

AIR TRAFFIC CONTROL SAFETY OVERSIGHT

HEARING

BEFORE THE

SUBCOMMITTEE ON AVIATION OPERATIONS,
SAFETY, AND SECURITY

OF THE

COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

ONE HUNDRED TWELFTH CONGRESS

FIRST SESSION

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MAY 24, 2011
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ONE HUNDRED TWELFTH CONGRESS

FIRST SESSION

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CONTENTS

	Page
Hearing held on May 24, 2011	1
Statement of Senator Cantwell	1
Statement of Senator Hutchison	3
Prepared statement of Hon. John D. Rockefeller IV, U.S. Senator from West Virginia	3
Statement of Senator Nelson	4
Statement of Senator Rockefeller	36
Statement of Senator Thune	38
Statement of Senator Lautenberg	40
Statement of Senator Warner	51
Statement of Senator Klobuchar	54

WITNESSES

Hon. J. Randolph Babbitt, Administrator, Federal Aviation Administration	5
Prepared statement	7
Hon. Calvin L. Scovel III, Inspector General, U.S. Department of Transportation	9
Prepared statement	11
Paul M. Rinaldi, President, National Air Traffic Controllers Association	19
Prepared statement	21
Gregory Belenky, M.D., Research Professor and Director, Sleep and Performance Research Center, Washington State University, Spokane	30
Prepared statement	31

APPENDIX

Response to written questions submitted to Hon. J. Randolph Babbitt by:	
Hon. John D. Rockefeller IV	57
Hon. Maria Cantwell	58
Hon. Tom Udall	60
Hon. Mark Warner	61
Hon. Kay Bailey Hutchison	62
Response to written questions submitted to Hon. Calvin L. Scovel III by:	
Hon. John D. Rockefeller IV	63
Hon. Maria Cantwell	64
Hon. Tom Udall	65
Hon. Kay Bailey Hutchison	65
Response to written questions submitted to Paul Rinaldi by:	
Hon. Maria Cantwell	66
Hon. Tom Udall	67
Response to written questions submitted by Hon. Maria Cantwell to Gregory Belenky, M.D.	68

AIR TRAFFIC CONTROL SAFETY OVERSIGHT

TUESDAY, MAY 24, 2011

U.S. SENATE,
SUBCOMMITTEE ON AVIATION OPERATIONS, SAFETY, AND
SECURITY,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Committee met, pursuant to notice, at 2:31 p.m. in room SR-253, Russell Senate Office Building, Hon. Maria Cantwell, presiding.

OPENING STATEMENT OF HON. MARIA CANTWELL, U.S. SENATOR FROM WASHINGTON

Senator CANTWELL. Good afternoon, everyone. Welcome to the Senate Committee on Commerce, Science, and Transportation, Subcommittee on Aviation Operations, Safety, and Security.

We're having a hearing today on air traffic control safety oversight, and we are joined by witnesses, the Honorable Randy Babbitt, FAA Administrator; and the Honorable Calvin Scovel, Inspector General, U.S. Department of Transportation; Paul Rinaldi, President of the Air Traffic Controllers Association; and Dr. Gregory Belenky, Director of the Sleep and Performance Research Center at Washington State University. Thank you all very much for being here.

Today, the aviation subcommittee is holding an oversight hearing on air traffic control safety. And I know my colleague, Senator Thune, will be here soon, but I want to recognize him in his new role as Ranking Member for this subcommittee, and I say that I look forward to working with him.

The two issues we are going to focus on basically are the advent of a series of recent incidents where air traffic controllers fell asleep during nightshifts and the increase in the number of reported operational errors by air traffic controllers.

As you know, this year, there have been a number of incidents involving air traffic controllers sleeping on duty. And I'm deeply concerned, as I know the chairman of the full committee is, about these incidents.

Some are clearly examples of unprofessional behavior on part of an individual controller. Their actions are totally unacceptable. Controllers do have a professional responsibility to come to work rested. Unfortunately, some have used those incidents to try and tarnish the reputation of a dedicated group of men and women who do work every day to ensure that our airspace is the safest in the world.

Air traffic controllers monitor 35,000 flights daily. Said another way, roughly two million air passengers come into contact with air traffic control each day. We can talk about how the NextGen technologies are going to help us improve this system, but we can't forget that at the heart of our air traffic control system are approximately 15,000 air traffic controllers.

The incidents do serve to highlight the legitimate safety issues of air traffic controller fatigue, particularly those working on the midnight shift. There is no escaping the science that shift work has the potential to disrupt the circadian rhythms of the body and often leads to fatigue.

Fatigue can seriously impair the work performance of individuals, such as air traffic controllers, who perform tasks that require consistent concentration. Ultimately, this raises concerns for safe operations of the air traffic control system.

I applaud Secretary LaHood and Administrator Babbitt for taking some quick actions. I know that these actions will be helpful and hope to improve some of the situation.

The National Transportation Safety Board has examined and made recommendations on air traffic controller fatigue, most recently in the aftermath of the 2006 crash of the Comair 5191 in Lexington, Kentucky.

It took until 2009 for the FAA and NACTA to get their fatigue workgroup underway. My understanding is that they have jointly made a dozen recommendations to mitigate air traffic controller fatigue.

The first two recommendations have to do with allowing air traffic controllers to recuperate during their break shift, particularly in the midnight shift. Historically, the question of allowing air traffic controllers to take a break or nap has been a political one rather than a scientific one. There are decades of science on this issue and we look forward to hearing more about it today.

And I want to say to Dr. Belenky thank you for coming all the way from the West Coast, from Washington State University, and we look to hear more about the Sleep and Performance Research Center and the sciences behind that center.

I am likewise concerned by the 53-percent increase in reported operational errors between Fiscal Year 2009 and 2010. Operational errors are situations where planes come too close to one another in the air. The number of operational errors increased from approximately 1,200 in 2009 to 1,900 last year. The errors were of varying degrees. And I'm sure we'll get into that during the hearing.

On March 2, the Committee asked the DOT IG to conduct an assessment of the FAA's current categorization of operational errors to better understand the impact and actual implications of this.

And last decade, the IG identified the problems with how most FAA facilities self reported operational errors. And the IG expressed concerns that there was a significant potential for under-reporting operational errors.

Beginning in 2008, the FAA made a series of changes. It initiated the Air Traffic Safety Action Program, a confidential reporting system to encourage air traffic controllers to come forward with these reported errors. And it began rolling out an automated reporting of

operational errors through a new software system called the Traffic Analysis and Review Program.

The Committee is trying to understand if the reasons more errors are being reported is because of the FAA finally having a more objective and reliable process or whether we are seeing just an increase in errors.

So I thank all of you for being here today. I look forward to your testimony at the hearing and coming up with answers on how to continue to improve air transportation safety.

I'd like to call on the Chairman of the full Committee if he'd like to make an opening statement.

The CHAIRMAN. I would say to Madam Chair that you said everything I was going to say, so I don't see any reason to repeat it. So I'll put it in the record.

[The prepared statement of Senator Rockefeller follows:]

PREPARED STATEMENT OF JOHN D. ROCKEFELLER IV,
U.S. SENATOR FROM WEST VIRGINIA

Good afternoon and thank you, Senator Cantwell. This is Senator Cantwell's first hearing as Chairwoman of the Aviation Subcommittee. She has picked a timely and important topic.

Today, we're here to talk about the safety of our air traffic control system. In the last 2 months, a series of alarming letdowns by controllers have shined a bright light onto a job that usually works best when we don't hear anything about it.

In February, a Knoxville air traffic controller went to sleep while working the midnight shift. He made a bed on the floor with couch pillows and abandoned his station so he could catch some shuteye.

A month later, a controller at our national airport just across the Potomac River fell asleep on the job. Pilots coming in for a landing got radio silence when they contacted the air traffic control tower and had to land without that controller's guidance.

Other incidents of sleeping controllers have since been reported in Seattle, Orlando, Cleveland, Miami, Lubbock and Reno.

Let's be clear on one thing here and now: it's unacceptable for a controller to fall asleep on the job. If they do, they should be removed immediately. That part is non-negotiable. Someone 5,000 feet in the air should never wonder if the controller on the ground has nodded off.

Air traffic controllers have a unique role. They handle runway traffic, police the skies and must have eagle-eye attention. I have enormous respect for air traffic controllers, most of whom work hard and are dedicated, outstanding professionals. We shouldn't tarnish the whole profession based on the poor judgment of a few.

But that's exactly why we are here today. We can't allow recent questions about the safety of the FAA to permeate air travel.

I commend Administrator Babbitt for taking strong action and hope the witnesses here today can shed some light on these shortcomings and make certain these issues won't happen again.

I'd like to thank the witnesses for taking the time to be here today, and I look forward to your testimony.

Senator CANTWELL. Thank you, Mr. Chairman.

And the Ranking Member of the full Committee, Senator Hutchison.

**STATEMENT OF HON. KAY BAILEY HUTCHISON,
U.S. SENATOR FROM TEXAS**

Senator HUTCHISON. Well, thank you, Madam Chairman. I think you certainly stated the case very well.

I want to welcome you as the Chairman and John Thune as the new Ranking Member of the Subcommittee and look forward to

working with you, especially on FAA reauthorization, which has just been hotlined for the 19th time to be extended.

And I hope that we can come together in the next month and pass a bill that all of us worked very hard to get across the floor of the Senate and is now in conference. So this will be a major mission for your subcommittee.

And your topic, today, of course, is very timely, and I appreciate all of you being here.

I want to say I do think that we have had a safe aviation safety performance, and, in general, the air traffic controllers have done a superb job. We pass 790 million people per year through our system, and there are 29,000 to 30,000 safe flights every day. That is a mark in our favor.

However, of course, in the last 5 months, we have had alarming lapses, and not only the air traffic controllers who went to sleep, but, apparently, one was watching a movie during the time he was on duty.

And I think the air traffic control incidents and near-misses have caused for us to have a hearing. And I think that we have to have a system in place, as you must know, that catches any kind of weakness in the system and takes action to remedy it.

Mr. Babbitt, you are going to be putting 11,000 new controllers in place by the year 2020. There's the turnover, of course. So I hope that we will hear that you are going to be looking at fatigue factors, training, scheduling, and professionalism as we are going into this transition.

Madam Chairman, I have to say that I have a 3 o'clock introduction of a Federal judge candidate, so I'm not going to be able to stay for the whole hearing, but I will certainly look at the record and be very interested in the results. Thank you very much.

Senator CANTWELL. Thank you, Senator Hutchison, and thank you for your leadership on trying to move, along with the Chairman, the bill through the process.

Senator Nelson, would you like to make an opening statement?

**STATEMENT OF HON. BILL NELSON,
U.S. SENATOR FROM FLORIDA**

Senator NELSON. Madam Chairman, an extraordinary number of air traffic controllers do an extraordinary job under exceptional circumstances. But the subject of today's hearing, I think, underscores all the more why we need to move to the next generation of air traffic control.

We are operating off of a series, a constellation of satellites. There will be in the cockpit updated information for the crew to know situational awareness at all times, in addition to what they're being told from the controllers on the ground. And yet we keep dithering and not funding the steps that we should toward the next generation.

It has happened in a lot of our states. Just in April, we had a controller asleep in Miami. In March, we had two controllers that vectored a Southwest Airlines very close to a private aircraft. The next generation of air traffic control would help that situation, but, in the meantime, we've got a problem that we have to address.

By the way, if you can figure out fatigue and sleep on air traffic controllers, it could sure apply to a lot of other professions as well. So I look forward to it. Thank you, Madam Chair.

Senator CANTWELL. Thank you, Senator Nelson, and I'm sure that you do have a very unique perspective on this and we look forward to your questions at the appropriate time.

Mr. Babbitt, we'll start with you. Thank you for being here today and thank you for your testimony, and thank you for your leadership during this period of time.

**STATEMENT OF HON. J. RANDOLPH BABBITT,
ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION**

Mr. BABBITT. Well, thank you very much, and good afternoon to you, Madam Chair, Ranking Member Thune, members of the Subcommittee, full Committee, Chairman Rockefeller and Ranking Member Hutchison. Thank you very much for the opportunity to be here to discuss the issues facing the Federal Aviation Administration.

I know that today's hearing will focus on the safety of our air traffic control system, and I know that I'll probably get some tough questions from you through the course of this hearing about some recent incidents.

But I welcome the opportunity to assure you and assure the traveling public that we remain the safest and the most efficient transportation system in the world, and to let you know that we're also taking a substantial number of actions to improve the level of safety.

Before I address these actions, I think I would be remiss if I were to appear before you and not mention the need for a multiyear reauthorization. We have a tremendous responsibility to enhance the safety of our airspace system and transform it from the radar-based system of the last century to the satellite-based system of tomorrow. To accomplish our goals, the FAA needs a multiyear reauthorization with sufficient funding levels.

As you know, the FAA has not had a steady source of funding for over three-and-a-half years now. Instead, we've relied on 18 short-term extensions of our spending authority. So I'm very pleased that both the House and the Senate have passed reauthorization bills. We very much appreciate your support. It's an important step forward.

However, if the authorized funding levels that were in the House bill—and they are well below what the president proposed in his 2012 budget—if the House levels were appropriated, it would degrade the safe and efficient movement of air traffic.

If we delay today's infrastructure investments, the long-term cost to our Nation, to our passengers, and to our environment will far exceed the cost of going forward with the technology and the infrastructure improvements we need now.

I would like to turn now to the reason for today's hearing and update you on the actions that we have taken regarding fatigue and incidents with air traffic controllers.

Last month, I had the pleasure of traveling with Paul Rinaldi, the President of the National Air Traffic Controllers Association, NATCA, to air traffic control facilities all around the country. We

were on this tour for a call to action, promoting both safety and professionalism among the controllers.

The visits reinforced for me that we have a workforce that is committed to safety 24/7, but the incidents of employees falling asleep on position showed that we have to make changes, and we have. We've made significant changes to long-time scheduling practices to reduce the possibility of fatigue, including establishing a minimum of 9 hours between shifts, and we'll do more.

We've added a second controller on midnight shifts, where appropriate, in facilities where there was only one controller. We've also changed management in critical positions to ensure that we have the right people in the right places.

We've also, unfortunately, found that it was necessary to terminate three controllers who were asleep on the job. This type of behavior is completely unacceptable.

The FAA and NATCA, along with outside experts, have joined together to create 12 recommendations regarding fatigue. We've now entered into formal discussions with NATCA on these recommendations.

I also want to address your concerns today regarding the rise in reported operational errors that we've seen over the last few years. I share your concerns. Everyone at the FAA is personally committed to the safety of our aviation system. Any potential upward trend in errors is deeply troubling.

However, we believe that this trend largely reflects the changes that we've instituted in recent years that encourage the reporting of errors. We're gathering more information than we ever had previously, and that data will allow us to make more informed decisions moving forward to overall enhance the safety of the system.

Our voluntary reporting program is called AT&SAP and we encourage air traffic controllers to report operational errors in exchange for the agency addressing the errors in a non-punitive manner. This is a program similar to one that exists throughout the airline industry.

These reports have given us information about everything from windows that are fogging up in towers to problems with radar equipment and ground markings. In Albuquerque, it showed us that pilots were missing a new hold-short line on the runway. An AT&SAP report fixed the problem and it became a solution instead of an incident.

While the incidents at AT&SAP were not counted as operational errors, I fundamentally believe that this program has helped us create a culture today of reporting within the FAA. And this is ultimately a very positive change that'll enhance safety by enabling us to identify risk and to spot trends.

In addition to this cultural transformation, we've rolled out new software that automatically detects operational errors and then reports them directly to the FAA's quality assurance program for analysis.

Nobody likes to see operational errors, especially me, but we are getting the data today that we need in order to improve safety. The American public trusts us to perform our jobs and make safety the highest priority every day, year in, year out. We're committed to making whatever changes are necessary to preserve the trust and

to continue to provide the safest and most efficient air transportation in the world.

That concludes my opening statement and I'd be happy to answer questions when that time arises. Thank you.

[The prepared statement of Mr. Babbitt follows:]

PREPARED STATEMENT OF HON. J. RANDOLPH BABBITT, ADMINISTRATOR,
FEDERAL AVIATION ADMINISTRATION

Chairwoman Cantwell, Senator Thune, members of the Subcommittee:

Thank you for the opportunity to appear before you today to discuss the issues facing the Federal Aviation Administration's (FAA) air traffic control safety oversight. Several recent incidents and reports have called into question the safety of our Nation's airspace and the professionalism of our air traffic controllers. Obviously, as Administrator, the fact that these incidents occurred and that these questions are being asked is extremely disturbing. Today I will describe the actions that we have taken to address the areas of concern. I want every member of this committee to understand how committed Secretary LaHood and I are to working with National Air Traffic Controllers Association (NATCA) and our controllers to ensure the safety of the system. I believe our Nation's air traffic controllers are dedicated and professional and a key reason why we have the safest aviation system in the world. But we can always improve, and therefore cannot tolerate lapses in judgment when it comes to safety.

In recent weeks, I have been traveling across the country with senior FAA leadership and Paul Rinaldi, the President of NATCA, along with his leadership team, on a Call to Action on Air Traffic Control Safety and Professionalism. The FAA's safety mandate is a tremendous responsibility and air traffic controllers are on the front lines of that mandate, day in and day out. We oversee the safe transportation of nearly two million people per day. That is why recent events have been so troubling. I have been very direct in the conversations I have been having with the FAA's workforce. Any incident that calls into question the professionalism of air traffic controllers cannot and will not be tolerated.

Together with NATCA, I have communicated that, even though we do the right thing over 99.9 percent of the time, we have to do better. We cannot have the flying public believe, even for an instant, that they cannot trust the men and women who are responsible for getting them to their destination safely. So I am asking the workforce to rededicate ourselves to the concept of professionalism. I am calling on all employees to be responsible, not only for our own actions, but for helping to ensure that our colleagues are also committed to excellence. I want to create a safety culture that makes it imperative to report and correct any potentially unsafe condition or action.

I am happy to report that we are working hand in hand with NATCA in our efforts. We both recognize that air traffic controllers have traditionally enjoyed a great deal of respect and admiration, and we do not want to see that perception of their profession tarnished. NATCA's leadership is willing to work hard with us to demonstrate a united front in demanding a new level of excellence. I am proud that FAA's relationship with NATCA has improved to the point where this joint effort is possible. A few years ago, it might not have been. I think we can all agree that working together toward a goal achieves a better result than working at odds.

As this Committee knows, I have been working with the aviation industry since shortly after I became Administrator on the concept of professionalism, and I think we have made some progress in making it a priority. It only makes sense to extend this conversation to the controller workforce. What do I think professionalism means? It means doing the right thing all of the time, even when no one is looking. It means following procedures and ensuring compliance with safety standards. It means looking out for each other and making sure that you correct colleagues who are not upholding these standards. The business of air traffic control is a tremendous responsibility, and I know that the controllers feel that responsibility. That is why they also need to feel that they are supported.

This means, on the management side, that we have a responsibility to address the areas of risk that have been identified. For example, we are looking at how to deal with fatigue, which as this Committee knows is a particularly difficult issue. Part of it is staffing, part of it is scheduling, part of it is education and, yes, part of it is professional responsibility. FAA has been focused on mitigating controller fatigue since well before the recently reported incidents. FAA and NATCA conducted a joint, in-depth assessment of controller fatigue, risks and mitigations beginning

in the fall of 2010. Twelve recommendations are currently under consideration as a result of that review. We want to ensure that we fully understand the impact of any changes made before we make them.

Since the reported incidents, there was an immediate agreement to allow for more recuperative time between shifts; a minimum of 9 hours in between all shifts. In addition, two air traffic controllers are required on duty during the midnight shift at 27 control towers across the country where only one controller had been scheduled previously, including Reagan National Airport here in Washington, D.C. Other scheduling changes have been implemented to accommodate this change without immediately hiring additional controllers. The FAA Academy will expand and update its fatigue management training to help controllers recognize, avoid, and combat fatigue. Not all of the changes are universally welcomed. But I am convinced that adding an extra layer of safety is the right thing to do.

The science of fatigue management for air traffic controllers is still an emerging discipline. There will undoubtedly be continued insights about how to mitigate fatigue and improve safety. Our challenge is to implement the benefit of new insights while still being good stewards of the taxpayer dollar. I look forward to sharing how FAA will move forward in this vital effort.

The recent incidents have come at a time when we have seen an overall increase in the reporting of controller operational errors. This is a serious and complex issue for the FAA and one I would like to take a moment to discuss.

For many years now, the aviation industry has been collecting data provided voluntarily by airline employees that it and the FAA have been analyzing. There is universal agreement that having access to safety information we would otherwise not know about has allowed us to identify trends and better understand the areas of risk that exist in the system so that we can focus our collective efforts on minimizing those risks. The FAA believes that this approach has already contributed to the remarkable decline of commercial aviation accidents; a decline of 82 percent since the late 1990s. With that kind of recognized success, it only makes sense to look for a way to expand this approach to air traffic control.

In late 2009, the FAA implemented confidential reporting systems and incentives for controllers to provide information directly to supervisors. We were seeking to achieve the same gains in knowledge and awareness of safety conditions in the air traffic control system that we did with the airlines. The reporting program we implemented, the Air Traffic Safety Action Program (ATSAP), was similar to those applicable for airlines. Further, we deployed additional technology to collect safety data. It is certainly fair to note that when the airlines implemented confidential reporting and improved flight data recording systems, the safety data available increased by a factor of 10 or more, so there was certainly an expectation that some significant increase in data reported with regard to air traffic would result. The important thing to remember is that this is data that we want. This is data that we need. This is data that will save lives.

The above noted changes generated over 28,000 confidential safety reports made to ATSAP on numerous safety issues. Although ATSAP filings do not get counted as operational errors, FAA believes that the improved recording systems combined with the overall safety culture that ATSAP and other programs are designed to foster, are at least partially responsible for the 53 percent increase in the number of losses of separation between FY 2009 and FY 2010.

The majority of the time, errors and other safety reports provide the FAA with knowledge critical to identifying and correcting potential risk. The more events the FAA is made aware of, whether through digital recording programs or voluntary reporting systems, the greater the opportunity to resolve the conditions that resulted in those errors. The only way to address system risk is to have as much data available as possible to identify problem areas, determine root cause and apply sustainable correction. We are now poised to tackle the task of fundamentally addressing the issues that contribute to operational errors and other safety occurrences.

But voluntary disclosure doesn't necessarily provide everything we need, which is why we are also relying on technology to inform us of errors that might otherwise not get reported. We have begun using the Traffic Analysis Review Program (TARP), a new software tool that will automatically detect losses of separation, collect data, and report them directly to FAA's quality assurance group for analysis. TARP covers the Terminal area, where we have the highest degree of congestion. A similar system was implemented in the En Route environment several years ago. While we are still discussing the implementation of this program with NATCA, we anticipate its use on a 24/7 basis within this fiscal year.

An important thing to note is that all operational errors are not created equal. Most operational errors are categorized through a system that reflects how much of the safety zone was breached. Most errors are classified based on severity as A,

B, or C, with A being the closest in range and C the furthest apart. Errors in the A category are generally the most troubling. Other losses are classified as “Other” or “miscellaneous” in order to capture those errors where such precise measurements are not possible, for example, non-radar, oceanic, terrain, procedural or equipment errors.

The table below is based on FAA data collections on separation events since 2007. The large increase in reports filed between the end of 2009 and the end of 2010 is concurrent with the implementation of voluntary reporting programs and additional electronic data collection.

Category	FY 2007	FY 2008	FY 2009	FY 2010
A	34	28	37	43
B	256	318	292	400
C	557	663	618	1,059
Other	193	340	286	385
Total	1,040	1,349	1,233	1,887

In 2010, 1,887 errors were reported, of which 443 were classified as A or B. To put these numbers in context, there were more than 133 million Tower, Tracon and En Route air traffic control operations during the same time period in 2010. While the data has not been subject to a statistical validation or significance test, it appears that error rates in the most serious incident categories (A and B) are lower than the overall error rate. I think it is fair to say that, while any error is troubling and taken very seriously, the numbers above suggest that these types of errors are a relatively a rare event.

So in conclusion, I would like to reiterate two important points. First and foremost, the types of controller incidents that have reflected poorly on the FAA’s dedication to its safety mission are being addressed aggressively, and, where possible, collaboratively to identify and mitigate risks, whether they stem from scheduling, staffing, technology, training or a combination of thereof. Second, I am committed to obtaining the most information possible to understand how to make the system safer. I take the rise in reported errors very seriously, but it is vital for everyone to understand how important information is. I know how disconcerting it is for the public to hear on the news that there are flaws or risks in the system. But it is essential for the public to put those stories into context and recognize that the safety record of commercial aviation is not an accident—that it is based on the use of critical information, to make informed decisions. These two points work hand in hand. Information is vital to improve safety, but where information discloses inappropriate actions or attitudes, those individuals who cannot meet the standards of professionalism and proficiency that FAA demands will be subject to retraining or replacement, as appropriate.

This has been a difficult time for all of us who are dedicated to aviation safety. Our commitment is strong and enduring. But I am convinced that these challenges give us the opportunity to move forward in a positive and productive way. I look forward to working with Congress, FAA’s workforce, industry and the public to implement improved standards that benefit the safety of a system that is both the most complex and the safest in the world.

That concludes my statement. I will be happy to answer your questions at this time.

Senator CANTWELL. Thank you, Mr. Babbitt. We’ll look forward to that opportunity.

Mr. Scovel, thank you very much. You can start. Press the red button there and—

**STATEMENT OF HON. CALVIN L. SCOVEL III, INSPECTOR
GENERAL, U.S. DEPARTMENT OF TRANSPORTATION**

Mr. SCOVEL. Mr. Chairman, Madam Chairman, Ranking Members Hutchison and Thune, members of the Subcommittee, thank you for inviting me to this timely hearing on FAA’s air traffic control system. Recent incidents, including several high-profile operational errors, underscore the need for improved oversight of this system.

Today, I will discuss longstanding concerns about FAA's process for reporting operational errors and managing the Nation's controller workforce.

Over the past decade, we in DOT's Office of Inspector General have repeatedly raised concerns about FAA's reliance on controllers to report operational errors and FAA's failure to uncover reporting inaccuracies. Our audit and investigative work has shown that some operational error reports were misclassified as nonevents while others were intentionally manipulated to cover up errors.

FAA's recent deployment of TARP, its automated reporting system for the terminal environment, should help reduce these weaknesses. However, concerns remain about FAA's efforts to accurately count the number of operational errors and identify troubling trends.

For example, it's unclear how FAA will use another recently implemented tool, the LoSS Index to improve its operational error data and assess risks. Without reliable reporting systems and processes, FAA's data on operational errors have little value.

Recent FAA data indicate that operational errors have increased substantially in the past year. However, FAA officials have stated that the increase is likely due to improved reporting practices, not to an actual rise in breaches of aircraft separation standards.

We recently initiated two audits to explore these issues in depth. While a lack of trend analyses makes it difficult to identify and target the root causes of operational errors, several unresolved controller workforce challenges may contribute to these errors.

First, NTSB identified controller fatigue as a potential contributing factor in several operational errors. However, FAA investigations of operational errors do not always develop adequate data on controller fatigue.

Further, our audit of three complex air traffic control facilities in the Chicago area determined that minimal rest hours between shifts, on-the-job training and scheduled overtime may contribute to fatigue.

In June 2009, we recommended that FAA determine the extent to which fatigue could be causing operational errors and to identify and address root causes of fatigue. The NTSB and an FAA workgroup have also made numerous recommendations to minimize sleep debt. To date, these recommendations have not been implemented.

Second, FAA faces challenges in achieving its goal to replace retiring controllers with 11,000 new controllers by 2020, in large part because requirements in its training contract were not well defined and the contract costs exceeded the first 2 years' estimates by as much as 35 percent.

Because the costs were so far above estimates, FAA has been unable to implement new approaches and programs that were expected to improve the quality and timeliness of controller training. At the same time, FAA lacked adequate metrics to measure the effectiveness of its controller training program and to make needed adjustments. In response to our recommendation, FAA recently established more complete metrics for evaluating its training program and its effectiveness.

Finally, FAA's controller placement process does not adequately consider controllers' knowledge, skills and abilities when assigning them to FAA's more than 300 air traffic control facilities.

As we reported in April 2010, FAA assigns new controllers to facilities based primarily on their choice and available vacancies not on complexity of operations.

As a result, FAA is assigning new controller candidates to some of the Nation's busiest and most complex air traffic control facilities with little consideration of whether they have the required skill sets to effectively and safely manage traffic at those locations.

More than 20 facilities that FAA deemed critical to NAS operations have a significant percentage of their controller workforce in training.

In 2009, we reported that Southern California TRACON faced the prospect of having over 100 controllers in training, more than 40 percent of its workforce, potentially overwhelming the facility's training capacity.

More recently, we found that Denver terminal radar approach control has 43 percent of its workforce in training. And LaGuardia air traffic control tower has 39 percent in training.

We are currently reviewing FAA's plans to provide its critical facilities with the appropriate controller staffing, training resources and other support and expect to report on our results later this year.

In closing, I want to commend FAA for ramping up its efforts to tackle these complex challenges. Clearly, sustained commitment will be critical to ensuring an alert, competent and certified controller workforce.

Madam Chairman, this concludes my prepared statement. I'd be happy to address any questions you or members of the Subcommittee might have.

[The prepared statement of Mr. Scovel follow:]

PREPARED STATEMENT OF HON. CALVIN L. SCOVEL III, INSPECTOR GENERAL,
U.S. DEPARTMENT OF TRANSPORTATION

Madam Chairman, Ranking Member Thune, and members of the Subcommittee,

Thank you for inviting me to this important hearing on the Federal Aviation Administration's (FAA) Air Traffic Control (ATC) system. As you know, the U.S. aviation system is one of the safest in the world—due in part to the dedicated professionals in FAA and throughout the aviation industry. However, several recent incidents have raised concerns about the safety of the ATC system. These include reports of on-duty controllers falling asleep as well as several high-profile operational errors, when controllers failed to maintain minimum separation distances between aircraft. These incidents are occurring at a time when veteran controllers are retiring at unprecedented rates and more new controllers are entering the workforce, requiring comprehensive training and placement efforts.

Administrator Babbitt has acted quickly to respond to these concerns, including standing up a task force of external and internal experts to review controller training, qualifications, and placement. The group is tasked with completing their efforts by the fall of 2011. However, further steps are needed to address the challenges of managing and overseeing the performance of FAA's controller workforce.

Over the past decade, we have developed a comprehensive portfolio of work involving ATC operations and addressing critical safety and workforce management issues. My testimony today will focus on four areas involving the ATC workforce that we see as key for effectively transitioning to the next generation of air traffic control: (1) identifying and addressing the causes of operational errors, (2) mitigating controller fatigue risks, (3) adequately staffing the controller workforce, and (4) training new controllers.

In summary, while FAA has acted quickly to address many of the recent incidents involving the ATC system, FAA has yet to fully identify and mitigate risks related to the management and operations of its controller workforce. FAA statistics show a recent significant increase in operational errors; however, FAA has not yet determined whether the increase is a result of better reporting systems or whether there are trends that require mitigating actions. As recent media reports have shown, fatigue is a significant concern for the controller workforce that FAA must address. Our work and that of the National Transportation Safety Board (NTSB) has identified a series of factors that create an inherent risk for controller fatigue, but FAA has not yet fully implemented recommendations for mitigating that risk. FAA is also taking action to hire and train nearly 11,000 new controllers through Fiscal Year 2020. However, our work shows that FAA's placement process does not adequately consider new controllers' knowledge, skills, and abilities when assigning them to ATC facilities, and expected innovations to improve the quality and timeliness of controller training have not been realized. Ensuring a sufficient, competent, and well trained controller workforce is critical to the safe and efficient operation of the National Airspace System (NAS).

Weaknesses in Reporting Limit FAA's Ability to Identify Trends in Operational Errors

FAA statistics indicate that operational errors have risen significantly over the past year. However, it is not clear whether this reported increase is due to more operational errors being committed or to improved reporting practices that have allowed FAA to capture a more accurate count of those operational errors that have been committed.

According to FAA data, the number of operational errors by air traffic controllers increased by 53 percent—from 1,234 to 1,887—between Fiscal Years 2009 and 2010. However, FAA officials acknowledge that the increase is likely due to improved reporting practices. Specifically, FAA states that the introduction of voluntary, non-punitive safety reporting programs—such as the Air Traffic Safety Action Program (ATSAP)¹—has encouraged controllers to voluntarily report operational errors. The reported increase could also be the result of FAA's implementation of the Traffic Analysis and Review Program (TARP), which automatically identifies when operational errors or other losses of separation between aircraft occur at terminal facilities. FAA's recent implementation of TARP represents substantial progress in addressing reporting weaknesses. If used effectively and consistently at all terminal facilities, TARP could be a significant tool for identifying trends in operational errors and addressing contributing factors.

Historically, FAA's oversight of operational error self-reporting has been problematic. Since 2000, our work on operational errors has repeatedly raised concerns that nearly 300 FAA terminal facilities relied solely on controllers to self report errors. In some cases, we found that the self-reporting process was subject to intentional manipulation. For example, in both 2005 and again in 2008, our investigations at the Dallas/Fort Worth Terminal Radar Approach Control (DFW TRACON) facility found that air traffic managers at the TRACON intentionally misclassified operational errors as either pilot deviations or "non-events"² to reduce the number of operational errors reported at that location. Our 2008 investigation identified 62 operational errors and deviations that were either incorrectly reported as pilot deviations or misclassified as "non-events."² Further, FAA's oversight processes failed to uncover this practice despite FAA's prior assurances that it would not allow operational errors to go unreported. Our recommendations included expediting the deployment of the automated TARP reporting system at DFW TRACON because of the facility's pervasive problems with self reporting.

Concerns remain about whether FAA is accurately counting the number of operational errors and sufficiently identifying the trends that contribute to them. For example, it is unclear how ATSAP reports are factored into FAA's current counts of operational errors.

Furthermore, NTSB has raised concerns about the reliability of FAA's process for assessing and reporting incidents involving the loss of separation between aircraft and is currently reviewing airline reports of Traffic Collision and Avoidance Systems (TCAS) advisories.³ Since NTSB issued its final rule requiring aircraft operators to

¹ATSAP is intended to better capture the actual number of operational errors and identify and address their root causes.

²Non-events are those incidents that facility personnel reviewed but determined there was no loss of separation.

³An onboard TCAS issues advisories for pilots to take evasive actions when the system detects a potential collision with other aircraft.

report certain TCAS advisories in January 2010, the Board has received nearly 950 reports of these collision advisories and has initiated investigations into 9 of the more serious incidents.⁴

Further concerns relate to FAA's recent implementation of the new System Loss of Standard Separation (LoSS) Index, which is designed to capture each incident where aircraft fly closer than separation standards permit.⁵ It is unclear how FAA will use LoSS to assess operational error risks or improve its error statistics. At the request of this Committee and others, we recently initiated two audits to assess FAA's implementation and oversight of ATSAP and evaluate FAA's process for tracking and reporting loss of separation events and its subsequent efforts to analyze and mitigate identified risks through the LoSS process.

Clearly, there are a number of questions regarding what is and is not reported in FAA's operational error statistics, and we plan to answer these questions in our upcoming audits. However, the fact that operational errors pose real safety risks is undisputed. FAA needs good systems and processes that accurately capture operational errors so that the true magnitude of these incidents is known. FAA needs this data so it can trend operational errors, identify their root causes, and develop actions to effectively address and mitigate them. As we progress in our audits into ATSAP and LoSS, we will keep this Committee apprised of our findings regarding this critical issue.

FAA Has Not Fully Implemented Recommendations to Identify and Mitigate Fatigue Risks

Recent reports of controllers falling asleep while on duty underscore the need for FAA to take actions to mitigate controller fatigue. At the request of Congress, in 2009 we evaluated controller fatigue issues at three busy and complex ATC facilities in the Chicago area and identified a number of factors that could create potential fatigue conditions for controllers. These factors included minimal hours between shifts for rest and counter-rotational shifts with progressively earlier start times, on-the-job training (OJT), and scheduled overtime. We also found that FAA does not consistently include fatigue issues as part of its normal operational error investigatory process, even though NTSB has identified fatigue as a potential contributing factor in several operational errors. 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. We have made a number of recommendations to address these concerns, but FAA has not yet implemented all of them.

Scheduling Practices and OJT May Create Risks for Controller Fatigue

Our statistical analyses of schedule information and time and attendance data identified factors that could create fatigue conditions at all three of the Chicago air traffic control facilities we reviewed (Chicago O'Hare, Chicago TRACON, and Chicago En Route Center). For example, we found that most controllers at two of 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.⁶ Controllers typically worked a type of schedule commonly referred to as a "2-2-1 rotation." While the configuration of the 2-2-1 rotation 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 (see table 1).

⁴After review by NTSB, many of these reports were considered "nuisance alerts" (*i.e.*, situations in which there was no collision risk but TCAS generated a resolution advisory). However, about 260 reports required additional data in order for NTSB to understand and evaluate the circumstances that caused the apparent conflict and to determine whether further action was warranted.

⁵The new tool calls for the investigation and analysis of all separation losses, not just operational errors. Pilot deviations or miscellaneous losses such as emergency descent for pressurization are also included. Instances of non-compliance with separation standards will be designated as LoSS events.

⁶FAA 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 was planning on amending FAA Order 7210.3 to increase the time available for rest from 8 hours to 10 hours.

Table 1. Example of a 2–2–1 Schedule Rotation Before FAA’s Recent Changes

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

*Rest periods between shifts close to FAA minimum requirements.

Most controllers had at least one “quickturn” during the week, a schedule characterized by shifts with minimum rest periods between them. In addition, we found that none of the three locations had established procedures for rotating controllers through more complex facility positions during scheduled shifts, even though the complexity of these positions can vary extensively.

We also found that certified controllers at all three facilities conducted OJT on a regular basis, which requires a high level of concentration and focus on the part of the veteran controller. The time spent conducting OJT in our samples ranged from 1 to 5 days per week. ATC managers 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.

We made a series of recommendations for mitigating potential fatigue, including amending FAA ATC orders to: (1) increase rest time between shifts from 8 hours to 10 hours, (2) increase the time available for rest after working a midnight shift, and (3) allow controllers to rest when not controlling traffic. FAA agreed with our recommendations but subsequently formed a workgroup with the National Air Traffic Controllers Association (NATCA) to further review controller fatigue issues. The workgroup completed its study and presented its findings to the Administrator and union president in January 2011 along with 12 recommendations. To date none of the recommendations have been implemented, but FAA and NATCA expect to finalize their proposed actions later this year.

NTSB has also made numerous controller safety recommendations related to fatigue issues, such as rest periods between shifts, scheduling practices, and fatigue awareness training. For example, following the 2006 fatal crash of Comair flight 5191, in which NTSB examined controller fatigue, NTSB specifically recommended that FAA work with NATCA to revise controller work-scheduling policies and practices and modify shift rotations to minimize sleep debt and decreased cognitive performance. NTSB’s recommendations also remain open.

FAA Does Not Know the Extent to Which Fatigue Contributes to Operational Errors

NTSB has identified fatigue as a potential contributing factor in several operational errors.⁷ Yet FAA’s investigations into the causes of operational errors do not consistently address human factors, such as fatigue and situational awareness. In our evaluation of controller fatigue issues at the three Chicago facilities, we found that their operational error investigations did not consistently include a review of factors that could cause fatigue. For example, final operational error reports that we reviewed at the Chicago En Route Center 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.

Accordingly, in our June 2009 report we recommended that FAA include potential fatigue factors, such as time off between shifts, as a standard part of its operational error investigation process to determine the extent that fatigue could be causing these incidents and identify actions to address the root cause.⁸ While FAA agreed with our recommendation, action has been slow. Last month, in a letter to the Chairman of the House Committee on Government Oversight and Reform, we identified this recommendation as our most important safety recommendation that remains open.⁹ FAA expects to fully address the issue next month.

⁷ In its April 10, 2007, recommendation letter to FAA and NATCA following the crash of Comair flight 5191, NTSB discussed four previous air carrier incidents in which fatigue contributed to controller errors. Three of these incidents involved runway incursions in Chicago, IL, on March 23, 2006; Los Angeles, CA, on August 19, 2004; and Seattle, WA, on July 8, 2001. The fourth incident involved a departure from a closed runway in Denver, CO, on September 25, 2001.

⁸ OIG Report Number AV–2009–065, “Air Traffic Control: Potential Fatigue Factors,” June 29, 2009. OIG reports are available on our website at <http://www.oig.dot.gov>.

⁹ Correspondence number CC–2011–024. “Letter to Chairman Issa on OIG’s Open Audit Recommendations,” April 29, 2011.

Past FAA Requirements for Staffing Midnight Shifts Were Not Consistently Followed

Recent media coverage of controllers who fell asleep while on duty has drawn attention to the fact that some air traffic control facilities were staffed with only one controller during midnight shifts. Following the 2006 fatal crash of Comair flight 5191, similar concerns were raised regarding single staffed midnight shifts when FAA policies issued in 2005 required that two controllers be present in towers that provide both tower control and radar services. At the request of the then Ranking Member of the House Committee of Transportation and Infrastructure and the then Ranking Member of the House Subcommittee on Aviation, we reviewed FAA policies that prohibited one controller from performing both radar and tower controller duties during midnight shifts and determined the extent to which the towers covered by the policies complied with them. We reported in 2007 that the policies were not being followed consistently.¹⁰ Based on a sample of midnight shifts, we were able to statistically project that approximately 11.1 percent of the total midnight shifts included in our review period were staffed with only one controller.¹¹

More importantly, we found evidence suggesting that the radar and ground control duties were combined for substantial periods of time even when there were at least two controllers on duty. For example, at several facilities, position logs we reviewed showed that all positions on midnight shifts were routinely combined and the two controllers on duty alternated between working the one position and taking breaks. In response to recent events, Administrator Babbitt recently stated that FAA will place two controllers on midnight shifts at 27 control towers not covered by the 2005 policy. As part of these actions, FAA needs to implement corresponding controls identifying when both controllers are expected to be on position.

FAA Faces Management Challenges in Training its Controller Workforce

FAA is taking action to hire and train nearly 11,000 new controllers through Fiscal Year 2020 to replace the large numbers of retiring controllers hired after the 1981 ATC strike. However, training and certifying new controllers have been a challenge, in large part because FAA's initial controller training requirements in its training contract were not well defined and the contract costs far exceeded the first 2 years' estimates. Because costs for basic training needs were so far above estimates, current training methods have remained essentially unchanged and FAA has not been able to implement new approaches and pilot programs expected to improve the quality and timeliness of controller training. In addition, FAA's metrics for managing its controller training program do not provide a true picture of the effectiveness of its training efforts.

Expected Innovations in Facility Controller Training Have Not Been Realized

Training new controllers to the Certified Professional Controller (CPC) level is important for two reasons: (1) only CPCs are qualified to control traffic at all positions of their assigned area, and (2) only CPCs certified for at least 6 months at their assigned location can become OJT instructors for other new controllers. Total training can take up to 3 years, and facility training is the lengthiest and most expensive part of new controller training. In 2008, FAA awarded a contract to Raytheon to administer the Air Traffic Controller Optimum Training Solution Program (ATCOTS), a critical component of FAA's plans to hire and train 11,000 new controllers by 2020. In designing and executing the ATCOTS program, however, FAA did not fully consider the number of controllers that needed training under the contract. For example, the contract solicitation stated that bidders were expected to train approximately 4,000 developmental controllers. However, Raytheon estimated that about 5,620 controllers needed training—41 percent more than FAA originally estimated. As a result, FAA now faces significant challenges in training a new generation of controllers to replace those who are retiring.

As we reported last September,¹² ATCOTS contract costs and fees to date exceeded baseline estimates by 35 percent during the first year of the contract (from \$81

¹⁰ OIG Report Number AV-2007-038, "Review of Staffing at FAA's Combined Radar Approach Control and Tower With Radar Facilities," March 16, 2007.

¹¹ Our review of 20 randomly selected weeks of staffing data for midnight shifts at 15 of the 62 facilities in our universe (a total of 2,100 shifts) identified 234 shifts where only 1 controller was scheduled on the midnight shift. Based on the results of our sample, we can statistically project (with a 95-percent confidence level) that approximately 2,563 or 11.1 percent of the 23,002 total midnight shifts (at the 62 facilities in our universe) were staffed with only 1 controller between August 28, 2005, and September 2, 2006.

¹² OIG Report Number AV 2010-126, "FAA's Air Traffic Controller Optimum Training Solution Program: Sound Contract Management Practices Are Needed To Achieve Program Outcomes," September 30, 2010.

million to \$109 million) and increased by 20 percent during the second year (from \$91 million to \$109 million). The impact of these cost overruns is that funds have only been sufficient to support existing training methods and procedures, not innovative training programs.

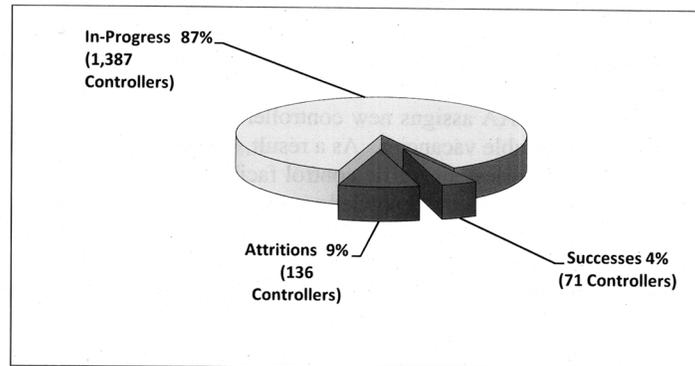
FAA is taking action to address many of the issues identified during our audit. For example, FAA has added a new planning tool for evaluating the level of instructor staffing at air traffic facilities. FAA is also establishing training priorities to ensure that costs remain within baseline estimates. However, it will be difficult for FAA to achieve ATCOTS's original training goals or implement any training innovations without significantly modifying the existing contract.

FAA Metrics Do Not Provide a Complete Picture of the Effectiveness of Its Training Program

Accurately assessing the controller training program is critical for ensuring a sufficient number of new hires are prepared to replace retiring veteran controllers and are assigned to the appropriate level and type of facility. Such assessments can also alert FAA to weaknesses in its training program that need to be addressed. However, as we recently reported,¹³ FAA's metrics for measuring the effectiveness of the controller training program are inadequate to identify weaknesses and make appropriate and timely adjustments to the program. For example, for Fiscal Year 2009, FAA reported a program attrition rate of 9 percent. However, as Figure 1 shows below, the success rate was only 4 percent while 87 percent of the controllers were still completing their initial training, which can take 2 to 3 years.

Figure 1. FAA's New Controller Training Data for Class Hired in FY 2009

Figure 1. FAA's New Controller Training Data for Class Hired in FY 2009



When we assessed the number of controllers who successfully completed training during a given period of time against those who did not, we found a significantly higher attrition rate. For example, we grouped the controllers by the Fiscal Year they ended training and then identified whether they ended the training successfully or unsuccessfully. Our analysis showed that the attrition rate for the controllers who ended their initial training in Fiscal Year 2009 was 21 percent and their success rate was 79 percent.

We recommended steps FAA should take to measure and present a more complete picture of the effectiveness of its air traffic controller training program. FAA agreed and is now using more complete metrics for evaluating its training successes.

Controller Staffing and Placement Can Be Improved

FAA's placement process does not adequately consider new controllers' knowledge, skills, and abilities when assigning them to FAA's more than 300 ATC facilities, which vary extensively in the number and complexity of operations. In addition, the recent surge of newly hired controllers means there are fewer certified controllers in the workforce to control air traffic and provide OJT for new controllers. At some critical locations, the percentage of new controllers in training is extremely high, which could impact operations not only at that location but potentially throughout the NAS.

¹³ OIG Report Number AV-2011-072, "FAA Must Improve Its Controller Training Metrics To Help Identify Program Needs," March 30, 2011.

FAA Does Not Adequately Consider Aptitude When Placing New Controllers

FAA has streamlined its hiring process, and over the past several years successfully met its hiring goals for new controllers. However, FAA's process for placing new controllers once they are hired does not sufficiently evaluate their aptitude before assigning them to complex facilities. As we reported in April of last year,¹⁴ FAA does not use results of the Air Traffic Selection and Training Test (AT-SAT) to match new controllers' aptitude to the level of facility.¹⁵ Instead, FAA assigns new controllers to locations based primarily on their facility choice and available vacancies. As a result, new controller candidates are being assigned to some of the busiest air traffic control facilities in the Nation with little consideration of whether they have the knowledge, skills, and abilities necessary to become certified controllers at those locations. We recommended that FAA place new controllers based in part on their performance at the FAA Academy. FAA partially agreed with our recommendation and initiated a study, which the Agency expects to complete by December 2012.

Critical Facilities May Need More Certified Professional Controllers To Maintain Continuity of Operations

The increase in hiring has changed the makeup of the controller workforce. Currently, new controllers comprise up to 25 percent of the ATC workforce compared to 15 percent in 2004. However, this percentage can vary extensively by location. For example, Seattle TRACON has 46 percent of its controller workforce in training, while St. Louis TRACON has no controllers in training. Our work at three facilities in California (LAX, Southern California TRACON (SCT), and Northern California TRACON)¹⁶ showed that FAA needs to take additional measures to ensure that these critical locations have enough certified controllers to ensure continuity of safe operations. For example, SCT had the highest percentage of existing and planned new controllers of the three facilities and had experienced a sharp decline in CPCs over the past 5 years. A significant issue was that SCT expected to have more than 100 controllers in training—more than 40 percent of its workforce—which could overwhelm the facility training capacity. We identified four specific focus areas that FAA needed to address: (1) making these locations a top priority in FAA's ongoing efforts to validate staffing ranges, (2) expanding the use of relocation and retention incentives, (3) providing enough instructors and other training resources, and (4) ensuring appropriate use of overtime hours.

Based on our results at Southern California, we initiated a review of staffing at other critical NAS facilities. We identified more than 20 facilities that, if operations had to be curtailed due to a lack of certified controllers, could impact the entire NAS. FAA agreed that these facilities are critical. Some of these facilities currently have a significant percentage of their workforce in training or eligible to retire. For example, the Denver TRACON has 43 percent of its workforce in training, and LaGuardia ATC Tower has 39 percent. We are reviewing FAA's plans to provide its critical facilities with appropriate controller staffing, training resources, and other support necessary to ensure continuity of facility operations. We expect to report on our results later this year.

Conclusion

While FAA's recent actions to improve ATC operations are steps in the right direction, sustained oversight and commitment are needed to identify the root causes of ATC incidents and address longstanding concerns. Until FAA takes action to develop comprehensive data (such as accurately capturing all operational errors), conduct astute trend analyses, and develop timely action plans to address controller workforce risks and vulnerabilities, FAA cannot ensure it has a sufficient number alert, competent, and certified controllers needed to effectively manage the challenges of the next generation of air traffic control.

Madam Chairman, this concludes my prepared statement. I would be happy to address any questions you or other Members of the Subcommittee may have.

¹⁴ OIG Report Number AV-2010-049, "Review of Screening, Placement, and Initial Training of Newly Hired Air Traffic Controllers," April 1, 2010.

¹⁵ Air traffic control facilities are categorized by levels (4 through 12) based on the complexity and number of operations. Level 4 facilities are the least complex, while Level 12 are the most complex.

¹⁶ OIG Report Number AV-2009-047, "Controller Staffing at Key California Air Traffic Control Facilities," April 23, 2009.

Exhibit A. Significant OIG Air Traffic Control Recommendations and FAA Actions Taken in Response

Date	OIG Recommendation	FAA's Actions Taken in Response
December 2001	Develop a strategy, in conjunction with OASIS deployment, to consolidate the 61 existing Automated Flight Service Stations.	FAA completed an A-76 study and contracted out its Flight Service Stations in 2005 at an estimated savings of \$1.7 billion.
September 2003	Establish milestones for completing a national database on all MOUs	FAA developed the national database for controlling MOUs at the national level.
June 2004	Compile national statistics and establish a baseline to better manage the time and costs associated with the controller OJT process.	FAA established the National Training Data base to manage and track controller training at the national level.
June 2004	Establish a system to uniformly estimate controller attrition by location.	FAA published the 4-year attrition estimates by location in the 2006 and 2007 Controller Workforce Plan.
June 2004	Develop an assessment process for identifying a new controller's potential to certify at a certain facility level and use this information in placing newly hired controllers.	FAA concurred and stated it was evaluating data gathered from AT-SAT scores to determine whether this information can improve the controller placement process. FAA has not yet completed this evaluation.
May 2005	Initiate the planned assessment of the current staffing standards for each facility.	FAA completed its efforts to revise the standards for towers and en route facilities in 2007, and completed revised standards for TRACON facilities in 2009.
February 2007	Include in the Controller Workforce Plan (CWP) the staffing ranges for each facility.	FAA included staffing ranges and actual on board numbers for each facility in the CWP.
April 2008	Permanently change DFW TRACON management team responsible for the misclassification of operational errors.	FAA removed the facility manager and assistant manager and assigned acting managers until permanent replacements were selected.
April 2008	Expedite the early deployment of TARP at DFW TRACON from its current date of 2011.	FAA accelerated the implementation of TARP to the end of FY 2008.
June 2008	Include in the CWP the actual number of CPCs, CPC-ITs, and developmental controllers by location.	Beginning in 2009, FAA listed the composition of the controller workforce by location.
June 2008	Designate authority and responsibility for oversight and direction of the facility training program at the national level.	FAA delegated authority for facility training to the Manager for Technical Training and Facilities Oversight through Order 3120.4M.
March 2009	Develop milestones for implementing Traffic Analysis and Review Program (TARP) as a full-time separation conformance tool	FAA plans to completely implement TARP by September 2011.
June 2009	Expand operational error investigatory requirements to include more detailed information on fatigue factors, such as overtime, OJT, and work schedules.	The next version of FAA's Air Traffic Safety Action Program submitter report, scheduled for implementation in summer 2011, will contain the fatigue data capture questions.
September 2010	Ensure that the ATCOTS program office has enough qualified personnel to oversee the contractual, financial, and operational aspects of the program.	FAA estimates that additional personnel will be added by December 31, 2011.

Exhibit B. OIG Published Reports on ATC Issues since 2001

Report Number	Report Title	Date Published
AV-2002-064	Automated Flight Service Stations: Significant Benefits Could be Realized by Consolidating AFSS Sites in Conjunction with Deployment of OASIS	December 2001
AV-2003-040	Operational Errors and Runway Incursions: Progress Made, but the Number of Incidents is Still High and Presents Serious Safety Risks	April 2003
AV-2003-059	FAA's Management of and Control Over Memorandums of Understanding	September 2003

Exhibit B. OIG Published Reports on ATC Issues since 2001—Continued

Report Number	Report Title	Date Published
AV-2004-060	Opportunities To Improve FAA's Process For Placing and Training Air Traffic Controllers in Light of Pending Retirements	June 2004
AV-2004-085	Audit of Controls Over the Reporting of Operational Errors	September 2004
AV-2005-060	Controller Staffing: Observations on FAA's 10-Year Strategy For The Air Traffic Controller Workforce	May 2005
AV-2006-021	FAA Has Opportunities to Reduce Academy Training Time and Costs by Increasing Educational Requirements for Newly Hired Air Traffic Controllers	December 2005
AV-2006-050	Report on the Air Traffic Organization's Management Controls Over Credit Hours	June 2006
AV-2007-032	FAA Continues To Make Progress In Implementing Its Controller Workforce Plan, But Further Efforts Are Needed In Several Key Areas	February 2007
AV-2007-038	Review Of Staffing At FAA's Combined Radar Approach Control and Tower With Radar Facilities	March 2007
AV-2007-048	Controls Over the Federal Aviation Administration's Conversion of Flight Service Stations to Contract Operations	May 2007
AV-2007-050	Progress Has Been Made in Reducing Runway Incursions, but Recent Incidents Underscore the Need for Further Proactive Efforts	May 2007
AV-2008-055	Review of the Air Traffic Controller Facility Training Program	June 2008
AV-2009-045	FAA's Process for Reporting and Investigating Operational Errors	March 2009
AV-2009-047	Controller Staffing at Key California Air Traffic Control Facilities	April 2009
AV-2009-059	Training Failures Among Newly Hired Air Traffic Controllers	June 2009
AV-2009-065	Air Traffic Control: Potential Fatigue Factors	June 2009
AV-2010-049	Review of Screening, Placement, and Initial Training of Newly Hired Air Traffic Controllers	April 2010
AV-2010-071	Review of FAA's Call to Action Plan For Runway Safety	July 2010
AV-2010-126	FAA's Air Traffic Controller Optimum Training Solution Program: Sound Contract Management Practices Are Needed To Achieve Program Outcomes	September 2010
AV-2011-072	FAA Must Improve Its Controller Training Metrics To Help Identify Program Needs	March 2011

Note: OIG reports are available on our Website at <http://www.oig.dot.gov>.

Senator CANTWELL. Thank you, Mr. Scovel.
Mr. Rinaldi, welcome to the hearing. Thank you for your testimony.

**STATEMENT OF PAUL M. RINALDI, PRESIDENT,
NATIONAL AIR TRAFFIC CONTROLLERS ASSOCIATION**

Mr. RINALDI. Thank you, Chairman Rockefeller and Madam Chair Cantwell—

Senator CANTWELL. Is your microphone on? Is it—

Mr. RINALDI. Is it on? There we go.

Chairman Rockefeller, Madam Chair Cantwell, Ranking Member Thune, members of the Committee, I'm the President of the National Air Traffic Controllers Association, who represents over 15,000 air traffic controllers within the FAA.

Our controllers are dedicated professionals with a passion to run the safest, most efficient system in the entire world. According to a recent MIT study, you're safer on a commercial airline in this country than you are on an escalator.

Last year, we had over nine million commercial flights with zero fatalities. That's something we're very proud of, but we can always do better, and we can always make the system safer.

In this testimony, I would like to address three topics. One would be the professionalism of the air traffic control system. Two would be the increase in operational errors. And three would be fatigue in the air traffic control work environment.

I need to be very clear. The air traffic controllers are very professional. We work day in and day out, 24 hours a day, 7 days a week, 365 days a year to run the safest, most efficient system in the world.

On an average day, we work over 700,000 operations. We save lives. We make emergency situations look routine, and that will never find its way into the press.

We are very unfortunate to have these incidents that have happened and found its way into the press, and we are not satisfied with it. We are not happy with it, and we have worked very closely with Administrator Babbitt to ensure that this will not happen again. We are proud professionals and dedicated to the safety of the flying public.

I, along with Executive Vice President Trish Gilbert, have traveled throughout the country with Administrator Babbitt, with Deputy Administrator Michael Huerta, to address these issues with the controllers to ensure that professionalism is first and foremost in the operation, that the safety of the flying public is first and foremost and stays on the focus of every air traffic controller in the system.

Over a year ago, we started working jointly with the FAA to develop a professional standards program, which is peer to peer, to really instill that we stay focused on the safety of the flying public.

I've heard from statements today there is great interest in the increase in operational errors in the air traffic control system. I'd like to make two points on that. First, the vast majority of operational errors are really not safety risks, and, second, we don't believe comparing 2010 numbers to previous years is appropriate. We had a big change in the FAA and a change for the better.

I commend Administrator Babbitt for bringing a new culture, of just culture of reporting every instance from the lowest to the deepest procedural issues, so that we can address every safety issue in the system to enhance the safety of the system anyway we possibly can.

Fatigue is real in our work environment. It is something that we have tried to work with the agency with the previous administrator, but we are working with the administrator, Administrator Babbitt, for the last 12 months trying to put together 12 recommendations, along with science and NASA scientists and the FAA and guidance with the NTSB, to address fatigue. It is a high-stress occupation and it is something where perfection is the bottom line and anything less than perfection is completely unacceptable.

In closing, NATCA is on the forefront of improving the safety of the National Airspace System. We have pushed for years for the ATSSAP program to voluntarily report situations that might cause safety problems in the system. We jointly develop professional standards with the FAA, and, over the last year, we worked real hard with scientists, with the FAA to come up with 12 recommendations to improve fatigue in our work environment. We look to implement these 12 recommendations as soon as possible. We have to be 100 percent 100 percent of the time. Anything less than that is completely unacceptable.

I can't stress enough that the men and women—the fine men and women of the National Air Traffic Controllers Association work the safest, most efficient, most complex system in the world, and I want to make sure we do focus on that.

I thank you for your time and I look forward to answering any of your questions.

[The prepared statement of Mr. Rinaldi follows:]

PREPARED STATEMENT OF PAUL M. RINALDI, PRESIDENT,
NATIONAL AIR TRAFFIC CONTROLLERS ASSOCIATION

Introduction

The National Air Traffic Controllers Association (NATCA) is the exclusive representative of over 15,500 air traffic controllers serving the Federal Aviation Administration (FAA), the Department of Defense (DOD), and the private sector. In addition, NATCA represents the FAA's Alaska flight service specialists and approximately 1,200 FAA engineers, 600 traffic management coordinators, 500 aircraft certification professionals, agency operational support staff, regional personnel from FAA's logistics, budget, finance and computer specialist divisions, as well as agency occupational health specialists, nurses and medical program specialists.

Air traffic controllers are dedicated to ensuring that our National Airspace System (NAS) is the safest in the world. In order to maintain that safety, our controllers work to modernize the NAS, promote new technology, and improve safety procedures. Controller skills are put to work every day as they handle an impressive volume of flights—air traffic controllers monitor takeoff and landing for more 70,000 flights each day, safely moving nearly two million passengers throughout the country. Air traffic controllers handle these flights in complex air space with roughly 5,000 planes in the sky at any given moment.

With about 64 million take-offs and landings each year, our highly trained controller workforce ensures safety. According to MIT, flying is 22 times safer than driving; and the chance of a fatality on a scheduled flight in the U.S. is one out of 14 million.

Air traffic controllers take considerable pride in their work. The controller work ethic and commitment to safety is not reflected in the high-profile incidents that recently gained media attention; the professional reputation of air traffic controllers should not be tarnished by a few incidents.

In this testimony, we would like to address the three policy changes that have led to increased reporting of operational errors. We will also discuss the series of incidents that gained widespread media attention, specifically explaining what we believe is the root cause of these incidents: fatigue. Our joint FAA-NATCA Fatigue Workgroup has made 12 recommendations for mitigating the risks associated with the midnight shift and fatigue. As subject matter experts qualified to determine inherent risks in air traffic control, we are working with the FAA to ensure that the risk of fatalities and errors are mitigated to their lowest possible levels.

Recent Increase in Reporting of Operational Errors

As per the Committee's request, NATCA will address the policy changes that have led to the increase in reported operational errors in the NAS. Just this month, the Department of Transportation Inspector General (DOT IG) cited a 53 percent increase in the number of reported operational errors between Fiscal Years 2009 and

2010 (from 1,234 to 1,887).¹ The increase can be attributed in large part to policy changes intended to improve the identification and reporting of operational errors and promote a safety culture in which errors can be reported without fear of punitive measures, as well as certain strains on the system associated with high ratios of trainee to fully certified controllers.

The Definition of Operational Errors

By definition, an operational error is an event that involves a loss of separation, and is attributable to an element of the air traffic system (see appendix for full technical definition). Operational errors are not always near-collisions or potential aircraft accidents; in most cases they are breaches of procedure or safety buffers that require investigation to determine cause and how to prevent recurrence.

It is important to note that not all operational errors are a result of a controller error. An operational error can also be a system error, such as an equipment malfunction or an improperly worded procedure that leads to a loss of separation.

Operational errors are categorized by risk associated with each event. Where it can be measured in terms of distance, separation losses are categorized in range bands designated as: A, B or C operational errors, with A being the closest range and C the furthest apart. For other separation losses, where such precise measurements are not possible, for example, non-radar, oceanic, terrain or procedural errors, or in the event of procedural or equipment malfunctions they are classified as “Other” or “Miscellaneous” operational errors.

The New Safety Culture at the FAA—Count Every Error and Learn from It

The safety culture that NATCA and the FAA have worked to create demands that all categories of errors be reported and counted as accurately as possible. One highly accurate program identifies errors imperceptible to the human eye, and will continue identifying increasing numbers of errors once it is fully operational and monitoring all air traffic (it is currently only employed for a certain number of hours per week). In addition to this precise error identification program, in July of 2008, NATCA and the FAA introduced a confidential safety reporting system intended to address systemic safety concerns rather than treat individual errors punitively, creating an atmosphere in which air traffic professionals feel confident that reporting errors will not result in punitive measures. The goal of each of these programs is to increase reporting of errors so they can be utilized to evaluate, propose, and implement changes to further the goal of risk mitigation. Simply stated, the best way to increase safety is to find every error and use this data to increase the safety of the system and, ultimately, the passengers and users of the system. While these programs likely account for most of the increase in reported errors, another contributing factor is the strain placed on the entire system and workforce by the hiring of 7,800 new air traffic controllers in the last 5 years.²

Increased Accuracy in Error Identification Adds to Increased Number of OEs

- *Traffic Analysis and Review Program (TARP) Identifies Minimal Losses of Separation that Cannot Be Identified by the Human Eye.* The FAA has started using TARP more and more over the past year. This automated system identifies when operational errors or other losses of separation occur at terminal facilities. It measures down to 1/100th of a mile, measurements that cannot be seen with the human eye, and thus were previously unreported. This can be seen in the fact that category C errors (those with the least significant loss of separation of any errors) have increased from 618 in FY 2009 to 1,059 in FY 2010. In layman’s terms, this program is picking up errors that have previously existed in the system, but have never been counted as errors. More importantly, TARP will soon be operating continuously, and we expect that this precise electronic monitoring of the operation will actually result in another increase in reporting of errors.

Safety Culture Enables Air Traffic Professionals to Report Errors without Fear of Reprisal

- *The Air Traffic Safety Action Program (ATSAP) allows controllers to report errors without fear of reprisal or punitive measures.* As part of efforts to enhance the safety culture of air traffic control and meet Congressional mandates, voluntary non-punitive programs have been implemented for the open reporting of

¹Department of Transportation Inspector General testimony before Subcommittee on Transportation, Housing, and Urban Development, and Related Agencies, “The Federal Aviation Administration’s Fiscal 2012 Budget Request: Key Issues Facing the Agency.” May 12, 2011.

²FAA, “A Plan for the Future 10-Year Strategy for the Air Traffic Control Workforce 2011–2020.”

safety concerns by controllers and other FAA employees. *The result of this has been an environment in which operational errors are openly reported, as never before.*

The Air Traffic Safety Action Program (ATSAP), is modeled after the very successful program used for over 12 years for airline pilots, known as Aviation Safety Action Program (ASAP). Like ASAP for pilots, ATSAP has created an environment in which employees can report mistakes (operational errors, operational deviations, and other reportable events) to management without fear of reprisal from their employer. This has led to an increase in reported errors.³ It is important to note that ATSAP does not remove accountability or responsibility from controllers; it takes a more systemic approach to addressing safety issues. ATSAP also improves the FAA's ability to provide additional training because an Event Review Committee (ERC), which reviews and analyzes the ATSAP reports to identify actual or potential safety problems, proposes solutions for those problems. The ERC recommends training with facility input, which provides a more measured approach compared to knee jerk reactions or punitive approach that had been taken in the past.

- Our collaborative efforts with the Air Traffic Organization (ATO) to increase reporting through ATSAP and to address those safety issues that contribute to high-risk events are essential, and NATCA looks forward to working with the ATO to develop and implement meaningful strategies to continue to reduce risk in the NAS.
- *Elimination of operational error (OE) quotas that prevented managers from reporting all errors.* As ATSAP was implemented, the facility operational error limits, or quotas, were removed in an effort to get more realistic and honest reporting. In other words, each facility had a yearly or quarterly maximum number of operational errors that they were expected not to exceed. Prior to the elimination of the operational error quotas, a manager's performance was tied to the number of operational errors as a metric during their performance evaluations. Thus the more reported operational errors charged against a facility, the greater the negative impact on the facility manager's evaluation and pay. By removing this disincentive to report operational errors, we have no doubt seen increased reporting of errors up the chain that were occurring all along but had not been reported. In addition, the rise in reported errors was concurrent with the implementation of ATSAP and removal of the error quotas in August 2008.

The Stress on the System and the Workforce

As we are all aware, the NAS has recently hired unprecedented numbers of new controllers, which is contributing to a strain on the system and workforce. High trainee ratios is an issue that NATCA has been warning about for over 5 years, and testified about before the Senate Subcommittee on Aviation Operations, Safety, and Security in March 2007,⁴ and before the House Subcommittee on Aviation in June 2008⁵ and March 2007.⁶ Our message was consistent: The recent surge in new hires is placing a serious strain on the system and leading to safety concerns as experienced controllers retire and are replaced with trainees who require several years to become fully certified controllers.

- *Large numbers of new hires require additional resources to train.* NATCA testified before the House Aviation Subcommittee in May 2007 and again in June 2008 about the strains of hiring thousands of new controllers in a relatively short period (7,800 new hires over the past of 5 years) would have on the ATC system. In the long-term, these new hires will enhance the safety and efficiency of our NAS, but in the short-term, this places a strain on facilities where they train because while achieving certification on position, trainees work under the

³Note: ATSAP has contributed to the increased number of reported errors. Confidential reports made by front-line employees to ATSAP are otherwise unknown to the FAA unless individuals choose to also report directly to their first level supervisors. Thanks to the new safety culture, they are likely to report errors in both systems. This is the identical process successfully in use by the airlines and is producing significant amounts of safety data for the Air Traffic Organization (ATO).

⁴Testimony of Patrick Forrey, President, NATCA Before the Senate Committee on Commerce, Science, and Transportation's Subcommittee on Aviation Operations, Safety, and Security, March 8, 2007.

⁵Testimony of Patrick Forrey, President, NATCA Before the House Transportation and Infrastructure Committee Subcommittee on Aviation, June 11, 2008.

⁶Testimony of Patrick Forrey, President, NATCA Before the House Transportation and Infrastructure Committee Subcommittee on Aviation, March 22, 2007.

direction of a fully certified controller or on-the-job-training instructor (OJTI). Their OJTI is therefore taken away from his normal controller duties, leaving one more position to staff in his absence. We have seen that fewer controllers in a facility or a higher trainee to controller ratio may also lead to an increased safety risk. Trainees currently account for 22 percent of the workforce⁷ across the system. For example, Chicago TRACON (C90) currently has 20 percent trainees, while Atlanta ARTCC (ZTL) has 26 percent trainees working at their facility.⁸

- *On the job training takes a toll on the instructing controller.* Providing on-the-job-training (OJT) to a new hire is extremely demanding, as the OJTI needs to be aware of every transmission and every keystroke the trainee makes. During OJT, a trainee works live air traffic, while the OJTI monitors both the trainee's actions and the radar or runway environment. The OJTI is held responsible for any errors made by the trainee. This essential training process increases workload for the OJTI and contributes to fatigue, particularly when these controllers are expected to train on nearly a daily basis. These instructors may also lose their proficiency while spending the majority of their time training others instead of working on position themselves, removing highly-trained, certified controllers from the operation and exacerbating the staffing shortage.

It is clear that the policy changes implemented by the FAA to gather as much operational error data as possible in order to create a safer ATC system has led to the increase in reported operational errors. The increase can be attributed in large part to policy changes intended to improve the identification and reporting of operational errors and promote a safety culture in which errors can be reported without fear of punitive measures, as well as certain strains on the system. It is important to note that in the coming months, increased use of programs such as TARP are expected to result in another spike in errors—even with partial implementation, we have seen an increase in Category C errors from 618 in FY 2009 to 1,059 in FY 2010, largely because TARP can identify errors too precise for humans to identify. While the human error will always be a part of the system, it is our responsibility to work to identify and rectify errors as often as possible. To that end, NATCA fully supports and endorses the increased safety culture and the use of the ATSAP Program.

While much of the increase in reported operational errors can be attributed to improved reporting accuracy, we also acknowledge that the combined stress of high attrition rates from 2006 to 2009 and the resulting surge in new hires has left the system overwhelmed with trainees. While this is productive in the long run, the essential process of training these new hires uses scarce resources such as controller time and energy, placing an additional burden on the system. NATCA strongly encourages the FAA to conduct a full staffing survey to find appropriate staffing levels to mitigate this strain.

Recent Incidents and the Effects of Controller Fatigue

The Committee has requested that we address the incidents that occurred over the course of 4 weeks in March and April of 2011. These nine incidents gained significant media attention, resulting in veritable media frenzy. These incidents involved supervisors and controllers who had allegedly fallen asleep while on position during the midnight shift (midshift), a controller who had been watching a DVD while on position, and one incident in which the First Lady's plane experienced a loss of separation. Additionally, some have included an event when a jumbo jet clipped a regional jet at JFK, despite the fact that this was not a controller error. The FAA is treating each incident as unique and investigating each one. To date, they have suspended several controllers from working traffic and one is no longer with the Agency. The Agency has stated it will continue to investigate each incident and take action as appropriate.

NATCA Response To The Incidents

When the first incident occurred, NATCA responded swiftly and firmly, issuing a statement declaring that safety is NATCA's number one priority and our members are committed to performing their critical function in the safest, most professional manner possible. NATCA does not condone sleeping while on position. In letters to Congress and other public communication, NATCA President Paul Rinaldi emphasized that the professional reputation of air traffic controllers should not be tar-

⁷ FAA payroll data, July 2010.

⁸ FAA, "A Plan for the Future 10-Year Strategy for the Air Traffic Control Workforce 2011-2020."

nished by these incidents. President Rinaldi and FAA Administrator Randy Babbitt jointly wrote an editorial in USA Today outlining their concerns and steps both the Union and Agency are taking to reduce fatigue and safety concerns. (See Appendix for article). Our controllers work every day to ensure the safety of the system, and NATCA believes that the safety of the system is paramount.

However, President Rinaldi also quickly pointed out that the controller fatigue issue is real and relevant in this discussion, especially when addressing issues regarding the midnight shift. Fatigue has existed in our system for many years, and NATCA has a consistent record of encouraging the Agency to address the issue. NATCA has warned about the safety concerns associated with staffing the midnight shift with only one controller. We have always insisted that if the FAA decides to keep a tower open overnight, they should staff the tower with a minimum of two controllers. President Rinaldi praised the FAA's announcement of increased staffing as a strong first step in ensuring that fatigue is mitigated on midnight shifts.

NATCA President Rinaldi and Executive Vice President Trish Gilbert also joined a Call to Action tour with FAA Administrator J. Randolph Babbitt and other FAA senior officials to begin an honest dialogue with employees about the recent incidents. They discussed at length the largest underlying problem that contributed to the majority of recent events: fatigue. The majority of incidents occurred during midnight shifts, when fatigue is most problematic. For more than a decade NATCA has expressed its deep concerns about increasing controller fatigue. Our national constitution calls for the ending of single staffing on the midnight shift, and for years we have advocated past Administrations and Congress on the need to find more complete solutions to controller fatigue before it is too late.

Impact of Fatigue

NATCA has not been alone in warning about the dangers of fatigue. The National Transportation Safety Board (NTSB) and others have joined NATCA in issuing these warnings. In April of 2007, in response to the August 27, 2006 Lexington crash of Comair Flight 191 (Delta Connections Flight 5191) in which 49 people were killed, the NTSB issued parallel safety recommendations to both the FAA and NATCA. The recommendations urged the Parties to work together to reduce the potential for controller fatigue by revising controller work-scheduling policies and practices to provide rest periods long enough for controllers to obtain sufficient restorative sleep; by modifying shift rotations to minimize disrupted sleep patterns; and to develop a fatigue awareness and countermeasures training program. The resulting joint Fatigue Workgroup, which came into being with the 2009 Collective Bargaining Agreement (CBA), was *required to develop a fatigue management system; to identify and mitigate workplace fatigue inherent in a 24/7 operation; and to refer recommendations for action.*

The Fatigue Workgroup consisted of FAA managers and NATCA members, supported by scientists from seven different components of the FAA, including Aerospace Medicine and FAA's Civil Aerospace Medical Institute (CAMI) scientists. External support included subject-matter experts and scientists from National Aeronautics and Space Administration (NASA), the Air Force, The MITRE Corporation, and others. In sixteen meetings held over 14 months, the group utilized fatigue and sleep scientists, medical experts, and other experts from the safety and aviation worlds to help in analyzing the numerous fatigue issues and developing viable recommendations.

The Workgroup decided to develop formal mitigations in order to address the hazards and operational risks caused by fatigue. To do this, the Workgroup focused on discovering the science and data that supported the safety case for each mitigation, with their specific focus being the following: to increase the safety of the NAS; to improve the health and well being of the workforce; to base any findings and recommendations on science and data, and to collaborate with internal and external organizations along the way.

The Workgroup's recommendations were briefed to the FAA Administrator in the spring of 2011, shortly before the series of incidents. NATCA fully supports their 12 recommendations, and advocates adopting all 12 to effectively mitigate the risks associated with fatigue.

What Science the Workgroup Relied Upon

The reality is that ATC operations demand shift work. ATC is a 24-hour, 7 day-a-week operation (24/7). Fifty-one percent of federally operated Terminal facilities are 24/7. One hundred percent of En Route facilities are 24/7. Over 3,000 controllers are exposed to midnight shifts annually, sitting in dark rooms frequently with little traffic to direct. Shift work contributes to cumulative fatigue (overall sleep debt), as well as acute fatigue (immediate fatigue that can affect an individual at any time

of day). Time on task and task intensity also contribute to fatigue. Since we cannot eliminate shift work, the Workgroup developed formal mitigations in order to address the hazards and operational risks caused by fatigue.

The fundamental question is how does fatigue happen and how does it compromise safety? *Fatigue refers to a physiological state in which there is a decreased capacity to perform cognitive tasks combined with an increased variability in performance.* There is an established cause and effect relationship between the two forces, influenced by multi-variant fatigue drivers and causes. To correlate the cause and effect, the Workgroup developed a multi-layered approach of mitigations that fall within six different areas which all interrelate.

The effects and impacts of fatigue are well documented in many industries—from pipelines, trucking, rail, and shipping to the nuclear power industry. The physiological and cognitive impacts relate to one’s ability to stay on task as your accuracy and timing degrade, as you experience involuntary micro-sleeps, and as your attention wanes. The impacts to individual performance can be numerous, from a loss of situational awareness, to an increased risk of operational errors, to an overall decline in performance. The cost to productivity can be high in terms of both increased absenteeism and higher operational costs. Finally, the impact of fatigue on safety is clear: since 1993, over 14 accidents resulting in 263 fatalities had fatigue as a causal or contributing factor.

Fatigue drivers are clear. There are four of consequence: Circadian rhythm; the amount of time since the last sleep period; the quantity and quality of one’s sleep; and task intensity as a result of workload. The primary driver is Circadian rhythm, which is the physiological regulator of the human “sleep and awake” cycle. Circadian rhythms combined with sleep debt, cause sleep pressure, *i.e.*, the urge to sleep, especially at night, which creates problems inherent on midnight shifts.

Fatigue causal factors include: (1) workplace elements such as schedule, culture, seniority, task complexity, and the physical environment; (2) personal elements such as life events and personal choices; and (3) individual differences and biological factors such as sleep disorders (there are over 70 disorders that influence how we sleep) and age. The NTSB uses similar drivers and causal factors as their criteria whenever it analyzes for fatigue during a post-accident investigation.

Methodology and Findings of the Workgroup

The Workgroup sought to determine the extent to which ATC schedules induce fatigue, and which schedules provide increased cognitive performance and opportunity for restorative rest over a six-week timeframe. They identified the most widely used schedules and modeled 110 schedule and sleep permutations to identify risk. They also modeled alternative work schedules that increased opportunities for restorative nighttime sleep between shifts. Finally, they comparatively analyzed modeling results to measure the effect of proposed countermeasures and schedule adjustments.

The Workgroup found that the greatest risk on any schedule is during the midnight shift when sleep pressure becomes intense as the body is fighting its natural Circadian rhythm. That can be compounded by cumulative sleep debt or simply acute fatigue. During that time, introducing a sleep opportunity during a shift can mitigate the risk of reduced cognitive performance due to fatigue. Proactive sleep prior to a midnight shift proved beneficial. Other personal mitigation techniques for a recuperative break may include exercise, hydration, light exposure, and caffeine.

What the Science-based Workgroup Recommends

The Workgroup developed 12 recommendations in six topical areas. Those areas are: recuperative breaks, scheduling, sleep apnea (SA), personal fatigue management, education, and the Fatigue Risk Management System. None of these recommendations stands by itself as sufficient to adequately mitigate fatigue risks in ATC operations; therefore the proposed solution requires the implementation of all of the recommendations together, in a comprehensive, layered fashion. The Parties have only now begun the process of evaluating and analyzing them for their potential impacts on staffing, budget, policy, the CBA, and other areas.

The recommendations and a summary of their related findings are as follows:

1. As fatigue can occur at any time and on any shift, the introduction of a recuperative break during a shift can mitigate the risk of reduced cognitive performance due to fatigue. The Parties recommend that current policy and orders be modified to permit recuperative breaks during relief periods.
2. Extensive scientific modeling clearly proves that introducing a recuperative break on the midnight shift can mitigate the identified risk of reduced cognitive performance due to fatigue. Re-entry time must be accounted for in all recuper-

ative break planning, execution and management. The Parties recommend the allowance for a recuperative break of up to 2½ hours.

3. Quick turns between evening and day shifts reduce opportunities for nighttime restorative sleep. On a 2–2–1, increasing the time between the second evening and the first day shift by one hour increases sleep opportunity and cognitive performance. The Parties recommend the scheduling of a minimum of nine (9) hours between evening and day shifts. This has already been implemented by the Parties.

4. Scientific modeling shows that increasing night time sleep opportunity during the night prior to the second day shift and subsequent midnight shift results in significant fatigue risk reduction during the midnight shift. However, the placement of the one hour from the reduced shift into a previous evening or day shift has no effect on this risk reduction benefit. Therefore, the Parties recommend that on a 2–2–1 CCW rotation, reduce the day shift preceding the first midnight shift from 8 to 7 hours, and begin that shift one hour later, to provide the opportunity for an extra hour of restorative sleep at the end of the night time sleep period.

5. Per Aerospace Medicine (AAM), 2.2 percent of the ATC workforce has diagnosed sleep apnea, and a minimum of an additional 1.8 percent may be undiagnosed. Perceived non-standardized processes, as well as a lack of awareness of sleep disorders and treatments, may result in financial disincentives and unreported sleep apnea in the ATC workforce. The Parties recommend the creation of policies and procedures that encourage self-initiated evaluation, diagnosis and demonstration of initial treatment effectiveness of SA by removal or reduction of economic disincentives.

6. There is a gap in awareness and understanding of sleep apnea among the controller workforce. Raising awareness and understanding of sleep disorders will reduce the risk to the National Airspace System. The Parties recommend the use of AAM-prepared SA education to build Sleep Apnea awareness in ATO workforce, include raising awareness of respiratory coaching to SA patients.

7. The scope of the sleep apnea issue requires collaboration across respective lines of business. The Parties recommend that:

- AAM to stay current with state-of-the-art in sleep medicine.
- AAM to utilize AASM standards and practices for SA risk factor identification, diagnosis and treatment standards.
- AAM to document the process for medical qualification for individuals at risk for sleep apnea.
- AAM to develop educational materials for the workforce and AMEs.
- AAM to educate AMEs on SA.

8. Controllers may not fully understand their responsibilities to minimize fatigue, and actions to be taken when they consider themselves too fatigued to safely perform their operational duties. The Parties need to develop policy and education for employees defining responsibilities to minimize fatigue and report fit for duty, and action to be taken when they consider themselves too fatigued to safely perform their duties.

9. Managers may not fully understand their responsibilities related to interacting with controllers who report that they are too fatigued to safely perform their duties. In order to avoid on-the-job fatigue that threatens safety, the Parties need to develop policy and education for managers that incorporates emphasis on a non-punitive approach when an employee, in accordance with the developed policy, self-declares as too fatigued to safely perform operational duties.

10. Existing controller fatigue awareness training does not comprehensively capture current science, personalize fatigue mitigation strategies, or support practical operational needs. The Parties need to update existing fatigue awareness training to reflect current science and to personalize the application of the training.

11. A formal Fatigue Risk Management System (FRMS) institutes a continuous, repeatable, collaborative process to identify, analyze and mitigate fatigue risks. The Parties should design and implement a Fatigue Risk Management System (FRMS) within the FAA operational ATC environment.

12. Retention of organizational knowledge supports a successful transition from the current Fatigue Work Group to the implementation of an approved ATO FRM. The Parties recommend the creation of a transition team composed of cur-

rent Fatigue Work Group members until the formal FAA FRMS is established for ATC.

This set of recommendation outcomes flow from the systemic approach of a complementing, cross-layered set of prescriptive and non-prescriptive fatigue risk mitigations. The mitigations would evolve and be managed within the formal structure of the FRMS, which operationalizes fatigue risk into the FAA decision process and cultural fabric. The recommendations equip the Agency to:

1. Systematically manage ATC fatigue risk;
2. Reduce acute and chronic sleep debt;
3. Improve opportunities for nighttime sleep;
4. Improve ability to obtain restorative sleep;
5. Allow for the self-declaration of fatigue;
6. Gather data to support fatigue analysis and mitigations;
7. Educate the workforce on personal and professional responsibilities in reducing fatigue; and
8. Support the ongoing adoption of a positive safety culture.

After the recommendations were presented, the Parties agreed to collaboratively examine the implementation considerations for all twelve recommendations, with a joint work team that was tasked with delivering Questions and Answers within 90 days of their initial meeting. Once that group finished their analysis, senior leadership from both Parties would determine how to proceed with implementation.

NATCA Recommendations

NATCA fully supports the implementation of the 12 recommendations put forth by the joint Fatigue Workgroup. These recommendations are science-based measures to mitigate fatigue and safety risks posed by the 24/7 schedule of air traffic control. It is imperative that we act quickly to mitigate these risks.

NATCA recommends that the Agency continue on its current path of enhancing the safety culture. Advances in the working environment have led to a more open, honest discussion about errors and a more transparent process for dealing with those errors in a productive manner that deals with root causes rather than punitive responses. As one component of that safety culture, NATCA fully supports the accurate, precise reporting of all errors and/or safety concerns. While the expected rollout of the TARP will add to the increase in reported errors, it will help the Agency and controllers perform their jobs with more accuracy and a higher degree of safety.

Thank you again for the opportunity to testify on operational errors and fatigue in the workforce. NATCA and the FAA must continue working together to mitigate fatigue and safety risks and reduce the strain on the National Air Space.

APPENDIX

An operational error is “an occurrence attributable to an element of the air traffic system in which:

- (1) Less than 90 percent of the applicable separation minima results between two or more airborne aircraft, or less than the applicable separation minima results between an aircraft and terrain or obstacles (*e.g.*, operations below minimum vectoring altitude (MVA); aircraft/equipment/personnel on runways), as required by FAA Order 7110.65 or other national directive; or
- (2) An aircraft lands or departs on a runway closed to aircraft operations after receiving air traffic authorization; or
- (3) An aircraft lands or departs on a runway closed to aircraft operations, at an uncontrolled airport and it was determined that a NOTAM regarding the runway closure was not issued to the pilot as required.

USA Today OP-ED—Updated 4/17/2011 3 P.M.

HOW WE'RE ALREADY FIXING OUR AIR TRAFFIC SYSTEM

By Randy Babbitt and Paul Rinaldi

The traveling public rightly expects air traffic controllers to make sure their flight safely reaches its destination. We work diligently to maintain the trust the American people have in our aviation system. But as recently as Saturday, we to uphold that trust.

After an air traffic supervisor at Reagan National Airport near Washington, D.C., fell asleep while two commercial flights landed last month, we immediately instituted a review of our air traffic control towers. In the last few weeks, we have seen more examples of controllers sleeping or being derelict in their duty in Seattle, Lubbock, Reno, Knoxville and over the weekend in Miami.

We cannot and will not tolerate this behavior.

This week, the FAA is changing long-time controller scheduling rules to make sure controllers have more time for rest between shifts. We have added staffing at airport control towers and other facilities around the country where we had only one controller on the midnight shift. Now there are two. We have instituted new hand-off procedures for the midnight shift that require contact between radar controllers and air traffic control towers to confirm that there is a controller prepared to handle each flight.

These recent incidents have cast doubt on whether our Nation's controllers are truly committed to keeping the skies safe. We want to tell you they are. We have the safest aviation system in the world, but we know we can do better.

On Monday, we are kicking off our Call to Action on air traffic control safety and professionalism. We will be traveling to air traffic facilities around the country, to reinforce the need for all air traffic personnel to adhere to the highest professional standards.

Professionalism involves more than just what you do when you're on the clock. It means everyone must report to work ready to work. That means all air traffic employees must manage their time off appropriately and be rested and ready for duty.

We now understand more about fatigue than we ever did before. The FAA has already used the latest fatigue science to propose new rules for pilot flight and duty time. Science tells us that working irregular day and night shifts without adequate rest periods in between can cause chronic fatigue. We are now addressing fatigue in how we schedule our controller workforce. The steps the FAA took this weekend are just the beginning—we know more needs to be done.

The FAA will also commission an independent review of our air traffic control training curriculum and qualifications to make sure new controllers have mastered the right skills and learned the right disciplines before they start their careers.

The National Air Traffic Controllers Association is committed to expanding its own Professional Standards program nationwide, which will reemphasize for controllers how to maintain the highest degree of professional conduct.

Unfortunately, the events of the last few weeks have tarnished the professional and faithful work of thousands of controllers who routinely report to their shifts and steadfastly work their stations without incident.

Controllers safely handle an average of 47,000 flights each weekday. They direct planes carrying 1.7 million passengers per day. And they control air traffic over 15 percent of the world's surface, not only over North America but over the Atlantic and Pacific Oceans as well.

We work diligently every day to deliver a flawless performance of the air traffic control system. But as is the case with any system operated by people, we must have redundancies and back-ups to ensure that the system is always safe. And we do.

As a result, all of the aircraft affected by the recent lapses in professionalism remained in contact with air traffic control and landed safely. Nonetheless, we are committed to reinforcing our culture of accountability in all that we do. There are no simple tasks in aviation—every single one is critical.

We are approaching a complete generational turnover of the controller workforce, and in the last 30 years the relationship between the FAA and its workforce has been characterized by varying degrees of cooperation. But right now our relationship is as strong as it has ever been.

We have an important opportunity to take a step back and look at all aspects of our air traffic control system.

The American public trusts us to perform our jobs and make safety the highest priority, each day, year in and year out. We are committed to making whatever difficult changes are necessary to preserve that trust and to continue to provide the safest and most efficient air transportation system in the world.

Randy Babbitt is Administrator for the Federal Aviation Administration. Paul Rinaldi is President of the National Air Traffic Controllers Association.

Senator CANTWELL. Thank you, Mr. Rinaldi.

Dr. Belenky, again, thank you for being here. We look forward to your testimony.

**STATEMENT OF GREGORY BELENKY, M.D.,
RESEARCH PROFESSOR AND DIRECTOR,
SLEEP AND PERFORMANCE RESEARCH CENTER,
WASHINGTON STATE UNIVERSITY, SPOKANE**

Dr. BELENKY. Thank you. Chairman Cantwell, Ranking Member Thune, Chairman of the full committee Rockefeller, distinguished members of the Subcommittee, thank you for the opportunity to testify on sleep, fatigue and performance in air traffic controllers.

I am Gregory Belenky. I am a physician-by-training and a Research Professor and Director of the Sleep and Performance Research Center at Washington State University. I joined WSU in 2004. Prior to that, I served for 29 years on active duty in the U.S. Army, developing systems to manage sleep and sustain performance in military operations.

At WSU, we are continuing this work, studying sleep and performance in operational environments, operational environments in which if the human fails the system fails.

Chairman Cantwell, it is important for this subcommittee, with its critical role in aviation safety, to examine the recent incidents in which air traffic controllers have inadvertently fallen asleep or deliberately napped while on shift.

Is this a moral failing on the part of a few air traffic controllers? Or does it indicate a systemic problem in the organizing, staffing and scheduling of air traffic control operations?

I believe it indicates systemic problems, specifically, the well-described sleepiness, insomnia and degraded performance that is generally characteristic of all nightshift work. Air traffic controllers are the same physiologically as any other nightshift worker, and the same principles apply.

What can we learn from these incidents of air traffic controllers sleeping on duty? By inadvertently falling asleep or deliberately napping on shift, air traffic controllers are pointing to a possible problem. They are identifying shifts and schedules of shifts that carry relatively higher fatigue risk and are in need of fatigue mitigation.

And, by sleeping on shift, they not only point to the problem, they point to a solution as well. The primary mitigation for fatigue is sleep, and, in this case, additional sleep could most easily come in the form of sanctioned, scheduled on-shift napping.

In the early morning of August 27, 2006, Comair Flight 5191 crashed on takeoff from Lexington, Kentucky, killing 49 of the 50 people onboard. The crash occurred at a time when the sole air traffic controller on duty was working the last shift of a 2-2-1 series of shifts consisting of two evening shifts, 2 day shifts and finally one nightshift.

There was an eight- to nine-hour break from the end of the second dayshift until the beginning of the final nightshift. Unfortunately, this break fell largely in the early to mid evening during the so-called "forbidden" zone for sleep. So the controller was only able to initiate and sustain sleep for two to three hours in the late afternoon.

Comair 5191 crashed at 6:06 a.m., as the captain, first officer and the air traffic controller failed to detect the plane was on the wrong runway, a runway much too short for a successful takeoff.

A fatigue analysis, including mathematical performance prediction modeling, suggests that, at the time of the crash, the air traffic controller's performance was impaired by a combination of sleep restriction and working at his circadian low.

Given the structure of the 2-2-1 shift series, an on-shift nap would have been the only way to increase sleep time in the controller during the 24 hours preceding the crash.

Though the National Transportation Safety Board did not implicate fatigue as a cause in the crash of Comair 5191, I believe it possible that had the air traffic controller had more sleep and been less fatigued he might have detected the error in runway choice prior to the attempted takeoff and in time to avert the disaster. This is a function of the stochastic nature of error, incident and accident, the probabilistic element in real-world operations.

I think that one way to sustain operational performance and well-being in air traffic controllers working the nightshift is sanctioned, scheduled on-shift napping. We could validate this proposed fatigue mitigation/countermeasure by testing the effect of sanctioned, scheduled napping on performance and vigilance at night-shift operations in select air traffic control sites.

Previous work in air traffic controllers working the nightshift has shown that even short, poor-quality naps improve alertness and performance.

As a research scientist, I can describe what the scientific evidence suggests is possible and propose ways to develop more relevant evidence.

The members of this subcommittee, as well as labor and air traffic control management, must decide what is feasible and desirable within the range of possible countermeasures as supported by the evidence.

Thank you, Chairman Cantwell, for the opportunity to testify before the Subcommittee. That concludes my remarks. I would be happy to answer any questions that you and the members of the Committee may have.

[The prepared statement of Dr. Belenky follows:]

PREPARED STATEMENT OF GREGORY BELENKY, M.D., RESEARCH PROFESSOR AND DIRECTOR, SLEEP AND PERFORMANCE RESEARCH CENTER, WASHINGTON STATE UNIVERSITY, SPOKANE

Chairman Cantwell, Ranking Member Thune, and distinguished members of the Subcommittee: thank you for the opportunity to testify on sleep, fatigue, and performance in air traffic controllers. I am Gregory Belenky. I am physician-by-training and Research Professor and Director of the Sleep and Performance Research Center at Washington State University (WSU), Spokane. I joined WSU in 2004. Prior to that, I served for 29 years on active duty in the U.S. Army, developing systems to manage sleep and sustain performance in military operations. At WSU, we are continuing this work, studying sleep and performance in operational environments, environments in which if the human fails the system fails. Operational environments include military operations, medicine, all modes of air, land, and waterborne transportation, security work, first responders, energy generation, resource extraction (mining and drilling), financial markets, and industrial production. We study normal people under extremes of scheduling. We are supported by grants and contracts from the U.S. Department of Transportation, the Department of Defense, and the National Institutes of Health, as well as state agencies, industry, and philanthropic foundations.

Chairman Cantwell, it is important for this subcommittee, with its critical role in aviation safety to examine the recent incidents in which air traffic controllers have inadvertently fallen asleep or deliberately napped while on-shift. Questions

abound. Is this a moral failing on the part of a few air traffic controllers or does it indicate a systemic problem in the organizing, staffing, and scheduling of air traffic control operations? I believe it is a systemic problem, specifically the well-described sleepiness and degraded performance that is generally characteristic of all nightshift work—the difficulties encountered when trying to work when one should be asleep and trying to sleep when one should be awake (Drake and Wright, 2011). Air traffic controllers are the same physiologically as any other nightshift worker, and the same principles apply. Given the structural realities of scheduling, the solution to this problem may lie in sanctioned, scheduled on-shift napping when working the nightshift.

We know that fatigue, operationally defined as degraded performance, results from the interaction of sleep loss, circadian phase, and workload (McDonald, Patel, and Belenky, 2011; Wesensten *et al.*, 2004).

Performance depends upon total sleep time in 24 hours. Thus sleep can be split into two or three sleep periods (a main sleep plus one or two naps) and will sustain roughly the same level of performance as a single consolidated sleep (Mollicone, *et al.*, 2007, 2008). Simply put, naps add to recuperative sleep time. If the main sleep period is truncated as it is in shift work, naps can make up the difference.

The circadian rhythms in task performance and sleep propensity parallel the 24-hour circadian rhythm in core body temperature. Task performance peaks in mid-evening just subsequent to the peak in the circadian core body temperature and troughs in the early morning just subsequent to the trough in circadian core body temperature. Twelve hours out of phase with performance, sleep propensity troughs in mid-evening and peaks in the early morning. It is difficult to fall asleep and to stay asleep when core body temperature is rising or high and easy to fall asleep and to stay asleep when core body temperature is falling or low. Hence, the reduced daytime sleep time in people working the nightshift and attempting sleep during the day. Sleep is particularly difficult in the early to mid-evening, the so-called “forbidden zone” for sleep.

What can we learn from these incidents of air traffic controllers sleeping on duty? By inadvertently falling asleep or deliberately napping on-shift, air traffic controllers are pointing to the problem. They are identifying shifts and schedules of shifts that carry relatively higher fatigue risk and are in need of fatigue mitigation. And, by sleeping on shift they are pointing to the solution. The primary mitigation for fatigue is sleep. Additional sleep could come in the form of sanctioned, scheduled on-shift napping.

It is a step forward to have two air traffic controllers on duty at all times even during slow shifts. However, the full value of this increased staffing will likely only be realized if it is leveraged by napping on-shift. As commercial airline pilots will tell you, simply augmenting flight crews without providing an opportunity for sleep isn’t much help—it just means three or four tired pilots instead of two.

In the early morning of August 27, 2006, Comair Flight 5191 crashed on take-off from Lexington, Kentucky, killing 49 of the 50 people onboard. The crash occurred at a time when the sole air traffic controller on duty was working the last shift of a 2–2–1 series of shifts consisting of two evening shifts, 2 day shifts, and finally one nightshift. Working through the night, he was coming to the end of the final nightshift of the 2–2–1 schedule when the crash occurred. The day shift preceding this trailing nightshift began early the previous morning and ended mid-afternoon. The air traffic controller then had the regulation-mandated 8–9 hours off duty before going back on duty in the late evening for the nightshift. He managed only 2–3 hours of “not real good” sleep in the late afternoon. He then remained awake through the evening. His sleep was truncated because the bulk of his sleep opportunity fell in the early to mid-evening, the so-called “forbidden zone” for sleep. With respect to the relationship between sleep and circadian physiology, the controller took the maximum possible advantage of the sleep opportunity he was given. He went back on duty at 11:30 p.m. with his shift projected to end at 7:30 a.m. Comair 5191 crashed at 6:06 a.m. as the captain, first officer, and the air traffic controller failed to detect that the plane was on the wrong runway, a runway much too short for successful take-off. A fatigue analysis, including mathematical performance prediction modeling, suggests that at the time of the crash the air traffic controller’s performance was impaired by a combination of sleep restriction and working at his circadian low (see Figure 1) (Pruchnicki, Wu, and Belenky, 2011). Having another controller on duty to enable alternating on-shift naps would have been the only way to increase sleep time in the controller on the 2–2–1 schedule during the 24 hours preceding the crash. Though the National Transportation Safety Board did not implicate fatigue as a cause, I believe that had the air traffic controller had more sleep and been less fatigued he might have detected the error in runway choice prior to the attempted takeoff and in time to avert the disaster.

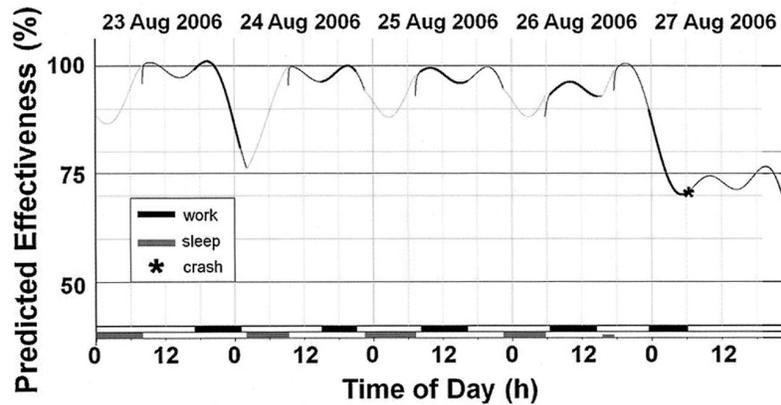


Figure 1: Performance prediction for the air traffic controller on duty during the Comair 5191 crash. Note that his predicted effectiveness at the time of the crash, marked by the asterisk, was 71 percent (from Pruchnicki, Wu, and Belenky, 2011).

Twenty years ago, then NASA scientists Curt Graeber and Mark Rosekind conducted a pioneering study that demonstrated the effectiveness of scheduled cockpit napping in sustaining performance and vigilance in flights across the Pacific (Rosekind, *et al.*, 1994). In this study, on-shift napping improved performance.

Recently, Charles Czeisler and colleagues in the Harvard Work Hours Health and Safety Group carried out a remarkable study of rates of medical errors associated with extended work hours and sleep loss (Landrigan, *et al.*, 2004; Lockley, *et al.*, 2004). They found that when publically-funded physicians in post-graduate residency training were decreased from an 85-hour to a 65-hour work week, and, as a result, obtained more sleep, they experienced a one-third reduction in the rate of serious medical errors that included a five-fold decrease in the rate of serious diagnostic errors. In this study, limits on work hours increased sleep and improved performance.

American, Continental, and Delta Airlines are currently conducting studies in pilots flying augmented (4-pilot) long-range flights. From these and other studies, it is apparent that pilots are able to take advantage of the on-board crew bunk facilities during cruise for rest and sleep. And, they do sleep. This sleep is on-shift napping, sanctioned by the FAA and paid for by the airlines.

I expect that an effective way to sustain operational performance and well-being in air traffic controllers working the nightshift is sanctioned, scheduled on-shift napping. We could validate this proposed countermeasure by testing the effect of sanctioned, scheduled napping on performance and vigilance in nightshift operations in select air traffic control sites. Previous work in air traffic controllers working the nightshift has shown that even short, poor quality naps improve alertness and performance (Signal *et al.*, 2009).

As a research scientist, I can describe what the scientific evidence suggests is possible and propose ways to develop more relevant evidence. The members of this subcommittee, as well as labor and air traffic control management, must decide what is feasible and desirable within the range possible countermeasures as supported by the evidence.

Thank you, Chairman Cantwell for the opportunity to testify before the Subcommittee. I would be happy to answer any questions that you and the members of the Committee may have.

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Senator CANTWELL. Thank you, gentlemen. Thank you, Dr. Belenky, and thank you all for your testimony.

Dr. Belenky, I think I'll start with you on this last point that you just made about what is the optimum schedule you're talking about within the framework of what exists today, but is there an optimal schedule to minimizing fatigue?

Dr. BELENKY. Well, Senator Cantwell, yes. The optimal schedule is daytime work and 8 hours of nighttime sleep. Unfortunately, there is no good solution for nightshift work. Many things have been tried—stimulants, bright light, melatonin, various behavioral—

Senator CANTWELL. I'm referring to the fact of these 2–2–1 schedules of—

Dr. BELENKY. Ah, the 2–2–1.

Senator CANTWELL.—of day and nightshift. Do organizations that have a strict nightshift workforce have a better way of dealing with this issue as opposed to this mix of day and nightshift?

Dr. BELENKY. The rapid turn on the 2–2–1 is particularly troublesome, but there are problems with full-time nightshifts, rotating nightshifts, forwardly rotating, backwardly rotating. None of these are good. Early starts pay a huge penalty on sleep time and performance degradation. They're almost as bad as working permanent nights.

So, there is no optimal solution. There are many partial fixes that improve performance to a degree, but no one-size-fits-all schedule that will work under all circumstances. I hope that's—Is that—

Senator CANTWELL. Well, yes, thank you. I wanted to clarify that, and then your testimony obviously talks about what you think some of the remedies are within that framework.

I want to go back to—Mr. Scovel, in your testimony, I wanted to—Do you have a sense why there has been this significant in-

crease in operational errors since fiscal 2010? I know Mr. Rinaldi doesn't want us to look at 2010, but did you have a sense of this?

Mr. SCOVEL. Thank you, Madam Chairman. Yes, certainly the numbers reported by FAA do show an increase in operational errors from 2009 to 2010, a 53-percent increase. In fact, the 1,234 errors in 2009 rose to 1,887 in 2010. The question is why?

As our written statement shows, we don't know. Neither does FAA at this point either. It could be better reporting practices, and we think that probably accounts for some of it. It could be an increase in the number of operational errors itself, and then, through better reporting practices, that increase is also captured.

The reporting practices that I'm referring to are what both Mr. Rinaldi and Administrator Babbitt spoke of earlier, and that is the Air Traffic Safety Action Program. They believe it has encouraged an atmosphere of self reporting minus possible professional repercussions for controllers submitting reports.

However, Mr. Babbitt has stated that reports of operational errors submitted through ATSAP are not included in those counts. So that cannot explain the increase.

The Traffic Analysis and Review Program that you, Madam Chairman, referred to earlier in your statement may explain part of it. And, in fact, as we sliced and diced some of the numbers, we found an 86-percent increase in reported operational errors at TRACON facilities from 2009 to 2010. TARP may account for part of it.

However, we're puzzled by the fact as well that en route air traffic control facilities reported operational errors increased 39 percent from 2009 to 2010, and at en route facilities, where they have had a program like TARP, an automated detection and reporting tool, in place for some time. So that would indicate that, at least at en route centers, there's an absolute and bottom line increase in operational errors. We don't know why.

In our visits to air traffic control facilities as part of our audit work, we have discussed this with managers and on-line controllers and they've told us some of them believe that it's due to the increased number of controllers in training, and that stands, perhaps, to logic.

Others have told us that they think it's attributable to controllers at the midpoint of their career who are beyond the training stage when they might be more careful in each and every action and who have become somehow more complacent. We just don't know.

But, Madam Chairman, you have kindly asked our office, and we have requests as well from the House, to review both the Air Traffic Safety Action Program as well as FAA's LoSS Index, which will attempt to capture all such losses of separation, categorize them, and, we hope, attempt to gather some data on those, so that it can be properly analyzed and corrective measures prescribed.

Senator CANTWELL. And, Mr. Scovel, just following up on that last point before I turn it over to my colleagues, do you have any information in data as it relates to that separation—loss-of-separation issue as it relates to this fatigue issue, any information about that today?

Mr. SCOVEL. I'm sorry, Madam Chairman, are you referring specifically to the LoSS Index or—

Senator CANTWELL. Loss of separation of flights and this issue of fatigue. Have you found any issues of how those are connected at this point in time?

Mr. SCOVEL. In 2009, at the request of Senator Durbin, we examined potential fatigue factors at the three main air traffic control facilities in Chicago. We identified scheduled overtime, minimal time for rest between shifts with a counter-rotational shift pattern with progressively earlier times, as well as high demands for on-the-job training on the part of veteran controllers at those facilities as key factors. Controllers reported a degradation in their performance and increased fatigue as a result of that. We did not link those specifically to operational errors.

Senator CANTWELL. So we don't have a link between these two issues at this point.

Mr. SCOVEL. We don't—

Senator CANTWELL. As it relates to operational errors and air separation. OK.

Mr. SCOVEL. Yes.

Senator CANTWELL. Senator Rockefeller.

**STATEMENT OF HON. JOHN D. ROCKEFELLER IV,
U.S. SENATOR FROM WEST VIRGINIA**

The CHAIRMAN. Thank you, Madam Chair.

Mr. Scovel, I think you said, the first time around, that it's very important to place people in the right airport, right air tower, and that large and complex ones for those who are just in training or relatively new into it is maybe not a good idea.

And so that makes me want to ask Randy Babbitt the question of how he handles that. How are people assigned?

And you may want to comment on this, Mr. Rinaldi. How are people assigned?

And it strikes me as a very smart point that he made. It doesn't cure a lot of problems, but it sort of creates a baseline of at least an attempt at prioritizing.

Mr. BABBITT. To answer the question, the placement has been made far more rationally today. Under the new agreement that we have with the air traffic controllers, we now can provide incentives to air traffic controllers to move to the more complex facilities.

We didn't have that opportunity under the last agreement, and, therefore, we often had a situation where a vacancy would come open in the most complex of facilities and no one would bid it. So we were forced to assign people fresh out of training, not necessarily in accord with our wishes, but simply because it was the only way to fill a vacancy.

And that was unfair to the controllers involved. It was unfair to the controllers doing the training. It was unfair to the facility. That has been remedied, and, today, controllers can and will bid the more complex facilities.

I think in any business venture, when you assign people, you certainly pay attention to how they do in their training. We like to think that everyone who graduates from the academy is suitably qualified to operate anywhere in our system.

We also try to honor their wishes. If someone grew up in Seattle and wanted to be an air traffic controller in Seattle and that is an

available vacancy, we would let them bid into Seattle or New York or wherever their home might be. People often bid to work where they grew up, and so, to the extent we can, we honor these preferences as well.

I also want to make one comment. There seems to be some thought that the rate of people who are in training is rising, and it's not. It's falling. With normal turnover we have historically had about a 25-percent rate of the controllers throughout the FAA in training. That includes people who transition.

If I were a controller yesterday in the Cleveland center and I moved to the Denver center, when I move there, I am considered an in-training controller. It takes me a while to learn that system. I may have been with the FAA for 20 years. I am a very well-qualified controller, but, in that transition, I am treated as a controller-in-training, and, therefore, I count in these ranks.

A year ago, the number was 30 percent. Today, it's 25 percent. So we are reducing the number of retirements. There was a surge. We had an exceptional number of retirements for 3 or 4 years after the last agreement. The previous agreement led a lot of people to retire.

We had an enormous surge in retirements, and, therefore, were dealing with a corresponding increase in the training. And I believe the Inspector General noted that we had a 25-percent increase in cost. We had about a 35-percent increase in training which would account for that increase in cost.

The CHAIRMAN. My time is about to run out. I'll get to you next time, Mr. Rinaldi.

As a background for all of this, the House has passed a budget which would take everybody—FAA—back to 2008 levels.

Now, I'm just trying to consider what the effect would be on what we've discussed so far, what the flexibility would not be for you and others because of the desperate—you know, the fact that a lot of these people would be laid off and you'd be dealing in a winter wonderland.

I'd like you to explain how, if we went back to 2008 levels—and, believe me, I'm not going to let us do that, but if we do, the world needs to know what would happen on your watch about this.

Mr. BABBITT. Well, let me start with saying I'm not going to budget safety. Safety will be maintained at the level that it is today. We're going to inspect all the airplanes. The facilities will operate. We don't have the option of shutting down radar for 10 percent of the time because we had a 10-percent budget cut. So we will maintain the level of safety.

But an area where we think we will feel impact, for example, is in flight standards, where we have over 850 requests awaiting approval today. These are airlines that are buying new equipment. They're pioneering new routes. They're doing a lot of new things, maybe opening new stations. These all require our certification.

We have 2,400 items—safety items that are in the queue to be certified. This includes new wingtips, new electronic equipment, advanced engines, all needing certification. These are all objects that would make the aviation system better, cheaper, more efficient, more environmentally friendly.

The CHAIRMAN. But nobody can do anything until they get certified.

Mr. BABBITT. They can't do anything, nor will they employ people who would build them, which leads to the final point, NextGen itself. NextGen becomes very seriously threatened.

I recently read a private sector report that said that if we delay NextGen for 5 years, it will cost \$148 billion worth of the potential value that we get by building the system now. So to delay it 5 years has an enormous impact.

The CHAIRMAN. I thank the Chair.

Senator CANTWELL. Thank you.

Senator Thune.

**STATEMENT OF HON. JOHN THUNE,
U.S. SENATOR FROM SOUTH DAKOTA**

Senator THUNE. Thank you, Madam Chairman. And I want to thank you for holding this important hearing today and for our witnesses for testifying.

And this is my first hearing as Ranking Member, so I'm looking forward to tackling the important issues that fall under this subcommittee's jurisdiction.

I think, in most circumstances, our constituents always want us to be able to share their experiences, and when it comes to flying, most of us do. Most of us are frequent flyers, so we can certainly identify with the challenges that people face in traveling. And I want to work with my colleagues on this committee to ensure that our consumers in this country have access to affordable, safe and timely air service.

Our Nation's airspace and the almost 25-million square miles of oceanic air space that the FAA is tasked with monitoring involves roughly 15,000 air traffic controllers and almost 1,300 civilian contract controllers and more than 9,500 military controllers. So, together, they ensure that our Nation has one of the safest aviation systems in the world.

But, as we have found from recent reports, there's still a lot of work that needs to be done, and so I appreciate hearing some of the steps that are being mentioned today.

And I wanted to take up a question, if I might, Mr. Babbitt, with you regarding NextGen. You mentioned it, and I'm aware that FAA is in the early stages of implementing some major advances in air traffic control management with the next-generation air traffic control system that the system will use technological advances to make aviation safer, more efficient.

In some cases, aircraft will also be flying closer together more safely, that's the plan. To what extent, if at all, do you see the NextGen system preventing or reducing incidents that could be caused by controller errors?

Mr. BABBITT. Well, one of the advantages that the NextGen system brings us is very enhanced and increased situational awareness, so that the display in the cockpit will show all the aircraft around your aircraft. So you'll have essentially the same display that the air traffic controller has, and it's just simply a backup system.

As hard as we try, there have been situations where radar fails. Sometimes it's for a few moments, a few seconds, but when airplanes are closing at a rate of eight miles a minute each, a combined closure rate of 16 miles a minute, 20 seconds is a long time. Having situational awareness improved through warnings that pilots would get from that type of better situational awareness and warning technology could be a huge lifesaver.

So, yes, it gives us a much better and timely situational update. People don't think about it, but where there are long-range radar sweeps—Paul could tell you better than I, I think it's between 9 and 12 seconds between updates. Airplanes go a long ways in 12 seconds. So that's when they update themselves again. Updated situational awareness is instantaneous. They're constantly showing the accurate position of where the aircraft are.

Senator THUNE. Is there anything in the NextGen system that could be improved that might help alleviate problems that are caused by controllers falling asleep?

Mr. BABBITT. Well, the issue there, I think, is being managed a little differently. We're taking a real hard look and working with our colleagues at NATCA to work through the scheduling process as fatigue mitigation and so forth.

The technology of NextGen is going to be more effective in terms of providing everybody with better situational awareness of where the traffic is. But, no, I don't see the relationship to alertness.

Senator THUNE. If anybody else on the panel would want to respond to that, feel free to. I was directing that to Mr. Babbitt.

But I also wanted to point out, I guess, over the next 10 years we're going to be looking at 11,000 new controllers being hired and trained. And so I would direct this to you, Mr. Babbitt as well, but are there any programs in place that would be able to identify who might be more adept or who might have the greatest difficulties at working midnight shifts? Is there any way that you can identify those types of things when you're evaluating personnel?

Mr. BABBITT. Dr. Belenky could probably shed a little more light on profiling, but, no. Just in terms of overall training, one of the things that we did this morning, is that I kicked off a sort of blue ribbon panel, if you would—a group that we've selected in this overall review of air traffic control training.

And this panel of five is going to look at every segment of how we hire, how we train, how we requalify our controllers. Are we teaching them the right things? Is the curriculum right? Are we getting the right ratios through our school? And these are all individual experts in their field. So I'm looking forward to their report to us to help us improve the training of the controllers.

Senator THUNE. Mr. Belenky.

Dr. BELENKY. Senator Thune, people who are morning types do not do as well in nightshift work as people who are evening types. There is actually a difference in their circadian rhythm phase, with the trough being earlier in the morning for morning types, later in the evening for evening types. This is a physiological trait difference between people.

Evening types do better at nightshift work. Also, younger people do better. As people get older, sometimes someone who tolerated shift work very well ceases to tolerate it as well or to tolerate it

at all. This may be because, as we get older, we shift toward becoming more and more a morning type. Therefore, this is an issue, and there are physiological differences that do speak to people's ability to do this.

Senator THUNE. Well, it just seems like that with that kind of information that managers might be in a better position to schedule and mitigate potential issues for controllers before they happen, if that kind of information and data is available.

Dr. BELENKY. Yes.

Senator THUNE. And it sounds like it is.

Dr. BELENKY. It is. Yes, this is accepted within the field.

Senator THUNE. Madam Chair, my time has expired, so I'll—

Senator CANTWELL. Thank you. Senator Lautenberg.

**STATEMENT OF HON. FRANK R. LAUTENBERG,
U.S. SENATOR FROM NEW JERSEY**

Senator LAUTENBERG. Thank you, Madam Chairman. I was beginning to feel kind of lonesome here, because we introduced the Chairperson, then the Chairman of the Committee, the Ranking Member and then members of the Committee. So I am multiples here, members of the Committee.

And I'm glad that we have a chance to have this exchange, really important, and when we look at the numbers that fly every day and how good the performance is of the controller force, it's really remarkable.

But the very obvious glitches that are in here, when you look at, now, six incidents in which air traffic controllers and supervisors were caught sleeping on the job, forcing pilots to land planes with no assistance—and I understand, Mr. Babbitt, that you're taking steps to ensure that there are at least two people, if I'm correct, in a tower at all times—but I wonder, in the processing of appointments to various stations, whether—are there any prohibitions against second jobs?

I'm sure a lot of people enjoy second-job income, among the controllers as well as other people in the workforce. Are there any rules that say, Look, you can't have strenuous exercise before you come to work? And that has to be a pledge. I don't know how you monitor it. But the fact of the matter is if someone just a five- or a ten-mile run and then comes to work, could be headed for a very serious problem. Dr. Belenky.

Dr. BELENKY. Thank you, Senator Lautenberg.

The main determinant of sleep time is work hours. So, if you add to the normal work hours with a second job with other employment, you cut into your sleep time. In the factors determining sleep time, first is work hours, second is travel time, including dropping people off and picking people up and commuting, and third is family and community responsibilities.

Senator LAUTENBERG. Right. But with all of those things, I mean, to answer the question as I put it, I mean, how do you regulate a behavior? Because that, obviously, has to do with sleep.

Now, I know when I get older, I'll probably—as you said—will need more sleep. Right now, I'm good, but, anyway—

Senator CANTWELL. I think he said you would just be getting up earlier.

Senator LAUTENBERG. Yes. We can't continue this dialogue, but—

And I am so proud of our workforce, Mr. Babbitt, but, as you know, and there are thousands and thousands of really well—good movements and no problems and so forth.

But it's not the good things you do. That's expected. It's the bad things that happen that were focused on, because one incident can be one far too many, and we have to be careful with that.

So, you know, we had a major assault on controllers some years ago where the whole force was terminated virtually and had to rebuild.

Now—And I hear you ask a plea for sufficient budget to take care of your responsibilities. Now—But then, on the other hand—and I like what you said, that safety is the most important issue and there will be no compromise on safety, but how do these things come together?

If you don't have enough money in the budget, it's pretty hard to say, Well, OK, we're all going to do safety measures, and the greatest safety would be to spread the hours out, 10 hours between jobs or whatever that is. There's an inconsistency there.

And I think that, not unlike the military, I mean, when we send people to the front, we have to have enough bullets for them to carry. And if we send people up in those towers, those jobs are equally important, because a mistake could be unacceptable under any condition. So how does that work out, the budget and safety?

Mr. BABBITT. Senator, I'll expand a little bit on the comment that I made. I mean, you're asking me to make somewhat of a Sophie's choice, and I indicated that we would not compromise safety, and we won't.

We have a very dedicated workforce, including the air traffic controllers. We're going to adequately staff and man our facilities and make certain that they have the rest they need, the education they need and so forth.

But what I did indicate was there are areas that are more discretionary, for example, in the certification area. We're looking at that right now. There are three different facilities being proposed to be built on the East Coast of the United States. One is Boeing. One is HondaJet, and one is Embraer. All three of these facilities propose to hire anywhere from 1,500 to 4,000 employees, and each of those facilities has to be certified by the FAA.

Now, is safety going to be compromised if I build one 4 months later? No, but I would suggest to you I think the American public would be far better served by building that plant and putting 4,000 people to work 4 months earlier, rather than for me to be lacking the 10 people necessary to inspect the plant.

So we're being forced to make some decisions, some discretionary spending decisions that I think—you know, there's a fairly significant business case that would support the request that we've made.

And I appreciate that all of us want to do better. We want to do more with the funds that we have. I think we're very good shepherds of the taxpayer dollar. I can point you to savings we have achieved. We have undertaken oversight programs within the FAA. We've saved \$560 million in the last 5 years, and that's money that

we invested in programs and didn't ask anyone for more money. We funded those from internal savings.

We're going to save \$85 million this year, much of it from IT consolidation. We've got plans going forward to share our services better to be more efficient.

But, at the end of the day, not having the funds that we're looking for will have consequences. It won't be safety, but it will have consequences. NextGen will be delayed.

Senator LAUTENBERG. Well, it's going to be someplace. I mean, you can't get more liquid in a quart bottle than the quart was intended to hold.

And I don't know how, Madam Chairman, that we can say, OK. Build additional airplane-building facilities, bring more airplanes into the system, and not be guaranteed that we have enough funds to supply the appropriate number of controllers.

And there ought to be a formula established that says, OK. You want to cut the funds that go into the FAA, OK, then here's how many controllers we have. And we say there can only be X number of airplanes in the sky, so that there isn't a question about—this tug of war that you find yourself in and that we find ourselves in, where, oh, it's going to be cut, cut, cut. When you cut too much, the blood starts running, and that's what we have to be careful for.

Thank you very much. And thank you all very much for your testimony.

Senator CANTWELL. Thank you, Senator Lautenberg.

Mr. Babbitt, I'd like to go back to the questioning that I was asking Mr. Scovel about operational errors and just trying to understand whether you have any purview on this as it relates to this year. Are we seeing the same trajectory? Do we have any information? Is this year better than last?

Mr. BABBITT. Let's start with the fact that—I'm as concerned with an increase of operational errors as anyone. That's not a good thing, but on the other side of it, I am pleased. We tried to change the culture. We want people to report everything.

We are now focused on some of the culture changes. We've asked our supervisors to be more proactive. And while ATSAP reports in and of themselves are excluded from the reporting, often operational errors are dually reported.

I'm your supervisor. You make an error. I see it. You file ATSAP. I still file it as an operational error. So there's no prohibition on both of us noting that operational error.

Senator CANTWELL. But you're not saying that's double accounting there.

Mr. BABBITT. No, no. No, but the comment was made that the ATSAP reports aren't counted, and I'm suggesting to you, that sometimes they are, in another fashion. Someone else is going to file the report about the incident.

The other thing that I think we should pay attention to is, yes, there has been a dramatic increase, but the A errors—just use the A's—the most serious errors; these went from 37 in 2009 to 43. That was out of 133 million operations. And we saw an increase of seven. I don't like an increase of seven, and I want to know why those happened, but that's a very small percentage of error increase.

The lion's share of the increase of errors comes down in the less significant categories, the C's and the D's. These are operational errors. This means that someone who we wanted to have five-mile in-trail spacing had 4.9 spacing for a minute. That's all. We put that margin there for a good reason. We don't want people getting inside of 5 miles.

But there was nothing at risk here. They simply violated the parameters we put around, and I want to know why. So we take this increased data and work it in and revise our training.

And, by the way, as we go forward, we're going to get more increases in error reporting as we capture more and more electronically. I think Mr. Rinaldi will tell you, when you look at a radar-scope that's scanning 50 miles, can you look at it and tell that's 5 or 4.9? No.

Electronically, you can, and as this TARP-type reporting comes in, we're going to see an increase in error reporting, and that's a good thing. I want to know why those errors are occurring, so we can address them.

Senator CANTWELL. Can you talk about the A group, which is the most severe classification of error and what the methodology is? Is this subjective? Is this an objective process and—

Mr. BABBITT. No, these errors are ranked A, B, C and D. Loss of separation is essentially what we're talking about. We—

Senator CANTWELL. And A is—

Mr. BABBITT. The most significant loss of separation.

Senator CANTWELL. Which is?

Mr. BABBITT. Well, depending on whether it's an en route environment, whether it's in the TRACON final approach, you know, each of these are different. For example, over the ocean, we separate airplanes with 50-mile, in-trail separation. Because we can't see them, we require them to report where they are.

Across the United States, they can go to 20-mile in-trail separation. In a TRACON, they can be down to five, and, on final approach, because the radar is better, or, when they can see each other, we can tolerate three miles. So—

Senator CANTWELL. And on this increase of seven over the previous year, do you know which of those they were, whether it was—

Mr. BABBITT. I can get back to you. I don't have that in the top of my head, but I certainly could get back to you with that data in each particular event.

[The information referred to follows:]

In Fiscal Year 2010 there was an increase of six (6) category A operational errors from Fiscal Year 2009 (FY 2009—37 and FY 2010—43). The increase for Fiscal Year 2010 was within the terminal environment with a separation requirement of 3 nautical miles lateral or 1,000 feet vertical.

But my point is that thousands of the increases were down in the C's, not significant. They were operational errors. They were a loss of separation, but not the significant losses. The significant losses are the ones that would really concern us. They all concern me. I just wanted to make that distinction.

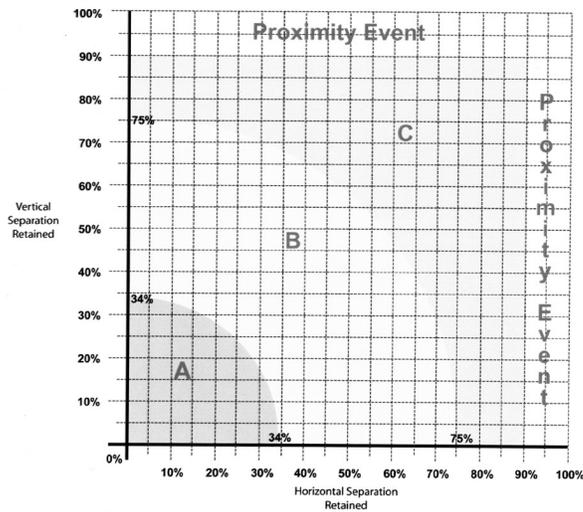
Senator CANTWELL. And do you know if any of them were proportionally more operational errors during the midnight shift than other shifts?

Mr. BABBITT. I don't know the answer to that, but, again, I can get back to you. We certainly can get the time and location of each event.

[The information referred to follows:]

No, there are not proportionately more operational errors during the midnight shift as compared to other air traffic controller shifts. For Fiscal Year 2010 there were 68 operational errors between the hours of 9:30 p.m. and 5:30 a.m. as compared to 1,819 for all other times.

Separation Conformance Review (SCR)



Senator CANTWELL. Because I think that's one of the questions that we're trying to ascertain here. We're seeing this increase of operational errors. It is very concerning.

Mr. BABBITT. Sure.

Senator CANTWELL. And we obviously have this issue of fatigue in the workplace and—

Mr. BABBITT. Yes, I would—

Senator CANTWELL. And they're both very concerning.

Mr. BABBITT. Sure.

Senator CANTWELL. But being related to each other would make us even more concerned.

Mr. BABBITT. Yes, I would—

Senator CANTWELL. And so—

Mr. BABBITT. Common sense would direct me to suggest that probably not, because the traffic drops off significantly in the evenings. These operational errors tend to happen in high-volume situations.

Senator CANTWELL. So is the air traffic controllers' schedule and fatigue considered causal factors for operational errors or is that—Do you know, Mr. Scovel?

Mr. SCOVEL. I'm sorry, you're asking, Madam Chairman—

Senator CANTWELL. The FAA lists causal—do they list causal factors for each operational error?

Mr. SCOVEL. When FAA launches its investigatory process, subsequent to each operational error, there are a series of questions that are asked. We believe that those questions need to be better refined and the data needs to be much more precise.

For instance, I referred earlier to our review of potential fatigue factors at the Chicago area air traffic control facilities, and in reviewing operational error reports at that location, we were looking specifically for the degree to which fatigue was accounted for in the investigation. And we found, in too many instances, a cursory description of what the controller had experienced that might lead an observer to think he might be fatigued.

For instance, the report form will ask what shift. That's entirely relevant. The controller, in some instances, reported simply "rotation." The reports did not always indicate which shift or which day in the 2-2-1 rotation.

With better attention from management, and a better list of questions to begin with, better data can be obtained. Better data, with proper analysis, will yield better corrective actions and reduce the risk to the flying public.

Senator CANTWELL. Thank you. Thank you.

Chairman Rockefeller.

The CHAIRMAN. Thank you, Madam Chair.

Mr. Rinaldi, I think it's only fair that you get to talk. So let me ask you a couple of questions.

Number one, this has not been answered, and I'm ashamed to say I don't know the answer myself. Please tell me that an air traffic control person cannot hold two jobs during the course of the day.

Mr. RINALDI. It's not prohibited, and under the imposed work rules of 2006 and payrolls of 2006, many of the new air traffic controllers were holding down two and three jobs to make ends meet because of the cut in pay.

I applaud the Administrator for really getting—and the Secretary of Transportation—for putting a lot of focus on getting us back to a fair collective bargaining agreement.

And I'm not sure what the number is, if anyone is holding two jobs down at this point.

The CHAIRMAN. You said two and sometimes three?

Mr. RINALDI. Sometimes three they were, from 2006 to 2009, to make ends meet.

The CHAIRMAN. That's stunning to me, because I think that Dr. Belenky can do all of the magic he wants, but he can't overcome that one. And I'll come to you in a minute, sir. But that's an enormous statement. It's an enormous statement. To me, that's like asking for trouble.

Mr. RINALDI. Fatigue is—

The CHAIRMAN. Your response would be, Well, they don't have any choice. They've got to make a living and they've got mouths to feed.

That's where we, again, get into the question of the budget not affecting this. Safety comes first. Well, the budget's going to affect this. It's going to affect pay increases or non-pay increases. Just like not having NextGen makes people's life much more complicated.

On the other hand, it makes it much better, because they can see farther out and have much more accurate spacing readings.

But how can this happen? Has this just always been the case? How do you make the case that this doesn't cause sleeplessness or bad judgment?

Mr. RINALDI. Well, actually, from the years of 2006 to 2007, we were talking exactly about the fatigue in the work environment and how we wanted to get together with the agency to address this.

And that was one of our biggest reasons to get back to the table and get a fair collective bargaining agreement was because we saw these new hires come in with a 30-percent reduction in pay and working at these busy facilities in these high-cost-of-living areas and not able to make ends meet, and they were waiting tables and doing anything they possibly can holding down as many jobs as they possibly could.

The CHAIRMAN. Well, we have a problem here, gentlemen. Dr. Belenky, maybe you'd care to comment. Can these two things coexist side by side and have us talk about maximizing safety?

Dr. BELENKY. They can, but in a rather roundabout way.

Performance is dependent on sleep in 24 hours, the total hours of sleep, however you split it. Divided sleep is good, can be fine, if it sums to 7–8 hours in 24 hours. If total sleep in 24 hours is adequate, then you probably need not to be so concerned about commute time or second jobs. It is when these cut into the sleep time that there is a problem.

There are ways of directly measuring on—activity monitors that you could actually track people's sleep-wake history over days, weeks, months, unobtrusively, and if the total sleep/24 hours were adequate, again, that would probably be all right, but, again—Yes.

The CHAIRMAN. With all due respect, I mean, you're talking, I think, a little bit from a lab point of view.

Dr. BELENKY. Absolutely.

The CHAIRMAN. And in the real world of being in a control tower, people aren't going to divide up their sleep very well, I wouldn't think. Maybe I'm wrong. Maybe both Randy and—I'm sorry—Director Babbitt and Mr. Rinaldi can comment on that. I mean, I think this is a very big issue.

Mr. RINALDI. Well, fatigue is real, as I said in my opening statement, and we've been wanting to address this for many years.

And I applaud the Administrator for putting a workforce together, a task force to address it. We've come up with 12 recommendations. We believe all 12 of these recommendations will help mitigate fatigue in the work environment.

And, as I said earlier, the new collective bargaining agreement is fair, and it has gotten us back to—although not yet. In 2012, we will get back to the 2006 pay bands, which has taken some of the stress off the new air traffic controllers that don't have to have maybe two or three jobs anymore. We're not there yet. We are getting there.

So there are a lot of things we're addressing there, but the 12 recommendations that are built on science—and it's not the union says or the FAA says—really is a conglomeration built on science, scientists from NASA, to say this will help fatigue in the work environment. That's one of the things that we're really pushing for.

The CHAIRMAN. Work to be done. Thank you.

Senator CANTWELL. Senator Thune, do you have a second round of questioning?

Senator THUNE. Well, just a couple of things, Madam Chairman.

And, Mr. Babbitt, following this string of sleeping-controller incidents, Hank Krakowski, the CEO of the FAA's air traffic organization, accepted responsibility and resigned. That's a critical position, obviously, at the FAA. How long before you find a replacement, and what is the type of skill set that you are looking for?

Mr. BABBITT. Yes, it was unfortunate. Mr. Krakowski was a professional, and I've known him for a long time. He had an excellent background and reputation.

We are starting the process now. I couldn't tell you in exact terms. Sometimes some of the folks that you'd like to have might not be as interested in taking the job as we might want them to be.

Certainly, this is a job that requires a lot of operational experience. This network is not unlike a large logistics network. This is a very complex operation.

Just with respect to the operation itself, you've got over 500 facilities that are manned with people on 24-hours—many of them, the vast majority of them are on 24-hour schedules. They have unique skills. They move. They have to be trained.

The operational side of it, includes introduction to this system and obviously the new techniques coming with the NextGen procedures. How do we maximize those? How do we prioritize those?

So we have, right now, a set of criteria that we're looking at. We're reviewing it within the Department of Transportation, and we're going to start our search very quickly.

Now, the good news is, in the interim, David Grissell, who was Chief Counsel to the FAA is in place. David is a seasoned professional, 24 years at Continental Airlines. He has a lot of experience in big operations and saw a lot of transformation at Continental Airlines.

He's familiar with networks, and I think he's doing a terrific job. He would rather go back to being Chief Counsel, I believe, than continue to be the COO. But he's doing a good job. In the interim, we've got a lot of good people in place. So my hope would be to have someone within the next few months, but it's hard to say when you're trying to recruit someone.

Senator THUNE. Accountability is important, but one individual is not solely responsible for these incidents. Have you made any other personnel changes that you believe will emphasize a change in approach throughout the rest of the management workforce?

Mr. BABBITT. Yes, sir, we have. We have undertaken some pretty dramatic management changes. We've got about 10 different areas where we have inside leadership changes, and, in some cases, people thought maybe it would be better to move on and do something else.

We clearly have some cultural changes to make. One of the reasons that Paul and I were on the Call to Action was to clearly reinforce professionalism.

As Senator Rockefeller mentioned, we can't regulate this. I can't regulate professionalism. I wish I could, but I can't. The vast majority of the air traffic controllers are very proud of what they do. They have great respect for what they do, and we've called upon them to help mentor people.

Sometimes you see someone doing something less than professional. If you do speak up. It's your profession. We've really carried that message to them, that they need to be helping us police the professionalism.

Someone can have 16 hours of rest, in terms of what Dr. Belenky thinks is adequate rest, but what if we found out that he played 36 holes of golf that afternoon? That's not professional. I don't care how much time off you had, if you didn't use that time wisely and take advantage of your sleep opportunity—it's not professional.

I'm very pleased the professional standards group that is being built within NATCA is addressing these issues, because on some of this stuff you can't do top down. You have to have it come from the bottom up. They're inspired to do it. It's a proud profession. They're not happier about this blemish than anybody else.

Senator THUNE. Right. Let me ask just a general question, too, because you've implemented the nine-hour rest period. I think the IG had recommended 10. NATCA recommended nine-hour rest between evening and dayshifts only. Is that satisfactory? Does that rest period—is it something that you feel will be the most effective in mitigating fatigue?

Mr. RINALDI. One of the 12 recommendations was the nine-hour break between the evening shift and going to what we would call the quick turn to the dayshift. That was backed with science and said that would give us an extra hour of sleep in our sleep bank, so to speak, as we were rotating through our shifts. That was backed with science and that was one that we recommended.

The extra hour between—and I defer to the scientists here—the extra hour between the dayshift and the midnight shift, because you're starting your shift later in that deprivation period of midnight to six o'clock in the morning when your circadian rhythms are expecting you to sleep—you know, you're really focused on falling asleep at that point—that we don't support it.

We're working with the administration to show if science supports mitigating the fatigue, we're 100 percent on board. If 10 hours is better than nine—Right now, it shows that 9 hours has the most benefit in between shifts than 10 hours, and if there is—nine hours are supported from a dayshift to a midnight shift with science, we will be 100 percent behind that.

Right now, it doesn't show that. It actually shows the opposite, because you're starting your midnight shift in an area where—and you're working more hours in that dangerous period.

Dr. BELENKY. I agree with Mr. Rinaldi. It is a very tricky issue, and it depends critically on the timing of the sleep opportunity. If you place the sleep opportunity, as Mr. Rinaldi indicated, in the early to mid evening, that is the forbidden zone for sleep. Your body temperature is rising. All your systems are telling you to be

awake, stay awake, and be alert. It is very difficult to sleep during that period.

Therefore, 9 hours off from 3 in the afternoon until 11 or 12 in the evening is not going to help very much, because it's not going to be a useable sleep opportunity. In contrast, 9 hours from midnight to 9 in the morning, is excellent. You will sleep well and be able to capitalize on that sleep opportunity. Therefore, it isn't just the duration of the opportunity, but the key is placement with respect to the circadian rhythm.

Mr. SCOVEL. Mr. Thune, if I may.

Senator THUNE. Yes.

Mr. SCOVEL. You referred to our recommendation, which dates back to 2009 as part of our report on the three Chicago facilities.

At that time, we recommended 10 hours between shifts, and it was our understanding, at that time, that FAA was about to change its internal order to specify 10 hours, as opposed to 8 hours between shifts, in the 2-2-1 rotation. In effect, we endorsed that change.

Since then—and Mr. Babbitt and Mr. Rinaldi have both referred to the work group that has recommended a move to 9 hours.

Look, we're not wedded to 10 hours. We would gladly defer to medical science on this question, but we think that the agency would be well-served to be guided by the science when it comes to naps or rests during a controller's work shift as well.

It will be cold comfort, Mr. Thune, for the family of a victim of an aircraft accident if it's determined that it was due to controller error and that the controller was fatigued at the time and had been deprived of opportunities for rest.

Senator THUNE. Yes. Thank you. Thank you, Madam Chairman.

Senator CANTWELL. Senator Lautenberg, do you have a second question—second round?

Senator LAUTENBERG. Yes.

Senator CANTWELL. Without objection.

Senator LAUTENBERG. And I want to ask Mr. Babbitt a question. In 2006, a former FAA Administrator informed me that Newark Liberty air traffic control needed at least 35 controllers to move traffic safely.

Now, I don't know whether it was intended to be full-performance people, but, right now, there are only 26 certified controllers manning the tower with 8 trainees. And what's the FAA plan to address the need to keep our towers fully staffed with certified controllers?

Mr. BABBITT. Yes, sir. I'm not sure—I don't have the numbers available to me, but my understanding today is that we do, in fact, try to staff to traffic. So traffic flows change sometimes, and, therefore, you might want to increase staffing some place. On the other hand, sometimes the traffic falls off some place and staffing may need to be reassessed.

A good example recently would have been Cincinnati, where a merger forced a move in traffic to other areas. So traffic in another city went up dramatically and traffic in Cincinnati went down.

It takes us a while to migrate the people back and forth. So, specifically, my understanding today with respect to Newark Liberty

is that we have a floor of around 28 and a ceiling of about 38. I could get you the absolute staffing numbers that we have.

[The information referred to follows:]

Safety is the top priority of the Federal Aviation Administration as it manages America's National Airspace System (NAS). An important part of managing the NAS involves actively aligning controller resources with demand. The FAA "staffs to traffic," matching the number of air traffic controllers at its facilities with traffic volume and workload. The FAA's staffing needs are dynamic due to the dynamic nature of the workload and traffic volume.

Based on the 2011–2020 Controller Workforce Plan that incorporates changes in air traffic forecasts, controller retirements and staffing ranges, the authorized staffing range for Newark 29 to 36.

As of June 18, 2011, Newark has 28 Certified Professional Controllers (CPC) and six trainees. Three of these trainees are currently being used operationally and two of the six are scheduled to become CPCs by the end of 2011.

In addition, Newark has brought on board two CPC-In Training (CPC-IT) transfers and one new hire in 2011. An additional CPC transfer is expected in September. Newark is scheduled to hire three additional CPC-IT transfers in 2012.

Senator LAUTENBERG. Let me ask you this: Newark Liberty is a complex airport due to high volume of flights, congestion, New York-New Jersey airspace, constrained runways.

Now, so what have we got to do to provide the numbers that we need for Newark when my understanding is that 75 percent of the trainees don't make it through the program? So when you have a dropout rate like that or an incomplete rate like that, what do we do to get Newark up to date?

Mr. BABBITT. Yes, sir. I think I made an earlier observation that we had difficulty with the previous collective bargaining agreement with the air traffic controllers. We were unable to attract seasoned controllers into complex facilities.

That has changed, and those numbers that you're looking at, those are old numbers. We've had dramatic improvement since then.

Now, if we needed to fill spots in, we're able to. For example, at Newark, we would be able to advertise a position, and a seasoned controller might come from a smaller facility and very easily upgrade into Newark as opposed to a new hire.

And the fact that we had to put new hires into some of those complex facilities led to an exceedingly high washout rate, which was unfortunate. But we've cured that today.

Senator LAUTENBERG. We still have increased salary for high-cost areas?

Mr. BABBITT. Yes. Yes, sir.

Senator LAUTENBERG. Is that still in place?

Mr. BABBITT. Yes, sir.

Senator LAUTENBERG. So if someone shifts in from another less busy airport to become a fully trained controller at Newark, that means they automatically will get an increase in their salary.

Mr. BABBITT. Well, if they had come from LaGuardia probably not.

Senator LAUTENBERG. No.

Mr. BABBITT. Within the metropolitan area it would be probably the same salary. I'd have to look in particular.

[The information referred to follows:]

When moving Certified Professional Controllers (CPCs), the pay setting guidance is outlined in the Collective Bargaining Agreement and Appendices between the Na-

tional Air Traffic Controllers Association (NATCA) and the Federal Aviation Administration (FAA).

When a CPC transfers to the same ATC level facility, their base pay will remain unchanged. For example, the above guidance applies upon CPC transfer from an ATC Level 10 facility like LaGuardia to the same ATC Level 10 facility like Newark.

When an employee transfers to a CPC position at a higher ATC level facility, base pay is increased to the minimum of the new CPC pay band, or is increased by 6 percent (6 percent), whichever is greater, not to exceed the new band maximum.

Note: One-half (1/2) of the increase is paid upon initial transfer to the new facility; the other one-half (1/2) is paid when fully certified in the new facility.

Senator LAUTENBERG. No, we try to keep the bi-state wars—Mr. Rinaldi, the House Republicans have threatened to cut back FAA funds to 2008 levels. What impact would these proposed cuts have on our ability to hire and fully train new air traffic controllers?

Mr. RINALDI. That would be a big concern of ours to go back to 2008 levels for the obvious reasons that, as Mr. Babbitt said, from 2006 to 2009, we lost somewhere between 4,500 air traffic controllers—around 5,000 air traffic controllers, and in the last 5-year period, they hired somewhere over 7,500 air traffic controllers.

It takes 3 to 5 years to train somebody to become an air traffic controller, and that training does put a lot of stress on the program, and a lot of our facilities are above the 25-percent optimal trainee to CPC, certified professional control level.

So if we went back to 2008 numbers and we looked at not hiring and continuing hiring, the fear that we have is currently we have about another 4,000 air traffic controllers are ready to retire or eligible to retire and they will be retiring soon. We have another wave of retirement. We haven't caught up from the first wave of retirement that we experienced in 2006 to 2009.

Senator LAUTENBERG. I close with thanks to all four of these people who do a terrific job, and their teams do a terrific job, but we're going to hound you to death to even make it better if we can possibly do it.

Thanks very much.

Senator CANTWELL. Senator Warner.

**STATEMENT OF HON. MARK WARNER,
U.S. SENATOR FROM VIRGINIA**

Senator WARNER. Thank you, Madam Chairman. Thank you for holding this hearing.

And I want to commend Mr. Rinaldi and Administrator Babbitt for some of the actions they're taking. I think we all were surprised by these incidents, but I'm glad to see you've been working further together.

This was not an area that I had a lot of knowledge about, but I'll remember a meeting I had with Mr. Rinaldi back in 2007, and I don't think I, in all my time in public service, had more of a frightening session kind of getting Air Traffic Control 101 in terms of the potential wave of retirees, the challenges of attracting new folks, the ability to get through training periods, the ability to attract people to stay in this profession, the antiquated equipment and the need to move to NextGen.

And I want to, again, echo what Senator Lautenberg said. I think you all do a good job. We need to constantly be vigilant.

But I guess I'd ask you first if there's anything else? I mean, the remarkable thing is a lot of the things he said in 2007 have all kind of come to pass, and I don't think a lot of our folks around the country would know kind of how close to the edge because there had been, obviously, a massive transformation of the air traffic control system in the early 1980s when a whole lot of new people were hired. They've run through their cycle.

And I just wonder if you've got any other—I know I've missed the first round of questions and your first round of testimony, but if you've got any other, at least at this moment, advice or admonition, hopefully not any more predictions similar to what you made in 2007.

Mr. RINALDI. Thank you, Senator.

Unfortunately, I think that there's a lag in the system, and I didn't mean to, in my opening statement, to say that we're not concerned about operational errors. We certainly are concerned about operational errors.

What I was trying to refer to is in the 2006 to 2009, and even years before that, there was a culture within the FAA to cover it up, hide it, and management's incentives were tied to it. And we weren't getting the information to address the safety concerns in the system, and that's why I applaud the administrator for really putting a just culture in place to address the safety concerns of the system.

Unfortunately, I think we're going to see an increase in operational errors, as we talked about TARP, of better reporting, open reporting, we're going to start to really see where there are possible implications of safety in the system. And I look forward to working with the administrator and working with all of you to say, yes, we have a concern here. We need to address it.

So as operations grow, as fatigue is a real problem in our work environment, and we look forward to implementing those 12 recommendations to mitigate as much as possible—and I don't know if you can ever eliminate fatigue in a high-stressed, 24-hour-a-day profession like air traffic control, but you could certainly try to mitigate it to the point that our cognitive skills are not impaired, and that's really where we look to go.

So that we're embarrassed by what has happened, and we're proud professionals and we don't like any of the nonsense that is going on, and we want to make sure it never happens again. And I think the first positive step is to address these 12 recommendations and to really address the safety concerns with the operational errors.

Senator WARNER. And do you both feel that you've got now the transparency and the training processes in place to make sure that we don't have this kind of cliff effect of retirement that we've run into in these last few years?

Mr. BABBITT. No, sir, senator. The retirement rate is literally half of what it was 3 years ago. We're down to a steady state. Any corporation, any business that's been in business long enough gets to the point where you've got retirements at five, six, seven percent per year. That's where we're living. That's as it should be. And we can train to that without any problem and not overburden the system.

But we were overburdened. There's no question. We were training twice that many of controllers for three straight years. It put a huge burden on the system. You know, we have a finite number of training facilities. When you put 30- and 40-percent trainees into a facility, who trains them? The other controllers train them. So it's a big burden on everyone.

But we're now getting the number of trainees down. We're very comfortable in the 20- to 25-percent range, and that's where we are today. So I'm very comfortable there.

Senator WARNER. Well, again, I appreciate the collaboration both of you are going to work on.

And, again, Mr. Rinaldi, I just wish that all those things you'd said hadn't—the rest of them don't all come true as well.

Administrator Babbitt, this is going to come a little out of left field, so you may not have the answer, but hope you get back to me.

One of the things I've been very interested in as well is making sure we get additional spectrum out into the marketplace, and a number of years back in part of the mobile satellite spectrum there was an award made to a company named LightSquared that potentially would be another mobile broadband competitor, and there were certain questions about interference with existing GPS systems.

Some of these concerns seem to have been raised now five or six years after the grants had been made. And nobody likes to give up spectrum, but some of the folks that I've talked to say there are ways that we can make sure there is another viable broadband competitor out there and still make sure, as we move into NextGen, that there is appropriate GPS protection for—or that appropriate NextGen GPS services are used and they're not going to have an interference.

And I would just hope, as the FCC moves through this process, that you'll participate and not just have the approach that says, OK. You had this spectrum for 6 years. Now, all of a sudden, we're going to say there's potential interference here. So—

Mr. BABBITT. Yes, sir. We're actively engaged in working through trying to find a solution there.

One of the problems, of course, was the original intent of LightSquared was to use satellite signals. Back in November, they began to come up with the idea that they could enhance the signal by boosting it on the ground with terrestrial antennas, that are very powerful, literally 100 times more powerful than the original satellites forecast from space.

Now, there is a technical solution available, but I have to tell you it would not be without consequence. The technical solution we would have to have would require the equipment redesigned to filter the interference, certify the redesign and reinstall it. It has weight. There are consequences to putting new equipment in airplanes.

To require that would probably take in the 5-year-at-best time range. And then you're talking about equipping airplanes that have been designed, for the last 15 years to accommodate ADSB, automatic dependent surveillance broadcast equipment. This is where the airplane takes its position and develops it from a satellite and

then broadcasts it. We have about 5,000 commercial airplanes that use that equipment today, and about 140,000 general aviation airplanes.

Senator WARNER. Clearly, anything would have to—

Mr. BABBITT. Right.

Senator WARNER.—require a transition period, but I would like to see—And my understanding is the FCC's going to come out with what some of those costs would be. I hope you will actively participate, because, at some point, we're going to have to weigh the policy implications—

Mr. BABBITT. Yes, sir. Yes, sir. No, we certainly will.

Senator CANTWELL. Thank you.

Senator WARNER.—but I just want to, again, thank you both for what you've been working on.

Senator CANTWELL. Senator Klobuchar.

**STATEMENT OF HON. AMY KLOBUCHAR,
U.S. SENATOR FROM MINNESOTA**

Senator KLOBUCHAR. Thank you very much, Madam Chairman. I apologize for being late. I was chairing a judiciary hearing, and, now, I'm the unenviable position of being last, where I think it means all questions have been asked, but not by me.

So I first wanted to thank all of you. I was especially impressed by your comments and exchange with Senator Warner, Mr. Rinaldi, about the pride in your profession and how these recent events have been so disappointing and the work that's being done to fix it.

As you all know, our commercial aviation system carried nearly 800 million people last year, many of them through major air transport hubs like Minneapolis-St. Paul International Airport.

And we know that our accident rate has gone down over the years, but there are still issues, we know, when we have some of our traffic controllers falling asleep. Fatigue and sleep deprivation among air traffic controllers is a serious issue and I appreciate the chairwoman for having this hearing and all of you for taking this on.

I know, Mr. Babbitt, the FAA has recognized and addressed the issue of fatigue, and the new staffing guidelines require two controllers in towers during nightshifts and 9-hour windows between shifts.

Have you been able to quantify the effect of these new staffing policies on operational errors and runway incursions since they were implemented or is it too early?

Mr. BABBITT. I believe, Senator, it's probably a little too early. Part of the problem is these towers—or whatever the facilities were, 27 towers, three TRACONS—that had a single person manning it.

The reason they had such low staffing is there is very little traffic operations at those hours. So we wouldn't expect there to be much in the way of operational errors there, but it is too early to tell.

Senator KLOBUCHAR. Well, I know there were a spate of reports sort of in one time period about people falling asleep, but there seems like there haven't been, at least in the last month or two,

since Secretary LaHood and others came out. Do you have any information on that?

Mr. BABBITT. Well, we instituted a number of changes. You did miss sort of our review, putting 9 hours—

Senator KLOBUCHAR. No, I know the changes. I just wondered if you'd had reports of others falling asleep.

Mr. BABBITT. Well, very candidly, I called for a top-to-bottom review, and we did find some that happened earlier. Now, I'm sure if I go back further I'll find more. But we did find two that happened in January, both instances of people either observed with their eyes closed or observed sleeping. Neither of these were good, one in Los Angeles and one in Fort Worth. We're just adding that to the statistics.

Senator KLOBUCHAR. And I know when you visited me last week, we talked about this, but the rest periods between shifts and double staffing may require additional air traffic controllers. Does the FAA have an estimate of how these new policies could affect the demand for controllers?

Mr. BABBITT. Well, in this case, we're talking about 30 total out of 15,000. Now, that has a consequence, but we're also looking and working with the controllers to provide the same effective result as having two people together in a tower.

As an example, we have facilities, where we have someone in a TRACON or a radar facility downstairs and someone in the tower upstairs, each of them alone.

Well, we can put a console upstairs and let the person work radar up there. It's dark at night anyway, so they could work the facility and now there are two people at no cost, other than the one-time installation. So we're looking at things like that.

Senator KLOBUCHAR. So you'd have someone else in there, but they're working—

Mr. BABBITT. Yes, they would be doing the same work that we're currently doing in a different location. We'll just put them in the same spot—

Senator KLOBUCHAR. I get it.

Mr. BABBITT. Thus saving us the extra person.

Senator KLOBUCHAR. Yes. And then one last question: This spring, the Fatigue Work Group, composed of representatives from the National Air Traffic Controllers Association and the FAA, made a set of 12 recommendations that, if implemented, would address and mitigate the issue of fatigue among air traffic controllers.

Do you know the status of review for this proposal? And do you expect to implement the recommendations? Are there other recommendations beyond double staffing during nightshifts and longer breaks between shifts that could be implemented?

Mr. BABBITT. Yes, there's a number, and we have already implemented several of the pieces that came right out of the fatigue study.

We are in discussions right now with NATCA. We're going to review and see what makes the most sense. In addition to the FAA and NATCA, we had some human-factors folks and people that introduced medical science to help us better understand fatigue and better understand how to mitigate it, so all of those factors are going to be in review.

Some of them will require memorandums of understanding or modifications to the collective-bargaining agreement if we need to increase shifts or do other things like that. But we have had excellent cooperation between FAA and NATCA going forward on this.

Senator KLOBUCHAR. OK. Thank you.

Anyone want to add anything?

Mr. Rinaldi.

Mr. RINALDI. Thank you. The 12 recommendations, they're a good start, but they'll have to be implemented, tested and evaluated to see if we actually reach the goals which we're trying to do, and there might have to be more. The scientists and the workforce will continue to work together to see if we need more time in between shifts or whatever might happen and actually test controllers with wristbands and see exactly if we're really addressing the fatigue.

More importantly—and Mr. Babbitt and Dr. Belenky touched on it—is the education factor about fatigue. We have about 5,000 new air traffic controllers under the age of 30-something that, quite frankly, when we were all 30, we thought we were invincible. And we all were in college, we pulled our all-nighters and did our tests and did everything.

Well, we really need to make sure that we address fatigue and address it real and identify it and make sure that we do have proper periods to sleep and we use that to sleep and rest.

Senator KLOBUCHAR. OK. Very good. Well, thank you very much. And thank you, Madam Chairman, for having this hearing.

Senator CANTWELL. Thank you, Senator Klobuchar.

And I think that does wrap up our hearing. We have discussed a variety of issues—training and the percentage of trainees that are acceptable, scheduling and changes to scheduling, getting more details on the operational errors and the meaning of those operational errors, and, obviously, the implementation of recommendations.

So this committee is going to play an active role on oversight on all of those issues. I can't say that we're taking a legislative path at this moment, but I can tell you we're not ruling it out either. We are going to continue to be diligent until we feel that we have improved the safety and continue to implement those safety recommendations.

So, thank you all very much for this hearing.

[Whereupon, at 4:11 p.m., the hearing was adjourned.]

A P P E N D I X

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JOHN D. ROCKEFELLER IV
TO HON. J. RANDOLPH BABBITT

Question 1. Administrator Babbitt, as you know, this committee has jurisdiction not only over aviation, but also telecommunications policy. Improving air traffic control safety and extending broadband to consumers are both priorities of mine. Over the past few months, there has been a lot of discussion about a decision coming out of the Federal Communications Commission (FCC) to allow certain satellite spectrum to be used for ground-based wireless broadband. I've heard conflicting reports on whether this FCC decision could result in networks that cause interference to the Global Positioning System (GPS), including those that aviation systems rely upon. I understand that the FAA is currently conducting tests to see if there is a technical solution to these concerns. Do you think that there is a possibility of a technical solution?

Answer. The LightSquared signal design consists of two broad channels, an upper and a lower. LightSquared's plan has been to deploy the upper channel first, so that is what we have concentrated on for test and analysis. This upper channel would cause unacceptable interference and loss of GPS service to the existing aviation GPS receivers throughout a significant portion of the National Airspace System. This interference is caused by the overwhelming power difference between the LightSquared signals and GPS. The only technical solutions are to significantly reduce the LightSquared signal power, or to try to develop new GPS receiver technology that could coexist with the LightSquared signals. The engineering to develop a GPS receiver solution is technically risky and will be expensive, and deploying it would likely require replacement of all existing aviation antennas and receivers. The FAA estimates that such an effort—including design, standardization, development, certification and retrofit—would take at minimum of 7–10 years and require the modification of thousands of international as well as all domestic aircraft.

On June 20, 2011, LightSquared released a press release identifying signal changes for their initial deployment plans, to use the lower channel first. We have conducted some preliminary testing and analysis that indicates that aviation receivers may be compatible with this lower channel. However, that same preliminary testing does show many other GPS receivers could be significantly impacted. Further study is required, and unless the upper channel is never transmitted this would only be a temporary solution.

Question 2. Do you think that this could adversely impact the Next Generation Air Traffic Control System (NextGen)?

Answer. If LightSquared were to use their upper channel, the effect on NextGen would be significant. Based upon aviation interference that occurred in testing and is supported by analysis, there would be a loss of a number of integral NextGen capabilities, including a loss of Area Navigation and Required Navigation Performance (RNAVRNP), loss of Localizer Performance with Vertical Guidance (LPV) approaches, loss of Automatic Dependent Surveillance-Broadcast (ADS-B) services, and Cockpit Display of Traffic Information (CDTI). The interference would also cause loss of effective terrain awareness and warning system alerting, which could have a direct impact on safety since pilots would no longer have the necessary input to avoid collisions with obstacles.

Question 3. Has there ever been a comparable period in FAA history where there was such a spike in operational errors?

Answer. The identification and reporting of operational errors has continually improved year after year. We are and will likely continue to experience an upward trend in the number of reports due to the increased emphasis on reporting, the establishment of a voluntary reporting program and the introduction of technology that automatically detects losses of separation.

Question 4. What data is included in the FAA's official count of operational errors by controllers?

Answer. The FAA's official count of operational errors includes all losses of separation attributed to the Air Traffic Control system where less than 90 percent of the required separation was maintained. Losses of separation where at least 90 percent of the required separation was maintained are classified as proximity events. These counts do not include employee identified potential losses of separation reported confidentially inside the Air Traffic Safety Action program (ATSAP).

Question 5. Have all of those losses of separation errors been included in the official count of operational errors?

Answer. All losses of separation are not classified as operational errors; *e.g.*, losses of separation attributed to pilots are classified as pilot deviations. As described above, proximity events and potential losses of separation reported confidentially to ATSAP are not included in the official count. The FAA's official count of operational errors does not include incidents that have been investigated and determined to be proximity events nor does it include incidents where the culpable party is not an air traffic controller.

Question 6. How many of what the FAA has defined as the more severe errors (Category A and B) are reported only via ATSAP?

Answer. Incidents reported only via ATSAP are held confidentially and are not categorized in the same manner as Operational Errors. Incidents reported to ATSAP are reviewed by a three-party committee of ATO management, Air Traffic Oversight and the National Air Traffic Controllers Association. This committee reviews each employee report, collects the information in a database and takes corrective action based on individual incidents and accumulated data.

Question 7. What number and what percentage of total facilities have TARP totally operational?

Answer. TARP is operational at all terminal RADAR facilities, but currently, is only turned on for one hour, twice a month for auditing purposes. With the finalization of our new Quality Assurance/Quality Control processes, it will be used 24/7, and full utilization will occur later this fall.

Question 8. Of the total errors reported in the official count, how many were reported through TARP?

Answer. Operational Errors identified via TARP, which is a technology that provides information in addition to operational errors, are not tracked separately from the standard official reporting system.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO
HON. J. RANDOLPH BABBITT

Question 1. How is the FAA doing so far this fiscal year with respect to operational errors? We are over halfway through the Fiscal Year. Is the trend for overall operational errors looking better or worse than for FY 10? Is the trend for the category A and B operational errors looking better or worse than for FY 10?

Answer. For the current fiscal year through May 2011 the trend for operational errors is higher; operational errors have increased by 4 percent over the comparable period in Fiscal Year 2010. As with total operational errors the trend for category A and B operational errors is higher; category A and B operational errors have increased by 1.7 percent over the comparable period in Fiscal Year 2010.

Question 2. It is my understanding that there is a letter grade given to each operational error. What is the methodology the FAA uses for determining whether an operational error is an A, B, C, or proximity error? What are the variables the FAA examines? Which variables are objective and which variables are subjective?

Answer. Operational errors are categorized as A, B or C using the criteria below. Proximity events are not considered operational errors. The only criteria used to determine the categorization of airborne operational errors is the airborne separation values. These values are objective as the data is collected from the radar systems used to track the aircraft.

Category A: Consists of a loss of airborne separation where the separation conformance is less than 34 percent. In events involving wake turbulence, it includes incidents where the lateral separation retained is less than 70 percent.

Category B: Consists of a loss of airborne separation where the separation conformance is more than 34 percent, but less than 75 percent. In events involving wake turbulence, it includes incidents where the lateral separation retained is equal to or greater than 70 percent, but not more than 85 percent.

Category C: Consists of a loss of airborne separation where the separation conformance is 75 or more, but the horizontal and vertical separation retained is less than 90 percent of the required separation. In events with wake turbulence where

issues identified around aircraft arrival sequencing, unexpected aircraft “go around” procedures, compliance with altitude and other ATC clearances.

Air traffic controller scheduling and fatigue are considered as potential causal factors for operational errors. The ATO, in collaboration with the National Air Traffic Controllers Association, has been researching the impacts of scheduling and fatigue on air traffic controller performance. The research has not revealed a direct causal link to operational errors at this time. The research has indicated potential impacts to employee performance and the ATO has made initial adjustments to controller schedules to address fatigue.

Question 5. Are there proportionately more operational errors during the midnight shift than other air traffic controller shifts?

Answer. No, there are not proportionately more operational errors during the midnight shift as compared to other air traffic controller shifts. For Fiscal Year 2010 there were 68 operational errors between the hours of 9:30 p.m. and 5:30 a.m. as compared to 1,819 for all other times.

Question 6. Mr. Rinaldi attributes some of the increase in reported operational errors to the precision of the TARP software. He implied that the TARP software is not up and running 24/7 at all the facilities it is intended to operate at. What is the status of the TARP rollout? Should we expect there to be an increase in the number of operational errors as it is rolled out because of the precision of its electronic monitoring? If so, can you explain why?

Answer. TARP is operational at all terminal RADAR facilities, but currently, is only turned on for 1 hour, twice a month for auditing purposes. With the finalization of the new Quality Assurance/Quality Control processes, it will be used 24/7, and full utilization will occur later this fall.

Yes, the FAA expects there to be an increase in the number of operations where specific separation minimums are not maintained and are detected because the system is active on a 24/7 basis.

Today’s system predominantly relies on a human being recognizing when they have lost separation. It is very difficult for the human eye to recognize the difference between 3.0 nautical miles (required in some areas) vice 2.9 nautical miles (considered a loss). TARP is an automated computer measuring system that is able to precisely identify when specific separation minimums are lost.

Question 7. My understanding is that prior to the recent incidents of air traffic controllers sleeping while on the midnight shift, air traffic controllers at some facilities were allowed to read books, do crossword puzzles, and do other similar low level activities while waiting for the scheduled flights to arrive. Are these types of activities now banned while the air traffic controller is working his or her position on the mid-night shift?

Answer. Historically, activities, such as reading a book, have been permitted in our facilities during midnight shifts while waiting for scheduled flights to arrive. The recent incidents and the evolution of personal technology have caused us to review these practices. We are completing the coordination necessary to establish a national policy on these types of activities.

Question 8. If an air traffic controller completes his or her shift and feels that they need a nap before they feel safe to drive home, can they currently use their break room to take a nap? Is there an overall FAA policy on this or is it facility-by-facility?

Answer. Air traffic control facilities are places of government business and, generally, not an appropriate location for off-duty breaks and activities. However, safety of our employees is a priority. If an employee is too fatigued to safely drive home, we expect our supervisors and managers not to endanger our employees. Therefore, they should make arrangements for the employee to commute safely or get appropriate rest prior to departing.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. TOM UDALL TO
HON. J. RANDOLPH BABBITT

Question. Representative Shuster introduced an amendment to the FAA Reauthorization bill that would require in-depth analysis of rulemaking’s impact on the economy, employment and private markets. The proposed amendment also would require the different safety rules for various components of the airline industry, such as passenger airlines, charter airlines and others. I would like to hear your thoughts on if this amendment would have any impact on the administrators’ ability to nimbly address safety concerns such as those highlighted today?

Answer. Many of the amendment’s requirements are generally consistent with the requirements of Executive Order 13563, *Improving Regulation and Regulatory Re-*

view. The FAA already incorporates its principles of economic impact analysis into our economic evaluation methodology. However, the additional depth of analysis at certain stages of rulemaking would mean that timelines would be impacted; an estimate is an average of 4 weeks additional time needed. It should be noted that while the amendment does require the FAA to “analyze the different industry segments and tailor any regulations to the characteristics of each separate segment,” this does not mean that the level of safety that the rule is intended to promulgate would differ for these segments. However, the economic analysis requirements are written in a way that could make it more difficult to quantify what we are required to analyze, which could impact the agency’s ongoing effort to achieve one level of safety.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK WARNER TO
HON. J. RANDOLPH BABBITT

Question 1. What are the key concerns that FAA has regarding the possibility of spectrum interference resulting from LightSquared’s proposed operations?

Answer. The FAA’s primary concern is with the upper channel that LightSquared has proposed. Government and industry testing and analysis have confirmed that there will be significant spectrum interference to GPS from LightSquared’s proposed operations. The LightSquared signal design consists of two broad channels, an upper and a lower. LightSquared’s plan has been to deploy the upper channel first, so that is what we have concentrated on for test and analysis. This upper channel would cause unacceptable interference and loss of GPS service to the existing aviation GPS receivers throughout a significant portion of the National Airspace System. This interference is caused by the overwhelming power difference between the LightSquared signals and GPS.

Based upon aviation interference that occurred in testing, there would be a loss of a number of integral NextGen capabilities, including a loss of Area Navigation and Required Navigation Performance (RNAV/RNP), loss of Localizer Performance with Vertical Guidance (LPV) approaches, loss of Automatic Dependent Surveillance-Broadcast (ADS-B) services, and Cockpit Display of Traffic Information (CDTI). The interference would also cause loss of effective terrain awareness and warning system alerting, which could have a direct impact on safety since pilots would no longer have the necessary input to avoid collisions with obstacles.

A secondary concern is the compatibility between LightSquared’s lower channel and GPS, although preliminary testing and analysis indicate that for aviation receivers this may be feasible though additional study is required. Another secondary concern is the potential to impact aeronautical satellite safety communications, as the spectrum available for these communications would be significantly diminished if LightSquared decides not to offer those services.

Question 2. To what extent has FAA been working with FCC to resolve any concerns it may have with spectrum interference issues resulting from LightSquared’s proposed operations?

Answer. The FAA has been actively involved in tests to assess the potential LightSquared impacts. The FAA participated in the Government-sponsored testing and analysis under the National Space-Based PNT Systems Engineering Forum (NPEF), and has also been participating as a member of the FCC-mandated Technical Working Group including, organizing and funding of the data collection for aeronautical GPS receivers. In addition, the FAA requested RTCA, Inc., to evaluate the potential impact to aviation receivers and provided funding and test results to support their report. The results from all of these efforts will be provided to the NTIA and FCC for their consideration.

Question 3. Are you confident that the process and procedures put in place by the FCC will provide meaningful opportunity for the FAA to voice its concerns? Are you confident that the FAA’s concerns can be successfully addressed through this process? If not, what else should the FCC or NTIA be doing?

Answer. Per established procedures, FAA comments on the LightSquared proceeding are provided through the NTIA. FAA comments sent to NTIA are combined with comments from the other Federal agencies, and NTIA provides consolidated input to the FCC. The agencies’ comments are considered as advice by NTIA, and may not be reflected in the final NTIA input to the FCC.

Question 4. Which specific frequencies of spectrum where FAA operates has the potential of being negatively impacted by LightSquared’s operations? To what degree are different types of operations relating to the FAA’s role being affected? *i.e.*, if activities in some portions of L-Band are of greater concern to the FAA, please indicate which portions.

Answer. The primary concern is the impact of LightSquared's signals on the use of GPS, and all of the operations which GPS enables. However, LightSquared terrestrial operation in the 1525–1559 MHz band has the potential to also impact aeronautical satellite safety communications. Aeronautical satellite safety communications are standardized by ICAO for the 1545–1555 MHz band, and as a result are to be given priority access to that spectrum. While LightSquared has indicated informally that they will respect that priority within their system if they offer such satellite communications, it is clear that such provision would impact the operation of their terrestrial broadband network. As a result, the FAA is concerned that implementation of the LightSquared terrestrial network may result in LightSquared deciding not to offer such satellite safety communications in their network, and a de facto loss of that capability over the United States.

Question 5. Understanding that these issues are still being worked out, are you able to walk us through the perceived next steps for the FAA and/or aviation receiver manufacturers with regard to technical and operational steps aimed at avoiding the interference, as well as possible mitigation strategies?

Answer. It is premature to determine next steps. We first need to better understand the revised signal architecture that LightSquared would propose, and we will have to evaluate the compatibility of those signals with our GPS infrastructure. In order for LightSquared to use their upper channel in any capacity, we would have to develop new GPS receiver technology. The engineering to develop a GPS receiver solution is technically risky and will be expensive, and deploying it would likely require replacement of all existing aviation antennas and receivers. The FAA estimates that such an effort—including design, standardization, development, certification and retrofit—would take at minimum of 7–10 years.

Question 6. Are there specific aviation components that you believe would have a higher degree of difficulty and require a longer lead time in terms of making the fixes that you anticipate may be deemed necessary after the release of the final report next week? How much time do you think you will need to resolve these concerns?

Answer. Aviation equipment would take a minimum of 7 to 10 years. International and military equipment could take longer. FAA ground systems would take an estimated 5 years to modify. The potential modifications are not proven and there is risk of degraded performance for some applications as well as fuel and carbon penalties for the additional weight.

Question 7. Has the FAA been in contact with LightSquared directly?

Answer. The FAA has interfaced directly with LightSquared in many different forums. In RTCA we worked together to ensure all assumptions used for the analysis were accurate and complete. The FAA also was a member of the FCC-mandated TWG that was co-chaired by LightSquared. LightSquared has met with the FAA Administrator, and has met with different levels of management down to the engineering level. The FAA has participated in tests involving LightSquared technology. These tests were observed by LightSquared personnel who validated the test environment and parameters.

Question 8. Does FAA have a comment on recommendations contained within the June 3 report from RTCA special committee 159?

Answer. The FAA concurs with RTCA that the proposed LightSquared channel plans would cause unacceptable interference to aviation use of GPS. Regarding the definition of alternate channel plans involving signals farther away in frequency from the GPS band, from an aviation perspective such an approach should only be considered if it represents an end-state for LightSquared and is codified by FCC rules at current planned versus authorized power levels and preventing operation of the terrestrial component above the studied lower-band frequency. If alternatively the new LightSquared channel plan is envisioned as simply an interim step it would not be acceptable, since the final end-state configuration would have the same impacts on aviation as the currently-defined LightSquared channel plans. Use of reduced power in the upper band is likewise not compatible with aviation use of GPS.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. KAY BAILEY HUTCHISON TO
HON. J. RANDOLPH BABBITT

Question 1. On several occasions the Department of Transportation (DOT), Inspector General (IG) has called for increasing the skill and knowledge requirements for applicants for air traffic control positions and transferring some of the expense for training to the applicant instead of the Federal Government. Many institutions are currently meeting those recommendations, but are not being utilized by the FAA.

Additionally, in October, 2007, and as updated in February, 2008, the FAA established Human Resources Policy Bulletin #48. That bulletin identified graduates of CTO schools, as an additional hiring source for FAA to staff terminal control facilities. The bulletin also authorized special appointing authority for these individuals and authorized bypassing the FAA Academy for placement in terminal facilities. Why has the FAA continued to hire people without air traffic control training or qualifications from the general public when qualified applicants are available from the CTO schools?

Answer. The Federal Aviation Administration (Agency) is committed to hiring the best qualified applicants to fill Air Traffic Control (ATC) vacancies. General public announcements provide the Agency with a valued hiring pool comparable to CTO applicants. Like the applicants from the CTO schools, applicants from the general public announcements provide the Agency with a substantive, diverse, and qualified hiring pool. Among those candidates are individuals who possess backgrounds and abilities such as pilots, airport dispatchers, and military personnel with aviation training.

Question 2. Why aren't CTO graduates being given priority designation over applicants without any air traffic experience?

Answer. Trade schools, universities, or colleges that have CTO programs have been designated by the Agency as a Special Appointing Authority. Applicants completing the CTO process from a Special Appointing Authority have the opportunity to apply for ATC positions through Agency CTO vacancy announcements. These announcements are not accessible to non CTO applicants. Applicants from all hiring sources who are qualified are processed in accordance with the Uniform Guidelines on Employee Selection policy.

Question 3. Why has the FAA not utilized or hired CTO graduates as authorized under this Policy Bulletin #48?

Answer. The Agency values CTO graduates and the supporting institutions as a valuable hiring source. The current Terminal hiring pool contains 761 applicants. A total of 51 applicants are identified as CTO graduates, which is 15 percent of the pool, and represents those graduates who are interested in a career with the Agency.

Question 4. Why are these individuals required to attend the FAA Academy if assigned to a terminal facility when the policy bulletin indicates they are authorized to proceed directly to a terminal facility?

Answer. Currently, all Agency ATC hiring sources are required to attend FAA Academy training. This requirement is necessary as the Agency needs to fill vacancies at medium to large Terminal facilities. The mandate to attend the FAA Academy equips the employees a greater opportunity for success considering the vacancies available, which is in the best interest of the applicant and the Agency.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JOHN D. ROCKEFELLER IV
TO HON. CALVIN L. SCOVEL III

Question 1. According to the September 30, 2010, DOT IG audit the new Air Traffic Control training program (ATCOTS) has been mismanaged and has had significant cost overruns. According to the report, the "FAA did not fully consider program requirements" in designing the ATCOTS program, adding that "it will be difficult for FAA to achieve the original ATCOTS program goals or any training innovations without significantly modifying the existing contract." How is the FAA modifying the ATCOTS contract to reach the goals of the contract?

Answer. FAA has modified the contract to add training costs and hours. However, FAA's actions are not enough to ensure that ATCOTS goals will be attained or even to ensure that those controllers and facilities most in need receive timely training. This is because FAA continues to significantly underestimate controller training requirements. For example, for the third year of the contract, beginning September 2011, FAA estimates that \$157 million is needed for ATCOTS support to meet existing training needs (not including addressing goals to improve and transform the training). However, FAA only plans to budget \$93 million for the efforts.

The mismatch between funding and training needs is causing delays in providing training, which is forcing many FAA facilities to compensate by conducting training with already-limited internal resources. Furthermore, FAA estimates that if ATCOTS spending continues at its current rate, it will run out of funds as early as June 2012, 15 months ahead of the 5-year base period of performance. Therefore, the program needs to be rebaselined, and the contract should be modified accord-

ingly. As part of these efforts, FAA should determine the best mechanisms to meet its goals for revamping how controllers are trained.

Question 2. Am I correct in stating that one of the conclusions in that same report is that air traffic controller training may have contributed to current air safety problems? What information does the FAA have regarding the experience level of controllers who have been involved in an operational error or deviation?

Answer. While we reported significant problems with the procurement and implementation of ATCOTS, we did not connect the training provided by its contractor under the ATCOTS contract with the recent increase in operational errors. Our objectives focused on the execution of the ATCOTS contract.

There are several factors that could explain the rise in operational errors, including a higher number of developmental controllers monitoring traffic, increased voluntary reporting under the Air Traffic Safety Action Program (ATSAP), the operating environment at certain facilities, training issues (including ATCOTS), or a combination of reasons. The results of previous NTSB investigations of operational error incidents have not revealed a single “silver bullet” reason for why these errors occur.

Currently, we are in the process of determining what type of information FAA has, if any, regarding the experience level of controllers who have been involved in operational errors or deviations. We also recently initiated an audit to evaluate FAA’s process for tracking, reporting, and mitigating loss of separation events, including operational errors. As part of that audit, we are reviewing FAA’s data on losses of separation.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO
HON. CALVIN L. SCOVEL III

Question 1. Are you satisfied that the FAA is accurately reporting all of its operational errors?

Answer. We are not satisfied that FAA is accurately reporting all operational errors. FAA statistics indicate that operational errors have risen significantly over the past year. According to FAA data, the number of operational errors committed by air traffic controllers increased by 53 percent—from 1,234 to 1,887—between Fiscal Years 2009 and 2010. However, it is not clear whether this reported increase is due to more errors being committed, to improved reporting practices, or a combination of factors.

Historically, FAA’s oversight of operational error self-reporting has been problematic. Since 2000, our work has repeatedly raised concerns that nearly 300 FAA terminal facilities relied solely on controllers to self report errors. In some cases, we found that the self-reporting process was subject to intentional manipulation. In 2008, our investigations at the Dallas/Fort Worth Terminal Radar Approach Control facility found that air traffic managers at the facility intentionally misclassified 62 operational errors as either pilot deviations or “non-events” to reduce the number of errors reported at that location. Since that time, however, no evidence of this type of manipulation has been brought to our attention.

Still, concerns remain about whether FAA is accurately counting the number of operational errors and sufficiently identifying the trends that contribute to them. For example, it is unclear how FAA’s Air Traffic Safety Action Program (ATSAP) reports are factored into FAA’s current counts of operational errors. Further concerns relate to FAA’s recent implementation of the new metrics, which are designed to capture each incident where aircraft fly closer than separation standards permit. It is unclear how FAA will use these new metrics to assess operational error risks or improve safety. At the request of this Committee and others, we recently initiated two audits to assess FAA’s implementation and oversight of ATSAP and evaluate FAA’s process for tracking and reporting loss of separation events and efforts to analyze and mitigate identified risks.

Question 2. Do you believe the FAA is doing a good job of understanding the root causes of its category A and B operational errors?

Answer. At this time, we are not confident that FAA is identifying and addressing the root causes of Category A and B errors, which are the most severe. As we note in our prepared statement, there is considerable uncertainty about the causes of the recent increase in operational errors. Moreover, we have found that operational error reports are often inconsistently completed. For example, in our audit of three Chicago area air traffic facilities, we found that many reports did not provide complete information about the work schedules or other potential fatigue factors for controllers who caused errors. This does not give us confidence that FAA currently has all the data it needs for effective root cause analyses.

We are in the process of reviewing how FAA determines the root causes of all types of losses of separation, including operational errors, and whether corrective actions are being taken to effectively mitigate their risk.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. TOM UDALL TO
HON. CALVIN L. SCOVEL III

Question. Representative Shuster introduced an amendment to the FAA Reauthorization bill that would require in-depth analysis of rulemaking's impact on the economy, employment and private markets. The proposed amendment also would require the different safety rules for various components of the airline industry, such as passenger airlines, charter airlines and others. I would like to hear your thoughts on if this amendment would have any impact on the administrators' ability to nimbly address safety concerns such as those highlighted today?

Answer. We have not analyzed the proposed amendment and its impact on FAA's ability to address safety issues. However, safety is and must remain FAA's top priority.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. KAY BAILEY HUTCHISON TO
HON. CALVIN L. SCOVEL III

Question 1. According to FAA, there is currently approximately 25 percent of the controller workforce in training. You indicate that the percentage is significantly higher at some of FAA's air traffic control facilities, such as 46 percent in training at Seattle TRACON. Is this a safety concern?

Answer. This could certainly become a safety concern at specific facilities where the number of trainee controllers becomes large enough to affect the overall operations of the facility. While FAA has enough certified controllers in total, nationwide, many of the Nation's most critical, complex facilities have a very high percentage of controllers in training within individual facilities. For example, the Denver TRACON has 43 percent of its controller workforce in training, and the LaGuardia Air Traffic Control Tower has 39 percent. These percentages are bumping up to a level of concern—that is when almost half of the controllers at these facilities are in training. It is important for individual facilities to maintain a significant number of fully certified controllers in the workforce because only they can manage air traffic at all of their assigned positions while providing sufficient on-the-job training (OJT) for newly hired controllers. Nevertheless, the stress on veteran controllers increases as they train large numbers of new controllers while at the same time maintaining their own proficiency.

Question 2. Are there any statistics that link the recent increase in operational errors to air traffic controller fatigue?

Answer. We are unaware of any statistical links between controller fatigue and the recent increase in operational errors because FAA lacks sufficient data to make such a determination. FAA currently gathers only limited data on controller fatigue during investigations of operational errors. For example, FAA's operational error investigative reports include a section for information on the start and completion times of the current and prior shifts. However, this field may be left blank, and it is unclear whether FAA completes any analysis of these data to identify significant trends. In our 2009 audit report on controller fatigue, we recommended that FAA expand operational error investigatory requirements to include more detailed information on 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.

We also note that NTSB has warned about the problems of controller fatigue on several occasions, and how fatigue can result in operational errors. In its letter following the August 2006 Comair Lexington crash, NTSB cited four other incidents that provided "clear evidence" of fatigue. In each case, the controllers forgot critical information about the traffic situation and issued an inappropriate clearance as a result. The controllers compounded this error by inadequately monitoring runways and/or displays, thereby failing to recognize and correct the developing conflicts between aircraft. The following briefly summarizes fatigue factors present in the four incidents:

- *March 23, 2006, Chicago—Runway Incursion.* A controller cleared an Airbus A320 to cross runway 4L and then cleared a Boeing 737 to take off on the same runway. The pilots in the departing 737 saw the A320 and stopped. The con-

troller had worked an 8-hour shift the previous day and was then off duty for 9 hours. He slept only 4 hours before returning to work at 6:30 a.m.

- *August 19, 2004, Los Angeles—Runway Incursion.* A controller cleared a Boeing 737 to take off at the same time that a Boeing 747 had been cleared to land on the same runway. The landing pilots discontinued their approach. The controller had worked a shift the previous evening until 11:30 p.m., then went home and slept 5–6 hours before returning to work the incident shift at 7:30 a.m.
- *September 25, 2001, Denver—Takeoff from Closed Runway.* The controller cleared a Boeing 757 to take off from a closed runway. She had worked a shift at the tower from 5:30 a.m. until 1:30 p.m. the day before the incident, and then had a 9-hour rest period during which she obtained between 60 and 90 minutes of sleep.
- *July 8, 2001, Seattle—Runway Incursion.* A controller cleared a Boeing MD–80 to cross runway 34R at the same time a Boeing 767 was on final approach to the same runway. The 767 applied max braking to avoid a collision. The controller was working his third shift in 2 days, with an 8-hour rest period between shifts.

Question 3. Your recent audit on controller training metrics showed a training attrition rate of 21 percent for newly hired controllers in Fiscal Year 2009. Are there significant differences between this national rate and the rate of attrition at specific facilities?

Answer. Yes, there are significant differences in the attrition rate of newly hired controllers at the national level when compared to the rate at some of the more complex air traffic control facilities. For example, our ongoing audit on staffing and training at FAA's most critical facilities found that the Denver and New York TRACONs, and the Newark Air Traffic Control Tower, had attrition rates of more than 70 percent for newly hired controllers over the past 3 years. In addition, the Chicago and Houston TRACONs, as well as the Miami Tower, had a 100 percent attrition rate for newly hired controllers in Fiscal Year 2009. Placing newly hired air traffic controllers at the most complex air traffic facilities severely limits their chances for successfully completing facility training. As a result, FAA needs to better scrutinize where it places newly hired controllers.

Question 4. Your office completed an audit on potential controller fatigue issues in June 2009. What actions has FAA taken to address your recommendations?

Answer. FAA agreed with our recommendations but has not yet implemented corrective actions. Specifically, we recommended that FAA approve recommended changes to FAA Order 7210.3 and implement the changes at all air traffic control facilities. The 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 reported that it has formed a workgroup with NATCA to develop an overall fatigue management system that will identify and mitigate fatigue concerns for air traffic controllers. This workgroup recently developed 12 recommendations to address controller fatigue, including instituting a minimum of 9 hours between evening and day shifts. These recommendations were shared with the FAA Administrator and the President of NATCA on January 20, 2011. However, it is unclear when changes will be implemented. The FAA ATO is working with NATCA to conduct an initial assessment of the 12 recommendations to develop a Question and Answer product (estimated completion summer 2011). This initial effort will be followed by an evaluation of implementation impacts and safety case validation. NATCA supports all 12 recommendations and believes they can be implemented immediately.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO
PAUL RINALDI

Question 1. There is probably not nearly as much forced overtime as there was in prior years. When overtime is required, typically how does that get scheduled? Typically, is it an extra day or are extra hours tacked on to the existing workday? What is the best way of scheduling overtime to minimize the risk of increased air traffic controller fatigue for a 2–2–1 rotation?

Answer. When overtime is scheduled, the assignment shift is posted on the schedule 28 days in advance, although changes may be made after the schedule has been posted if the need arises. However, if call-up overtime is necessary, an employee can be required to report to work on their regular day off with limited advance notice

of the assignment. The nature of this unscheduled event can be fatiguing if the controller does not have time to plan for the overtime assignment. Additionally there is another category called “holdover” overtime. In this instance, the controller can be advised at the end of their shift that they will be required to stay for 2 hours of overtime or sometimes can be required to report to work up to 2 hours early.

The Fatigue Workgroup did not model schedules with overtime. However, the Workgroup did find that all of the scientists indicated that any overtime, be it hold-over or scheduled, increases the risk of fatigue. The best way to prevent overtime from contributing to fatigue is to properly staff field facilities so as to minimize the use of overtime. When overtime is necessary, it is least disruptive and poses the least risk to fatigue when it is known and scheduled in advance.

Question 2. Why do you believe that the recent increase in reporting of operational errors is in part due to the certain strains on the system associated with high ratios of trainees to fully-certified controllers?

Answer. We believe that the recent increase is from the lack of experience of fully certified controllers compared to past years. As controllers gain experience the number of errors should decrease.

High trainee ratios is an issue that NATCA has been warning about for over 5 years, and testified about before the Senate Subcommittee on Aviation Operations, Safety, and Security in March 2007, and before the House Subcommittee on Aviation in June 2008 and March 2007. Our message was consistent: The surge in new hires is placing a serious strain on the system and leading to safety concerns as experienced controllers retire and are replaced with trainees who require several years to become fully certified controllers.

The strain comes in large part because high numbers of new hires require additional resources to train. NATCA testified before the House Aviation Subcommittee in May 2007 and again in June 2008 about the strains of hiring thousands of new controllers in a relatively short period (7,800 new hires over the past 5 years) would have on the ATC system. In the long-term, these new hires will enhance the safety and efficiency of our NAS, but in the short-term, this places a strain on facilities where they train because while achieving certification on position, trainees work under the direction of a fully certified controller or on-the-job-training instructor (OJTI).

On the job training takes a toll on the instructing controller too—providing on-the-job-training to a new hire is extremely demanding, as the OJTI needs to be aware of every transmission and every keystroke the trainee makes. During OJT, a trainee works live air traffic, while the OJTI monitors both the trainee’s actions and the radar or runway environment. The OJTI is held responsible for any errors made by the trainee. This essential training process increases workload for the OJTI and contributes to fatigue, particularly when these controllers are expected to train on nearly a daily basis.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TOM UDALL TO
PAUL RINALDI

Question 1. Mr. Rinaldi, you stated that many of the ATC employees have multiple jobs. I am concerned that economic conditions may contribute to more and more employees working other jobs besides their ATC job, which could prevent them from getting adequate sleep and make it more likely for them to make an operational error. What percentage of ATC employees have second or third job?

Answer. During the period of imposed work rules (2006–2009), reductions in pay bands and a 30 percent reduction in salary for incoming controllers, as well as lack of compensation to those in the Academy training program led to many new controllers taking second or even third jobs to supplement their income. To the best of NATCA’s knowledge, the need for supplemental jobs ceased to be a problem with the implementation of the 2009 collective bargaining agreement, which restores sufficient compensation for air traffic controllers for their work and should reduce the need for supplemental income.

Question 2. Does the FAA take second or third jobs into consideration when determining the ATC shift schedule?

Answer. The FAA does not consider second or third jobs when determining the controllers’ schedule.

Question 3. Is there any connection between the operational errors and shifts with at least one employee who has multiple jobs?

Answer. I am not aware of any records that are available to answer this question.

Question 4. What is the FAA doing to reduce fatigue concerns in controllers with multiple jobs?

Answer. The FAA has worked collaboratively with NATCA on the Fatigue Mitigation, and has implemented several of the recommendations and is currently meeting to implement the remaining recommendations. However there are no specific guidelines for controllers with multiple jobs. The Agency has stated in the past it is the controller's responsibility to be fit for duty and the controller should manage their off duty time to ensure proper rest.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO
GREGORY BELENKY, M.D.

Question 1. In his written testimony, Administrator Babbitt says "the science of fatigue management for air traffic controllers is still an emerging discipline." Do you agree?

Answer. Yes, it is an emerging discipline as is the discipline of fatigue-risk management, but we already know enough to know that one mitigation for on-shift fatigue and sleepiness is sanctioned, on-shift napping.

Question 2. In your testimony, you speak about the impact of circadian rhythms on shift work. Is there one particular air traffic controller schedule that is better than others when it comes to minimizing fatigue?

Answer. The best, most natural mitigation for fatigue is sleep. The problem with nightshift work is that night workers after getting off work are trying to sleep when their circadian rhythm is telling them that they should be awake. This leads to truncated sleep. Most nightshift workers are not able to sleep more than 5 hours off shift during the day. Again, the only way to ensure that nightshift workers are able to obtain adequate amounts of sleep in each 24 hours is sanctioned, on shift naps.

Question 3. Is there a correlation between experience level and level of fatigue? In general, would you expect air traffic controllers working midnight shifts with lesser experience to experience greater fatigue than if more experienced air traffic controllers were working the shift? Of course, the complementary question is does coping with shift work and fatigue become increasingly difficult with age?

Answer. The factors that interact to create fatigue are time awake, circadian rhythm phase, and workload. Being more experienced makes the work easier, thus lightening effective workload. Hence, being more experienced would lessen fatigue for equivalent work difficulty and duration. However, as you indicate, coping with shiftwork becomes increasingly difficult as we age.

Question 4. One the factors impacting fatigue is time on task. For many air traffic controllers on the midnight shift, they do not get to rotate positions. I know that you recommend they be allowed to get recuperative rest during break times. Short of that, are there other steps based on the scientific literature that air traffic controllers can take to maintain a high level of situational awareness throughout their shift?

Answer. In your question, you take away two good fatigue mitigators, on-shift napping and rotating positions. As they say in the British Army—"A change is a rest." The mitigations that are left are: (1) a late afternoon nap prior to going back on the nightshift to supplement the morning sleep obtained immediately after the previous nightshift, and (2) judicious use of caffeine on the nightshift. The less regularly you use caffeine, the more effective it is as a fatigue-mitigation.

Question 5. In your written testimony you describe in detail the Harvard Work Hours Health and Safety Group study of rates of medical errors associated with extended work hours and sleep loss. What should be the Committee's take-away from that?

Answer. The Committee's take-away should be that an increase in sleep improves performance and decreases errors, incidents, and accidents in operational personnel working extended work hours. Sleep is the most powerful mitigator of fatigue in general and for fatigue on the nightshift.