In addition, an awareness brochure was provided to each controller through their facility on December 1, 2008. Recurrent training using computer based instructions (CBI) was distributed to field facilities and a notice published making the training mandatory. This notice has been incorporated into the soon to be distributed Order 3120.4, "Air Traffic Technical Training." The initial qualification lesson, brochure, and CBI course were updated to include the concept of "sleep inertia." These updates were completed on March 11, 2009.

OIG Recommendation 4: Expand operational error investigatory requirements to include more detailed information on fatigue factors, such as overtime, on-the-job training (OJT), and work schedule that could create fatigue conditions to determine whether these factors are a contributory cause to operational errors, the frequency in which the factors are occurring, and whether or not the existence of the factors indicate a systematic problem. The reports should at a minimum include: (a) whether the controller worked overtime during the previous day or worked more than 40 hours during the prior work week; (b) the length of time the controller conducted OJT, if applicable; and (c) the exact days and shifts worked by the controller during the week the operational error occurred.

FAA Response: Concur. The FAA is actively pursuing significant modifications to its processes for identifying, reporting, and analyzing losses of separation including, but notably not limited to, those that are currently categorized as operational errors.

As a fundamental aspect of this effort, FAA will be implementing processes in fiscal year 2010 to collect schedule data. This data will include time-on-position, shift schedule, and OJT instruction time for each person staffing operational positions associated with an identified loss of separation for at least a fourteen day period leading up to the event.

OIG Recommendation 5: Require all facilities to establish procedures to rotate controllers through challenging and less demanding positions during each shift to mitigate the potential for fatigue to occur.

FAA Response: Concur in part. The FAA agrees that procedures for directing work assignments are required. FAA does not agree that this procedural development should occur at the facility level. Adequate procedures were developed at the national level and are included in FAA directives including FAA Order 7210.3. Air traffic control facilities are mandated to adhere to the provisions of these orders by FAA Order 7210.3 and FAA Order 1320.1. Additional guidance on providing relief breaks is contained in Article 33 of the FAA, National Air Traffic Controllers Association Contract. In the event that a conflict exists between an FAA Order and the contract, the provisions of the contract are followed.

Appendix. Agency Comments

FAA air traffic control facilities are properly applying the provisions of these orders as they pertain to workload assignments and relief breaks.