
Office of Inspector General

Audit Report

FAA AND INDUSTRY ARE TAKING ACTION TO ADDRESS PILOT FATIGUE, BUT MORE INFORMATION ON PILOT COMMUTING IS NEEDED

Federal Aviation Administration

Report Number: AV-2011-176

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Memorandum

U.S. Department of
Transportation

Office of the Secretary
of Transportation
Office of Inspector General

Subject: **ACTION:** FAA and Industry Are Taking Action
To Address Pilot Fatigue, but More Information on
Pilot Commuting Is Needed
Federal Aviation Administration
Report No. AV-2011-176

Date: September 12, 2011

From: Jeffrey B. Guzzetti 
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for Aviation and Special Program Audits

Reply to
Attn. of: JA-10

To: Federal Aviation Administrator

Fatigue in aviation has been on the National Transportation Safety Board's (NTSB) Most Wanted List of Transportation Safety Improvements since 1990. NTSB has cited pilot performance or fatigue as a cause or contributing factor in four of the last six fatal accidents involving regional air carriers. In addition, as part of its investigation into the February 2009 fatal crash of Colgan Air flight 3407, NTSB concluded that both pilots were impaired because of fatigue.¹ After NTSB's May 2009 hearing on the Colgan crash, the Chairmen and Ranking Members of the Senate Committee on Commerce, Science, and Transportation and Subcommittee on Aviation Operations, Safety, and Security, as well as the former Chairman of the House Subcommittee on Aviation requested that we review the Federal Aviation Administration's (FAA) regulations and airline policies on crew rest requirements and fatigue issues, including pilot domicile and commuting. This request was also reiterated by Representatives Louise Slaughter and Brian Higgins.

Therefore, our audit objectives were to assess (1) FAA's actions taken to address the current Federal regulations governing crew rest requirements and fatigue issues and (2) FAA's and the airlines' oversight and enforcement of those regulations. We conducted this audit between August 2009 and July 2011 in accordance with generally accepted Government auditing standards prescribed by

¹ During deliberations at the NTSB Board Meeting to close out the Colgan Air investigation, the three members of the Safety Board voted 2-1 to not elevate fatigue as a contributing factor in the accident, noting that the extent of pilots' impairment due to fatigue, and the degree to which fatigue contributed to their performance, could not be "conclusively" determined.

the Comptroller General of the United States. Exhibit A details our scope and methodology. Exhibit B lists the entities we visited or contacted.

RESULTS IN BRIEF

FAA has taken steps to update flight, duty, and rest regulations for pilots. These include issuing advisory circulars² and other guidance³ to carriers on best practices to mitigate fatigue and key elements for carriers to include in their fatigue risk management plans and systems. FAA also published a Notice of Proposed Rulemaking (NPRM) last year⁴ that, if adopted, would significantly change existing flight, duty, and rest regulations for commercial carriers by basing them on scientific factors (e.g., time of day flown and sleep consideration) rather than type of flight operation. However, it will be difficult for FAA to address this issue or finalize new rest rules given the significant opposition the NPRM faces from the aviation industry. In addition, the NPRM does not impose requirements on carriers to track pilot domicile⁵ or commuting—factors that can contribute to fatigue given that many pilots in the industry reside hundreds or thousands of miles from their assigned duty locations. None of the six air carriers we visited⁶ had their own voluntary policies to track pilots who commute or their commuting distances. The National Academy of Sciences recently completed a study noting that there was not enough available data to determine the role commuting plays in contributing to fatigue or whether commuting should be regulated.

Both air carriers and FAA have systems that generally ensured compliance with current Federal regulations governing flight, duty, and rest requirements by alerting schedulers of potential violations. However, we found that when non-compliances do occur due to human error, FAA inspectors do not fully examine and analyze the self-disclosure data from the carriers on those instances. This disclosure data, which inspectors normally would not obtain through their regular surveillance,⁷ could serve as a valuable source of information to identify instances and potential trends related to fatigue. In addition, our assessment of FAA inspectors' records at the six carriers identified areas where carriers can improve internal controls to oversee pilot flight, duty, and rest policies. For example, an

² Advisory Circular, 120-100, Basics of Aviation Fatigue, June 7, 2010 and Advisory Circular, 120-103, Fatigue Risk Management Systems for Aviation Safety, August 3, 2010.

³ An Information for Operators (InFO) message contains information for operators that should help them meet administrative requirements or certain regulatory requirements with relatively low urgency or impact on safety.

⁴ Flightcrew Member Duty and Rest Requirements; 75 Fed. Reg. 55852 (September 14, 2010).

⁵ In the aviation industry, "domicile" means the work location of the crewmember rather than the "home" of the crewmember.

⁶ The six carriers were selected based on their classification as a Part 121 air carrier and represented three types of operations: mainline, regional, and cargo.

⁷ This system is known as the Air Transportation Oversight System (ATOS). FAA uses ATOS to conduct surveillance of nearly 100 airlines that transport more than 90 percent of U.S. airline passenger and cargo traffic. Under the ATOS concept, FAA inspectors apply system safety principles and use data analysis to focus their inspections on areas that pose the greatest risk and identify potential problems before accidents occur.

inspector found that one air carrier did not have a manual that described flight crewmember flight, duty, and rest time process controls or instructions for showing compliance in their records.

We made four recommendations to FAA to improve its awareness of the extent of pilot commuting and fatigue within the air carrier industry. FAA concurred with or met the intent of two of them, which we now consider closed, but we are requesting a revised response for the remaining two recommendations.

BACKGROUND

Current Federal regulations establish daily, weekly, monthly, and yearly flight time limitations for U.S. flight crews (see table 1).⁸ Although the regulations contain prescriptive flight time limits, they permit these limits to be exceeded for “circumstances beyond the control” of the air carrier, such as adverse weather conditions, provided the pilot was originally scheduled within the limits. The current regulations also establish the amount of rest a pilot must receive based on the pilot’s scheduled flight time.⁹

Table 1. Maximum Domestic Flight Time Limitations

Flight Time	Time Period
8 Hours	Between Rest Periods
30 Hours	In Any 7 Consecutive Days
100 Hours	In Any Calendar Month
1,000 Hours	In Any Calendar Year

Source: FAA

Table 2. Regulatory Rest Periods for Scheduled Domestic Flights

Scheduled Flight Time in 24 Consecutive Hours	Normal Rest	Reduced Rest	Compensatory Rest
Less Than 8 Hours	9 Hours	8 Hours	10 Hours
8 Hours Or More But Less Than 9 Hours	10 Hours	8 Hours	11 Hours
9 Hours or Greater	11 Hours	9 Hours	12 Hours

Source: FAA

Types of rest are broken down into three categories: normal rest, reduced rest, and compensatory rest,¹⁰ and the regulations allow for flexibility in scheduling rest periods. For example, as shown in table 2, a pilot scheduled for 7 hours of domestic flight time is required to have at least 9 hours of normal rest. However, this rest can be reduced to 8 hours, as long as the pilot receives 10 hours of compensatory rest before the next flight.

⁸ The current Federal regulations that govern flight and duty time, and crew rest can be found in the Code of Federal Regulations (C.F.R.) 14 Part 121, subparts P, Q, R and S (domestic, international and supplemental operations) and 14 C.F.R. Part 135, subpart F (on demand and commuter operations). According to 14 C.F.R. Section 1.1, flight time begins when an aircraft moves under its own power for the purpose of flight and ends when the aircraft comes to rest after landing.

⁹ A rest period is the continuous and defined period of time before and/or following a duty period in which a flight crewmember is free from all duties and is not obligated to be available for direct contact by an air carrier.

¹⁰ Compensatory rest is the amount of rest required after a pilot’s normal time off between scheduled flight times has been reduced.

According to the National Academy of Sciences, lengthy commutes across multiple time zones may exacerbate fatigue. Commuting is a common industry practice, and pilots are not required to live within a certain distance of their assigned duty location. Many pilots' commutes can involve cross-country travel; for example, as shown in table 3, the NTSB's Colgan investigation revealed that out of 136 Newark-based Colgan pilots, 49 (36 percent), had commutes of at least 400 miles, with some commuting from states such as California, Nevada, and Washington.

Table 3. Commuting Distances for Newark-Based Colgan Pilots

Distance From Newark Airport	# Pilots	States Represented
Less Than 100 Miles	45	Connecticut, New Jersey, New York, Pennsylvania
100 to 199 Miles	13	Maryland, Massachusetts, New York, Pennsylvania, Rhode Island
200 to 399 Miles	29	Maine, Massachusetts, New Hampshire, New York, North Carolina, Pennsylvania, Virginia
400 to 999 miles	20	Florida, Georgia, Illinois, Iowa, Michigan, Ohio, South Carolina, Tennessee, West Virginia
Over 1,000 Miles	29	California, Colorado, Florida, Louisiana, Minnesota, Nevada, Texas, Utah, Washington

Source: NTSB

The Airline Safety and FAA Extension Act of 2010¹¹ requires FAA to establish new flight and duty time limits that consider scientific data on human physiology by August 2011. The Act also called on the National Academy of Sciences to study pilot commuting, its impact on pilot fatigue, and carriers' commuting policies.¹²

FAA HAS BEGUN UPDATING OUTDATED FLIGHT, DUTY, AND REST REGULATIONS BUT HAS NOT ADDRESSED PILOT DOMICILE AND COMMUTING ISSUES

FAA has taken steps to update flight, duty, and rest regulations for pilots, such as including commuting as a topic for the proposed training requirements in the NPRM. However, FAA has not developed requirements for carriers to have policies addressing pilot domicile and commuting issues, and FAA's September 2010 NPRM does not impose limitations on pilot domicile or commuting—factors that can contribute to fatigue. In addition, FAA does not require carriers to collect and analyze data on pilots that commute. None of the six air carriers we visited had their own policies regulating pilot commuting or domicile, and they did not

¹¹ Pub. L. No. 111-216, Section 212 (August 2010).

¹² The National Academy of Sciences report was published in July 2011.

track the total number of commuters or their commuting distances. Our work also indicates that pilots may not be reporting all instances of fatigue. This may limit FAA's ability to identify any connection between commuting and fatigue.

Current Federal Regulations Are Outdated, Difficult To Interpret, and Not Scientifically Based

While the aviation industry has seen dramatic change over the years, the current flight, duty, and rest regulations that apply to Part 121 air carriers¹³ were originally written decades ago and have not been updated to reflect industry changes such as multi-leg flights and crossing multiple time zones. The last modification to the regulations occurred in 1985 when the following were added: (1) pilots were required to have a minimum of 8 hours of rest in the 24-hour period before the expected arrival time of their flight and (2) dual responsibility was placed on both the pilot and air carrier to ensure compliance with flight, duty, and rest regulations.

The current regulations can be confusing to pilots and air carriers since they contain many sets of rules governing domestic, international, and supplemental (i.e., unscheduled cargo or charter) operations. Each flight and duty time regulation was developed independently for each segment of the aviation industry, creating a lack of continuity and implementation challenges. FAA personnel we interviewed noted that flight crews and air carriers frequently contact FAA to obtain clarification on flight and duty rules. For example, domestic flight rest requirements state that a pilot scheduled for at least 8 hours but less than 9 hours of flight time must receive a minimum of 10 hours rest. However, the rest period can be reduced to 8 hours, as long as the pilot receives 11 hours of compensatory rest prior to the next flight. In contrast, international flight rest requirements, for a one or two-pilot crew, state that a pilot scheduled to fly more than 8 hours during a 24-hour period, shall have a rest period at or before the end of the 8 scheduled hours of flight duty. Further, the rest period must be at least twice the number of hours flown since the preceding rest period, but not less than 8 hours.

In addition, the current regulations do not incorporate the results of scientific data and research despite longstanding recommendations from the National Aeronautics and Space Administration (NASA) and the NTSB:

- In 1996, a NASA Ames work group, formed to develop principles and guidelines for duty and rest scheduling in commercial aviation, made recommendations for Part 121 and 135 operations.¹⁴ These included

¹³ Part 121 operations refer to commercial operations of large aircraft regulated under 14 C.F.R. Part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations.

¹⁴ Part 135 operations refer to commercial operations of small aircraft regulated under 14 C.F.R. 135, Operating Requirements: Commuter and On Demand Operations. Commuter operators conduct scheduled operations using aircraft with 9 or fewer passenger seats and on-demand operators conduct unscheduled operations using aircraft with 30 or fewer passenger seats.

recommendations to define maximum flight duty periods and minimum rest periods and to consider scientific data on human physiology with regard to scheduling practices.

- In 2006, the NTSB stated that FAA flight and duty time limits did not reflect recent research on crew alertness and pilot fatigue and sleep issues, which increased the possibility that pilots would fly fatigued. The NTSB recommended that FAA modify the flight crew hours of service regulations to consider factors such as length of duty day, start time, workload, and other factors that affect crew alertness.

Other countries and international aviation organizations have already designed and implemented scientifically based airline pilot fatigue standards. For example, in 2004 the United Kingdom updated its regulations based on scientific factors and adjusted maximum pilot duty periods based on time of day, number of flight legs, time zones crossed, acclimatization to local time, and other factors. In 2009, the International Civil Aviation Organization also enacted standards and recommended practices that require participating countries to base their regulations on scientific principles and knowledge.¹⁵

FAA Is Working To Address Longstanding Issues With the Existing Flight, Duty, and Rest Regulations

After the Colgan accident, in June 2009 FAA and the Department held an Airline Safety Call to Action and identified pilot fatigue as a top priority for the aviation industry. Since then, FAA has taken several steps to address the longstanding issues with the current flight, duty, and rest regulations. The Agency released three guidance documents in 2010 that addressed fatigue within the industry:

- On June 7, 2010, FAA issued Advisory Circular 120-100 that reported findings and best practices discussed at an FAA-sponsored international fatigue symposium in 2008. The circular addressed the effects of fatigue on human performance and how individuals and aviation service providers can reduce or mitigate the effects of fatigue. For example, one strategy is to decrease fatigue factors that drive lapses in attention, such as improved crew scheduling, to provide adequate sleep opportunities and improve individual sleep habits.
- On August 3, 2010, FAA issued Advisory Circular 120-103 that described the concepts and common elements of a fatigue risk management system, such as formulating a fatigue risk management policy, fatigue analysis, and incident reporting process.

¹⁵ If the current NPRM is finalized as written, it would meet the intent of these standards.

- On August 19, 2010, FAA issued Information for Operators (InFO) message no. 10017 that provided the structure and elements required for an air carrier's fatigue risk management plan. These elements include having a fatigue reporting system, a fatigue training program, a fatigue incident reporting process, and a fatigue monitoring system for flight crews.

FAA is developing additional advisory circulars that will complement the proposed changes to the current regulations and is facilitating a study to assess crewmember fatigue during long-range flights.

In addition, on September 14, 2010, FAA issued an NPRM that would make significant changes to the existing flight, duty, and rest regulations for commercial carriers. If adopted without modification, the new requirements would eliminate the current distinctions between domestic, international, and supplemental operations. It would also institute new flight, duty, and rest requirements based on scientific factors such as time of day flown and sleep consideration. Table 4 summarizes these changes.

Table 4. Comparison of Current Part 121 Regulations to NPRM Regulations

Current Part 121	NPRM
Minimum Rest Prior to Duty, Domestic	
8 to 11 Hours Depending on Flight Time	9 Hours
Minimum Rest Prior to Duty, International	
Minimum of 8 Hours to Twice the Number of Hours Flown	9 Hours
Maximum Flight Duty Time, Unaugmented^a	
16 Hours	9 to 13 Hours Depending on Start Time and Number of Flight Segments
Maximum Flight Duty Time, Augmented^b	
16 to 20 Hours Depending on Crew Size	12 to 18 Hours Depending on Start Time, Crew Size, and Aircraft Rest Facility
Maximum Daily Flight Time, Unaugmented	
8 Hours	8 to 10 Hours Depending on Flight Duty Period Start Time
Maximum Daily Flight Time, Augmented	
8 to 16 Hours Depending on Crew Size	None

a. Unaugmented means there is a minimum number of flight crewmembers.

b. Augmented means there is more than the minimum number of flight crewmembers required by the airplane type certificate to operate the aircraft. This allows a flight crewmember to be replaced by another qualified flight crewmember for in-flight rest.

Source: Federal Register, Vol. 75, P. 55852 (September 14, 2010)

Issuing the NPRM was an important and much needed step towards changing outdated regulations. However, the NPRM still faces significant opposition from the aviation industry. FAA has already received over 2,500 comments related to

the NPRM, most of which oppose the implementation of the rule as proposed.¹⁶ Examples of some comments are listed below:

- Air carriers oppose a “one size fits all approach” to eliminate the distinctions between different types of aviation operations (e.g., passenger, cargo operations, short-haul, long-haul, unscheduled). These comments are echoed by representatives of a large cargo air carrier, who states that the proposal does not consider the vastly different operational models of the cargo industry and the passenger airline business.
- While FAA estimates the 10-year cost of the rule to be \$1.25 billion, the Air Transport Association argues that the proposal would result in costs to air carriers of more than 15 times than those projected by FAA.
- Pilots and their unions objected to the NPRM’s daily flight time limit and minimum rest period. This group advocates a decrease in the proposed daily flight time and an increase in the proposed rest period and urges that a non-punitive sick and fatigue policy be included in the final rule.

Earlier attempts to modify flight and duty regulations met similar resistance from the industry. In 1992, FAA established a working group to create one set of comprehensive regulations for Part 121 and 135 carriers. While the group did not reach a consensus, it submitted a final report in 1994 to FAA with proposed changes, which were eventually incorporated into an NPRM in 1995. However, industry representatives opposed these potential changes, stating that FAA lacked adequate safety data to justify the rulemaking and that compliance with the regulations would impose significant costs on the industry. After 14 years of debate and over 2,000 comments received, FAA withdrew the proposed changes in November 2009. Given the historical opposition from the aviation industry regarding revamping rest rules, it will be difficult for FAA to implement a final rule on new flight, duty, and rest regulations.

FAA and Industry Policies Do Not Address Pilot Domicile and Commuting Issues

Despite the potential impact commuting could have on pilot fatigue, FAA decided against proposing a commuting regulation in the September 2010 NPRM. While FAA considered mandating that pilots arrive in time to receive a pre-flight rest period, it stated that enforcing this regulation would be difficult and that it would not guarantee responsible commuting. Instead, it developed a draft advisory circular with the NPRM that elaborates on the pilot’s responsibility to be properly rested and outlines an air carrier’s responsibility to ensure each flight crewmember

¹⁶ The number of comments is understated because many of the comments consists of bundles of 50 to 100 individual comments and do not include late comments, which FAA is accepting even though the comment period ended on November 15, 2010.

is properly rested before being assigned to a flight. In addition, the Agency included commuting as a topic for the proposed training requirements in the NPRM and noted that it expected carriers to take the length of a pilot's commute into account in assuring that the pilot could reasonably get the rest proposed in the NPRM. While these are positive steps, they are only proposed components of the NPRM.

According to the Air Line Pilots Association (ALPA), roughly 60 percent of ALPA pilots are commuters. Of the 33 randomly captains and first officers from five air carriers we interviewed,¹⁷ 24 pilots, or about 73 percent, were commuters at some point in their careers (see table 5).

Table 5. Number of Pilot Commuters

Airlines	Number of Pilots Interviewed	Current Commuters	Past Commuters	% of Current and Past Commuters
Airline #1	7	1	4	71%
Airline #2	5	0	1	20%
Airline #3	10	7	2	90%
Airline #4	5	2	1	60%
Airline #5	6	5	1	100%
TOTAL	33	15	9	73%

Source: OIG

The NTSB investigation of the Colgan crash revealed that both pilots had commuted hundreds of miles before the flight. The captain commuted from Tampa to Newark 3 days before the accident. He slept in the Newark crew room on the night of his commute and again the night before the accident. The first officer commuted from Seattle to Newark the night before the accident, changing planes shortly after midnight in Memphis and arriving in Newark early in the morning. She then was reported to have slept in the Newark crew room for 5.5 hours. NTSB also found that although the crew room was supposed to be a quiet area with couches and recliners, it was not isolated and was subject to interruptions, sporadic noise, lights, and other factors that prevented quality rest. As a result, neither pilot took the opportunity to obtain quality sleep and be as rested as possible before the flight.

The NTSB also found that Colgan Air did not proactively address the pilot fatigue hazards associated with operations at an airport where pilots typically have to

¹⁷ We did not interview pilots and first officers during our site visit with the first airline. After this visit, it was decided that more insight into pilot commuting and fatigue could be gained by interviewing these employees. The 33 pilots and first officers were interviewed at the five remaining airlines' headquarters we visited, based on their availability at the time of our visit.

commute to in order to begin their work shifts, and stated that “Operators have a responsibility to identify risks associated with commuting, implementing strategies to mitigate these risks and ensure that their commuting pilots are fit for duty.” The NTSB issued a recommendation to FAA to address fatigue risks associated with commuting, including identifying pilots who commute.

However, FAA still does not plan to require carriers to identify pilots who commute, or to have policies addressing pilot domicile issues that impact commuting and fatigue. None of the six air carriers we visited had their own commuting/pilot domicile policy for regulating commuting or a procedure to track the total number of commuters or their commuting distances. Four of the six carriers had a commuting clause as part of their pilots’ collective bargaining agreement, but these do not reference ways to mitigate fatigue resulting from commuting. Rather, these clauses are designed to relieve pilots from disciplinary action when pilots are absent or late for work due to circumstances beyond their control.¹⁸

According to ALPA, the demand for more monthly and yearly flight hours flown by fewer pilots has led to endemic fatigue levels, and the current trend among airlines is to reduce pilot rest periods to minimum levels. Our limited work in this area also indicates that pilots may not be reporting all instances of fatigue. During our interviews with 33 captains and first officers at five air carriers, 26 (79 percent) stated that they experienced fatigue while on duty. However, only eight of them notified their air carrier that they were fatigued. Reasons for not reporting fatigue can vary, but one reason cited by pilots was that they feared punitive action from their employers.

In its July 2011 final report,¹⁹ the National Academy of Sciences noted that there was not enough available data to determine the role commuting plays in contributing to fatigue or whether commuting should be regulated. In addition, neither FAA nor the industry can determine the impact that commuting has on fatigue, or whether fatigue policies need improvement.

AIR CARRIERS AND FAA HAVE EFFECTIVE OVERSIGHT SYSTEMS TO ENSURE REGULATORY COMPLIANCE BUT FAA SHOULD REVIEW ADDITIONAL SELF-DISCLOSURE DATA

Both air carriers and FAA have systems that generally ensured compliance with Federal regulations governing flight, duty, and rest requirements. However, FAA inspectors do not fully examine and analyze self-disclosure data when non-

¹⁸ While commuting clauses are designed to relieve commuting pilots from disciplinary action, these pilots will not be paid for the portion of the trip that was missed.

¹⁹ National Academy of Sciences, “The Effects of Commuting on Pilot Fatigue,” July 6, 2011.

compliances do occur due to human error. This information could assist them in monitoring the safety compliance of their assigned carriers, including in areas of pilot fatigue.

Automated Air Carrier Scheduling Systems for Flight Crews Are Effective in Preventing Flight, Duty, and Rest Violations

We found that the airlines' automated crew scheduling systems are generally accurate in alerting schedulers of potential violations. Air carriers use several different automated systems to schedule their pilots. The six air carriers we visited used four different automated scheduling systems, each with checks and balances to ensure compliance with Federal duty and rest regulations and collective bargaining agreements with the airlines' respective unions. In addition, each scheduling system generates real-time alerts to warn schedulers of potential violations of these regulations and agreements.

We examined a systematic sample of 214 automated pilot schedules and actual shifts worked for a 1-month period at the six carriers we visited and found no violations of Federal flight, duty or rest regulations (see table 6). While there were 31 instances where pilots exceeded their prescriptive flight time, these were "circumstances beyond the control" of the air carrier due to factors such as adverse weather. In addition, we found 25 instances in which pilots received reduced rest (i.e., received less than 9 hours of normal rest but more than 8 hours of reduced rest), but in each instance the pilots received compensatory rest in accordance with Federal regulations.

Table 6. Results From Pilot Flight Schedule Reviews

Airline	Pilot Schedules Reviewed	Scheduling Violations	Scheduling Issues Beyond the Control of the Carrier	Reduced Rest Periods Permitted Under Part 121
Airline 1	30	0	5	9
Airline 2	29	0	8	1
Airline 3	25	0	9	3
Airline 4	30	0	1	4
Airline 5	30	0	1	0
Airline 6	70	0	7	8
Total	214	0	31	25

Source: OIG

While FAA Uses Inspections To Identify Violations of Flight, Duty, and Rest Requirements, It Does Not Require Inspectors To Analyze Self-Disclosure Data

As we reported in December 2010,²⁰ inspectors typically place more emphasis on the results of their regular surveillance activities and enforcement actions and do not fully analyze or trend data from FAA's Voluntary Disclosure Reporting Program (VDRP).²¹ FAA inspectors use the Air Transportation Oversight System (ATOS) to oversee air carrier maintenance and operations at 94 Part 121 U.S. air carriers. Under the ATOS concept, FAA inspectors apply system safety principles and use data analysis to focus their inspections on areas that pose the greatest risk and identify potential problems before accidents occur. ATOS also permits inspectors to shift the focus of their inspections in response to changing conditions within air carriers' operations. However, VDRP and other voluntary disclosure data, which are not typically obtained through normal surveillance means, could serve as a valuable source of information to assist inspectors in identifying instances and potential trends related to fatigue.

Although air carriers scheduling systems were generally accurate, human error and judgment caused instances of non-compliance with flight, duty, and rest regulations. These violations were self disclosed by the air carriers through the VDRP but were not identified as violations during FAA ATOS inspections. For example, at the six carriers we visited, four self-disclosed 10 flight, duty, or rest violations since fiscal year 2007. The violations involved human error on the part of crew schedulers or dispatchers when automated scheduling system alerts were ignored, employees failed to follow company policies and procedures for resolving warnings, or they manually miscalculated crew rest periods. For example:

- One violation occurred when the crew scheduler attempted to add a training flight to a pilot's schedule and misinterpreted an administrative code intended to show an actual day of work for the pilot. The scheduler also deleted a previous training event, allowing the automated scheduling system to accept the assignment. However, this action violated Federal rest regulations because the pilot worked 7 consecutive days of duty without a 24-hour rest period.
- Another violation occurred when inclement weather and a closed runway caused a flight diversion to an alternate airport, which required a plane refuel.

²⁰ OIG Report AV-2011-026, "FAA Needs To Improve Risk Assessment Processes for its Air Transportation Oversight System," issued December 16, 2010. OIG reports are available on our Web site at <http://www.oig.dot.gov>.

²¹ The VDRP provides air carriers with the opportunity to notify (self-disclose) FAA of known safety violations without fear of legal enforcement action.

However, delays after the refueling caused the flight crew, who were already working on a reduced rest period, to end their flight an hour past the mandated rest period, violating the compensatory rest requirement. Without the diversion, the crew would have ended their flight prior to violating the regulation. However, there were no crew schedulers on duty to account for the delay or determine if there was a violation. In addition, the dispatcher on duty was distracted with other obligations and did not check to see if a violation would occur. Both the airline and the flight crew failed to recognize the violation until 7 days later when the crew reviewed their logbooks.

Although ATOS contains a standardized checklist of questions, inspectors' assessments of flight crewmember flight, duty, and rest time reflect a high degree of subjectivity because individual inspectors determine the process used to conduct these inspections. For example, the 12 inspectors we interviewed stated there is no set number of records or schedules that must be reviewed, and the number of records reviewed is determined by the inspector. FAA recently took steps to ensure inspectors would consider VDRP data as part of their normal surveillance planning by directing them to review national trend analyses of VDRP data and identify potential safety risks.

In addition to VDRP, there are other voluntary reporting systems that inspectors could examine that would identify instances and trends associated with fatigue. For example, NASA's Aviation Safety Reporting System (ASRS) allows pilots to voluntarily report safety incidents, including instances of fatigue. From FY 2007 through FY 2010, ASRS received 484 voluntarily reports from Part 121 flight crewmembers where instances of fatigue were cited.²² While the role that fatigue played in each of the reports varied, we found no indication that inspectors had considered using this data to identify trends in fatigue.

Our assessment of inspectors' ATOS records at the six carriers showed that while the inspectors found no violations of flight, duty, and rest regulations, they did identify several internal control issues relating to procedures and documentation. Inspectors found 11 specific instances where two airlines did not adhere to procedures, interfaces, records, or process controls or measurements. For example, one air carrier did not have a manual that described flight crewmember flight, duty, and rest time process controls or instructions for showing compliance in their records. Another air carrier did not have a person responsible for establishing and modifying the carrier's policies, procedures, instructions, and information for the flight crewmember flight, duty, and rest time process.

²² According to NASA, the existence in the ASRS database of a specific number of fatigue reports cannot be used to project the prevalence of fatigue within the National Airspace System. However, NASA also notes that ASRS statistics represent the lower measure of the true number of such events that are occurring.

Inspectors also found a total of 73 deficiencies in the design of three carriers' oversight processes, such as the air carrier not having a reference in its manual on how the scheduling process works or no procedure in its manual to specify how pilots will be prohibited from flying beyond the maximum limits.

CONCLUSION

Although the United States operates the safest airspace system in the world, the 2009 Colgan accident is a reminder that vulnerabilities remain. Pilot fatigue is a longstanding safety concern as evidenced by the history of debate between FAA, airlines, and industry over revising flight and duty regulations. FAA has taken commendable steps to update outdated regulations and improve systems that monitor fatigue within the industry. However, it should also collect and analyze additional information on pilot domicile and commuting so it can better target solutions to reduce fatigue within the aviation industry.

RECOMMENDATIONS

We recommend that FAA:

- 1) Ensure the collection and analysis of data regarding domicile and commuting length for all Part 121 flight crews. Specifically, information regarding the number of pilots and other flight-crewmembers who commute, their methods of transportation, and the distances they commute, should be collected.
- 2) Review and analyze the Part 121 domicile and commuting data collected to determine if further changes to flight duty and domicile regulations are needed or if airlines need to take further mitigating actions in their fatigue management systems.
- 3) Implement an internal mechanism that encourages pilots and other flight-crewmembers to voluntarily report instances of fatigue without facing disciplinary action.
- 4) Require inspectors to analyze voluntary disclosure data specifically for violations of flight, duty, and rest requirements.

AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

We provided a draft of this report to FAA on July 20, 2011. We received a response from FAA on August 16, 2011, which is included in its entirety as an appendix to this report. FAA fully concurred with recommendation 3, and partially concurred with recommendation 4, but completed actions that addressed

the intent of these recommendations. Therefore, we consider these two recommendations closed.

With regard to recommendation 1, FAA noted that the National Academy of Sciences study did not identify a correlation between pilot commuting and safety and that FAA would scan for available data on pilot commuting. However, we note that the Academy concluded that a correlation could not be identified because there were no comprehensive commuting data available in areas such as the frequency or length of pilot commutes, the transportation modes used in commuting, or the timing, duration, and quality of sleep for pilots before and during their commutes. Given this lack of available data, the potential for commuting to contribute to fatigue, clear scientific evidence that fatigue can decrease performance, and recent fatal regional air carrier accidents in which pilot performance or fatigue were cited as a cause or contributing factor, we believe that FAA should collect and analyze domicile and commuting data to gain a better understanding of the issue. We acknowledge that there are a large number of Part 121 pilots, making data collection challenging. As an option, FAA could consider using statistical sampling techniques to collect data on commuting within the industry.

In response to recommendation 2, FAA proposed to address commuting by providing guidance for reviewing and validating air carrier specific fatigue risk management plans (FRMP). FAA also proposed strengthened fitness for duty requirements in its Notice of Proposed Rulemaking. In our opinion, and as noted by FAA in its response, FRMPs do not directly address pilot commuting practices. While FRMPs and stronger fitness for duty requirements are positive steps, a comprehensive review of Part 121 domicile and commuting data by FAA will better position the Agency and airlines to determine whether additional mitigation or oversight measures are needed.

Accordingly, we are requesting that FAA reconsider its position for both recommendations 1 and 2.

ACTIONS REQUIRED

In accordance with Department of Transportation Order 8000.1C, we are closing recommendations 3 and 4. For recommendations 1 and 2, we request that FAA reconsider its position based on the additional information provided in this report and provide us with a revised response within 30 days.

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

EXHIBIT A. SCOPE AND METHODOLOGY

We conducted this performance audit between August 2009 and July 2011 in accordance with generally accepted Government auditing standards prescribed by the Comptroller General of the United States. 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 following scope and methodology were used in conducting this review.

The audit included site visits to six air carriers, who were selected based on their classification as a Part 121 air carrier and represented three types of operations (mainline, regional, and cargo), two FAA Flight Standards District Offices (FSDO), five FAA Certificate Management Offices (CMO), and fieldwork at FAA Headquarters in Washington, DC. We also attended two aviation forums and interviewed members of four aviation trade associations. Lastly, we interviewed a National Aeronautics and Space Administration (NASA) consultant/sleep scientist and representatives from the National Transportation Safety Board (NTSB) (see exhibit B for list of all entities contacted or visited).

To determine FAA's actions to address the current Federal regulations governing crew rest requirements and fatigue issues, including the role of pilots' domicile and duty location, we interviewed five officials from FAA's Office of Aviation Safety, an official from FAA's Office of Chief Counsel, the NTSB, the six air carriers, and the aviation trade associations. We also reviewed reports from the FAA's Civil Aerospace Medical Institute (CAMI) dealing with fatigue and human factors and we interviewed a sleep scientist, who coauthored the National Aeronautics and Space Administration (NASA) technical memorandum entitled "Principles and Guidelines for Duty and Rest Scheduling in Commercial Aviation."

To determine FAA oversight and enforcement of the regulations, we received an overview of the Air Transportation Oversight System (ATOS) from FAA's ATOS Certificate Management Office. The Air Transportation Oversight System is the FAA's risk-based approach to air carrier safety oversight. In addition, we interviewed 12 FAA Principal Operations Inspectors (POIs) and aviation safety inspectors at each of the air carrier's FSDO or CMO to determine how ATOS flight, duty, and rest time inspections are conducted and to learn more about FAA's voluntary reporting systems.

During the POI interviews, we received a total of 15 violations from four air carriers between fiscal year 2007 to date that were self-disclosed in FAA's Voluntary Disclosure Reporting Program (VDRP). We analyzed all 15 VDRPs to

Exhibit A. Scope and Methodology

determine if the violations were flight, duty, or rest time related and what caused the violation. In addition, we reviewed a total of 19 performance assessments or Element Performance Inspections (EPIs) and a total of four design assessments or Safety Attribute Inspections (SAIs) of Element 6.1.2 Flight Crewmember Flight/Duty/Rest Time to determine if any flight, duty, or rest time violations were identified. Lastly, we compared the ATOS inspection results to the VDRP data to assess whether ATOS inspections identified violations that were self reported by air carriers in VDRP.

To determine air carrier oversight and enforcement of the regulations we conducted interviews with air carrier personnel responsible for Crew Planning, Crew Scheduling, Safety, and Operations. At each air carrier, we requested and received an up-to-date list of all pilots, stratified by seniority. From the seniority lists, we systematically selected and analyzed a total of 214 pilots' actual monthly flight schedules out of a possible 13,836 pilots to identify instances of noncompliance with FAA flight/duty time regulations and rest requirements. Of the 214 pilot schedules, 184 were from the month of September 2009 and 30 were from March 2010. (US Airways was unable to provide the pilot schedules for September 2009 due to computer system limitations. As a result, US Airways provided 30 pilot schedules from March 2010, which was the most current schedules available at the time of our site visit.)

We also analyzed all 10 flight, duty, and rest violations reported by the carriers in VDRP from FY 2007 through FY 2010 and provided to us by FAA inspectors to determine what weaknesses, if any, exist within the air carriers scheduling system. We also requested ASRS data from NASA regarding voluntary reports of fatigue for Part 121 crewmembers from FY 2007 through FY 2010. In addition, we reviewed each air carrier's commuting policy, if they existed, to determine if the air carrier identifies or maintains records on commuting pilots. Lastly, we conducted interviews with a total of 33 pilots, who were randomly selected based on availability, from five air carriers to gather their thoughts on fatigue, commuting, and rest requirements. We did not interview pilots and first officers during our site visit with the first airline. After this visit, we decided that more insight into pilot commuting and fatigue could be gained by interviewing these employees.

EXHIBIT B. ENTITIES VISITED OR CONTACTED

Federal Aviation Administration (FAA)

- FAA Headquarters Office of Aviation Safety, Flight Standards- Washington, DC
- FAA Air Transportation Oversight System (ATOS) Certificate Management Office (CMO)- Dulles, VA
- FAA Office of Chief Counsel
- FAA Miami CMO- Miami, FL
- FAA Delta Airlines CMO- Atlanta, GA
- FAA Continental CMO- Houston, TX
- FAA Pittsburgh CMO- Pittsburgh, PA
- FAA Washington Flight Standards District Office (FSDO)- Herndon, VA
- FAA Cincinnati FSDO- Cincinnati, OH

Aviation Trade Associations

- Air Line Pilots Association (ALPA) - Washington, DC
- Regional Airline Association (RAA) - Washington, DC
- Air Transport Association (ATA) - Washington, DC
- Allied Pilots Association (APA) - Fort Worth, TX

Air Carriers

- Continental Airlines- Houston, TX
- US Airways- Pittsburgh, PA
- Atlantic Southeast Airlines- Atlanta, GA
- ExpressJet- Houston, TX
- Compass Airlines- Minneapolis, MN
- ASTAR Air Cargo- Florence, KY

Other Federal Agencies

- National Transportation Safety Board (NTSB)- Washington, DC
- National Aeronautics and Space Administration (NASA)

Aviation Forums Attended

- NTSB's Professionalism in Aviation Forum: Ensuring Excellence in Pilot and Air Traffic Controller Performance- Washington, DC
- Fatigue Management Forum sponsored by Aviation Week- Miami, FL

EXHIBIT C. MAJOR CONTRIBUTORS TO THIS REPORT

<u>Name</u>	<u>Title</u>
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Audre Azuolas	Writer/Editor



Federal Aviation Administration

Memorandum

Date: AUG 16 2011

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

From: Clay Foushee, Director, Office of Audit and Evaluations, AAE-1

Subject: OIG Draft Report: FAA and Industry Are Taking Action to Address
Pilot Fatigue But More Information on Pilot Commuting is Needed

A handwritten signature in black ink, appearing to read "Michael A. Wilkerson" with "for CF" written below it.

The Federal Aviation Administration (FAA) has taken steps to update flight, duty, and rest regulations for pilots. These steps include issuing advisory circulars and other guidance to carriers on best practices to mitigate fatigue and key elements for carriers to include in their fatigue risk management plans and systems. On September 14, 2010, the FAA published a Flightcrew Member Duty and Rest Requirements notice of proposed rulemaking (NPRM) setting out proposed flight, duty, and rest regulations intended to limit flightcrew member fatigue in part 121 operations. That NPRM proposed to change existing flight, duty, and rest regulations for commercial carriers by basing them on scientific factors (e.g., time of day flown and sleep consideration) rather than type of flight operation. The FAA has drafted a final rule that would implement the new regulatory requirements, which is currently under review. The FAA believes the new rule represents a significant improvement over the existing regulations.

RECOMMENDATIONS AND RESPONSES

Recommendation 1: Ensure the collection and analysis of data regarding domicile and commuting length for all Part 121 flight crews. Specifically, information regarding the number of pilots and other flight-crewmembers who commute, their methods of transportation, and distances they commute, should be collected.

FAA Response: Concur in part. The work by the National Academy of Science (NAS) with regard to air carrier pilot commuting practices represents the most recent effort to determine whether there is a linkage between commuting and safety. The NAS panel identified neither a correlation between pilot commuting and safety nor a unique risk to aviation safety. Since commuting may be the result of a change to an air carrier's business model, such as closing a domicile or furloughing pilots, or due to a crewmember's personal choice, any data collection represents only a snapshot of the industry.

Currently 90 part 121 air carriers employ 80,000 pilots in part 121 passenger and cargo operations. Collecting data on pilot domicile and commuting practices would be a daunting task and any consideration of additional data gathering in this regard must be based upon consideration of whatever data is already available and the potential safety benefit of collecting additional data. In order to make this determination, FAA will conduct a scan of available data on pilot commuting and will determine whether additional data could offer significant safety benefits prior to October 1, 2012.

Separately, the FAA believes the new standards established by the fatigue risk management plans (FRMP), will address the fatigue risk posed by commuting and other activities engaged in by crewmembers. As described more fully below, an FRMP requires training on the effects of fatigue as a result of commuting. The FRMP also requires an incident reporting process, a fatigue monitoring system and an evaluation program which will gather and analyze fatigue data relating to commuting.

Recommendation 2: Review and analyze the Part 121 domicile and commuting data collected to determine if further changes to flight duty and domicile regulations are needed or if airlines need to take further mitigating actions in their fatigue management systems.

FAA Response: Concur in part. The FAA has already proposed to address pilot commuting in its NPRM through the strengthened requirements surrounding fitness for duty. Additionally, all part 121 air carriers have submitted FRMP in response to Public Law 111-216, section 212. While not directly addressing pilot commuting practices, the FRMP provides carriers with the ability to determine whether it needs to address the commuting practices of its pilots. An FRMP is an air carrier's method for managing and mitigating flight crewmember fatigue throughout its operation within the current regulatory structure for flight, duty, and rest limitations. Two important components of the FRMP are the establishment of a "Just Culture" where flight crewmembers do not have to feel fear of retribution for reporting fatigue occurrences and the associated circumstances leading to the fatigue event. Secondly, the FRMP establishes a "Safety Culture" that defines a minimum threshold or level of safety that will be acceptable for the organization. The FAA reviews and accepts all air carriers' FRMPs. The FAA requires any condition less than that threshold level be mitigated to bring the condition to the acceptable level. This is normally accomplished through policy, procedure, and root-cause analysis for continual evaluation of the effectiveness of the FRMP. The combination of fatigue reporting and fatigue mitigation will address the effects of commuting at an individual air carrier. The FAA will review and validate an air carrier's FRMP every 24 months. If necessary, the FAA will require additional revisions to an FRMP during this review. As of August 1, 2011, the FAA has accepted all FRMPs. We request this recommendation be closed.

Recommendation 3: Implement an internal mechanism that encourages pilots and other flight-crewmembers to voluntarily report instances of fatigue without facing disciplinary action.

Appendix. Agency Comments

FAA Response: Concur. On August 8, 2010, the FAA published Information for Operators (InFO) 10017, FRMP for Part 121 Air Carriers – Part 2, which outlines guidance for the development of an FRMP. The development of FRMP was in response to P.L. 111-216, section 212(b), requiring each part 121 air carrier to develop an FRMP for its operation and submit the document for review by the FAA. One element of the FRMP is to establish a “Just Culture” and have a reporting system that encourages flight crewmembers to report fatigue occurrences without fear of retribution. Upon FAA acceptance of the FRMP, the air carrier is required to comply with its FRMP, as prescribed in P.L. 111-216. The FAA accepted all FRMPs by August 1, 2011. We believe we have met the intent of this recommendation and request it be closed.

Recommendation 4: Require inspectors to analyze voluntary disclosure data specifically for violations of flight, duty, and rest requirements.

FAA Response: Concur in part. The FAA Flight Standards has two voluntary disclosure programs: Voluntary Disclosure Reporting Program (VDRP) and Aviation Safety Action Program (ASAP). The goal of these programs is to enhance aviation safety through the prevention of accidents and incidents. Their focus is to encourage voluntary reporting of safety issues, including fatigue, and events that come to the attention of employees of certificate holders. The FAA believes that the open sharing of safety events and a cooperative approach to solving problems will enhance and promote aviation safety. The FAA analyzes and evaluates each voluntary disclosure using a root cause analysis. The root cause analysis leads to the development of a comprehensive fix. The comprehensive fix includes a follow-up self-audit to ensure that the action taken corrects the identified safety issue. This self-audit is in addition to the FAA’s risk analysis process conducted under the FAA’s Air Transportation Oversight System.

The analysis of each event includes the potential involvement of flight, duty, and rest standards. Whether a VDRP or ASAP, the FAA inspectors responsible for the oversight of an air carrier are directly involved with the air carrier in analyzing the root cause of the report and evaluating the implementation of the comprehensive fix. In addition, FAA periodically audits the voluntary programs and includes much of the voluntary program data in Aviation Safety Information Analysis and Sharing analysis. The FAA believes that we have met the intent of this recommendation and requests it be closed.