

GAO

Testimony

Before the Subcommittee on Aviation,
Committee on Transportation and
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RUNWAY SAFETY

Progress on Reducing Runway Incursions Impeded by Leadership, Technology, and Other Challenges

Statement of Gerald L. Dillingham, Ph.D.
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Highlights

Highlights of [GAO-08-481T](#), a testimony before the Subcommittee on Aviation, Committee on Transportation and Infrastructure, House of Representatives

Why GAO Did This Study

While aviation accidents in the United States are relatively infrequent, recent incidents have heightened concerns about safety on airport runways. As the nation's aviation system becomes more crowded every day, increased congestion at airports may exacerbate ground safety concerns. This statement discusses (1) the trends in runway incursions, (2) what FAA has done to improve runway safety, and (3) what more could be done. This statement is based on GAO's November 2007 report issued to this committee on runway safety. GAO's work on that report included surveying experts on the causes of runway incidents and accidents and the effectiveness of measures to address them, reviewing safety data, and interviewing agency and industry officials. This statement also contains information from FAA on recent incursions and actions taken since November 2007.

What GAO Recommends

In prior work, GAO recommended that FAA take several measures to enhance runway safety, such as updating its national runway safety plan, collecting more complete data on runway incidents, and addressing air traffic controller fatigue. The agency agreed to consider the recommendations.

To view the full product, including the scope and methodology, click on [GAO-08-481T](#). For more information, contact Gerald L. Dillingham, Ph.D., at (202) 512-2834.

RUNWAY SAFETY

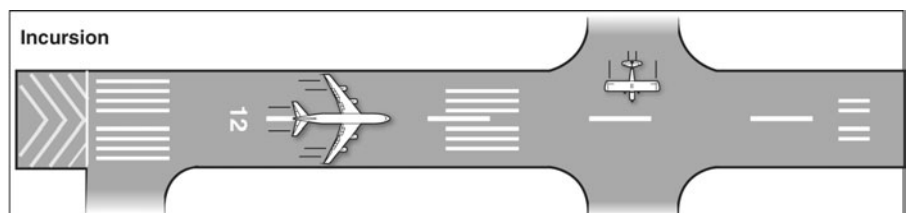
Progress on Reducing Runway Incursions Impeded by Leadership, Technology, and Other Challenges

What GAO Found

Recent data indicate that runway incursions, which are precursors to aviation accidents, are growing. Although the number and rate of incursions declined after reaching a peak in fiscal year 2001 and remained relatively constant for the next 5 years, they show a recent upward trend. From fiscal year 2006 through fiscal year 2007, the number and rate of incursions increased by 12 percent and both were nearly as high as their 2001 peak. Furthermore, the number of serious incursions—where collisions are narrowly or barely avoided—increased from 2 during the first quarter of fiscal year 2007 to 10 during the same quarter in fiscal year 2008.

FAA has taken steps to address runway safety, but further progress has been impeded by the lack of leadership and coordination, technology challenges, lack of data, and human factors-related issues. FAA's actions have included deploying and testing technology designed to prevent runway collisions and promoting changes in airport layout, markings, signage, and lighting. However, until recently, FAA's Office of Runway Safety did not have a permanent director. Also, FAA has not updated its national runway safety plan since 2002, despite agency policy that such a plan be prepared every 2 to 3 years, resulting in uncoordinated efforts within the agency. Moreover, runway safety technology currently being installed, which is designed to provide air traffic controllers with the position and identification of aircraft on the ground and alerts of potential collisions, is behind schedule and experiencing cost increases and operational difficulties with its alerting function. FAA also lacks reliable runway safety data and the mechanisms to ensure that the data are complete. Furthermore, air traffic controller fatigue, which may result from regularly working overtime, continues to be a matter of concern for the National Transportation Safety Board (NTSB) and others.

FAA could take additional measures to improve runway safety. These measures include implementing GAO's recommendations to prepare a new national runway safety plan, address controller overtime and fatigue, and start a nonpunitive, confidential, voluntary program for air traffic controllers to report safety risks in the national airspace system, which would be similar to a program that FAA has already established for pilots and others in the aviation community. Such a program could help the agency to understand the causes and circumstances regarding runway safety incidents. Additional improvements, suggested by experts and NTSB, include developing and deploying technology to provide alerts directly to pilots.



Source: GAO.

Mr. Chairman and Members of the Subcommittee:

Thank you for the opportunity to testify today on runway safety. While aviation accidents in the United States are relatively infrequent, recent incidents have heightened concerns about safety on airport runways. On August 16, 2007, for example, at Los Angeles International Airport—one of the nation’s busiest airports—two commercial aircraft carrying 296 people came within 37 feet of colliding, resulting in an incident that is called a runway incursion. As the nation’s aviation system becomes more crowded every day, increased congestion at airports may exacerbate ground safety concerns. At airports, the Federal Aviation Administration (FAA) focuses its safety oversight on the movement areas—runways and taxiways¹—where the chances of catastrophic accidents are greater than other areas.

My testimony today is focused on (1) the trends in runway incursions, (2) what steps FAA has taken to improve runway safety, and (3) what more could be done. This statement is based on our November 2007 report on runway safety² and work that we conducted between January 2008 and February 2008 to obtain updated information on recent incursions and actions taken by FAA since our report was issued. Our work on the November 2007 report included surveying experts on the causes of runway incidents and accidents, the effectiveness of measures that are being taken to address them, and what additional measures could be taken. We conducted this work in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives.

Summary

- Recent data indicate that runway incursions, which are precursors to aviation accidents, are growing. Although the number and rate of incursions declined after reaching a peak in fiscal year 2001 and remained relatively constant for the next 5 years, they show a recent upward trend. From fiscal years 2006 through 2007, the number and rate of incursions increased by 12 percent and were nearly as high as when they reached

¹Taxiways are routes that aircraft follow to and from runways.

²GAO, *Aviation Runway and Ramp Safety: Sustained Efforts to Address Leadership, Technology, and Other Challenges Needed to Reduce Accidents and Incidents*, [GAO-08-29](#) (Washington, D.C.: Nov. 20, 2007).

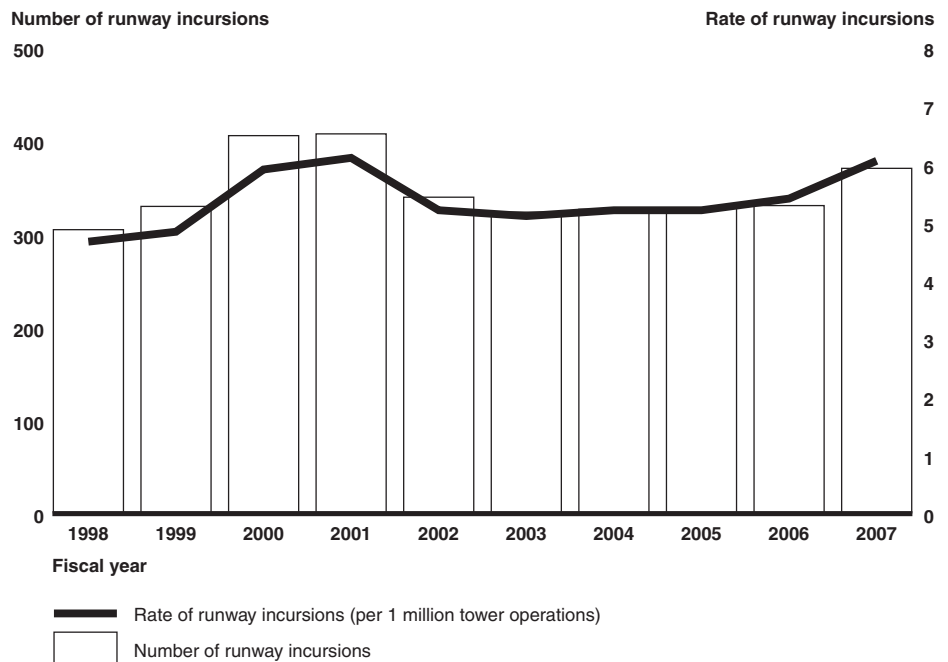
their 2001 peak. Furthermore, the number of serious incursions—where collisions were narrowly or barely avoided—increased substantially during the first quarter of fiscal year 2008, compared to the same quarter in fiscal year 2007.

- FAA has taken steps to address runway safety, but the lack of leadership and coordination, technology challenges, lack of data, and human factors-related issues impede further progress. To improve runway safety, FAA has deployed and tested technology designed to prevent runway collisions; promoted changes in airport layout, markings, signage, and lighting; and provided training for pilots and air traffic controllers. However, until recently, FAA's Office of Runway Safety did not have a permanent director. Also, FAA has not updated its national runway safety plan since 2002, despite agency policy that such a plan be prepared every 2 to 3 years, which resulted in uncoordinated runway safety efforts by individual FAA offices. Moreover, the runway safety technology that FAA is currently installing, which is designed to provide air traffic controllers with the position and identification of aircraft on the ground and alerts of potential collisions, is behind schedule and experiencing cost increases and having operational difficulties with its alerting function. Additional technology to prevent runway incursions is years away from deployment. FAA also lacks reliable runway safety data and the mechanisms to ensure that the data are complete. Furthermore, air traffic controller fatigue, a human factors issue that may result from regularly working overtime, continues to be a matter of concern for the National Transportation Safety Board (NTSB) and other aviation stakeholders.
- FAA could take additional measures to improve runway safety. In our November 2007 report, we recommended that FAA prepare a new national runway safety plan; address controller overtime and fatigue; and start a nonpunitive, confidential, voluntary program for air traffic controllers to report safety risks in the national airspace system, similar to a program that FAA has already established for pilots and others in the aviation community. Such a program could help the agency to understand the causes and circumstances regarding runway safety incidents. The agency agreed to consider our recommendations. Additional improvements, suggested by experts we surveyed and NTSB, include developing and deploying technology that provided alerts of potential incursions directly to pilots.

Number and Rate of Incursions Show Upward Trend

Runway safety is a longstanding major aviation safety concern; prevention of runway incursions, which are precursors to aviation accidents, has been on NTSB's list of most wanted transportation improvements since 1990 because runway collisions can be catastrophic. Recent data indicate that runway incursions are growing and may become even more numerous as the volume of air traffic increases. The number and rate of incursions declined from a peak in fiscal year 2001 and remained relatively constant for the next 5 years. However, from fiscal years 2006 through 2007, the number and rate of incursions increased by 12 percent and nearly regained the 2001 peak (see fig. 1).

Figure 1: Number and Rate of Runway Incursions from Fiscal Year 1998 through Fiscal Year 2007



Source: FAA.

Note: Table 1 in the appendix shows data for fig. 1.

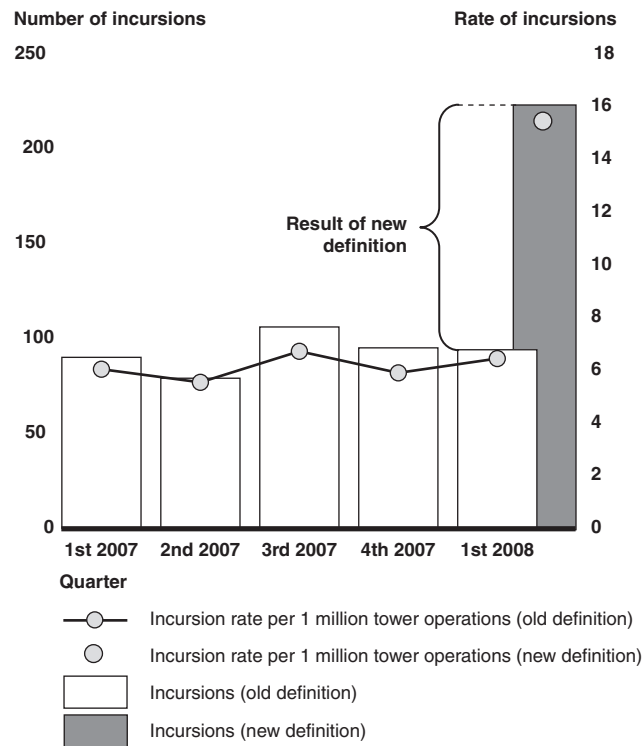
Additionally, data for the first quarter of fiscal year 2008 show that the number of incursions increased substantially after FAA began using a definition of incursions developed by the International Civil Aviation

Organization (ICAO), a United Nations specialized agency.³ Using the ICAO definition, FAA is now counting some incidents as incursions that had been formerly classified as surface incidents.⁴ During the first quarter of fiscal year 2008, using the ICAO definition, FAA counted 230 incursions. If FAA had continued to use its previous definition, it would have counted 94 incursions. According to an FAA official, by adopting the ICAO definition, FAA expects to report about 900 to 1,000 incursions this year. Fig. 2 shows the number and rate of incursions, by quarter, during fiscal year 2007 and during the first quarter of fiscal year 2008.

³ICAO's definition of an incursion is any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing or take-off of aircraft. Through September 2007, FAA defined a runway incursion as "any occurrence in the runway environment involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in a loss of required separation when an aircraft is taking off, intending to take off, landing, or intending to land."

⁴Runway incidents that were classified as surface incidents can be serious, including an August 2006 crash of a Comair regional jet in Lexington, KY. That aircraft crashed after taking off on a runway that was too short for the aircraft, killing all but one of the 50 people aboard. FAA had defined a surface incident as any event where unauthorized or unapproved movement occurs within a movement area associated with the operation of an aircraft that affects or could affect the safety of flight.

Figure 2: Incursions, by Quarter, during Fiscal Year 2007 and the First Quarter of Fiscal Year 2008



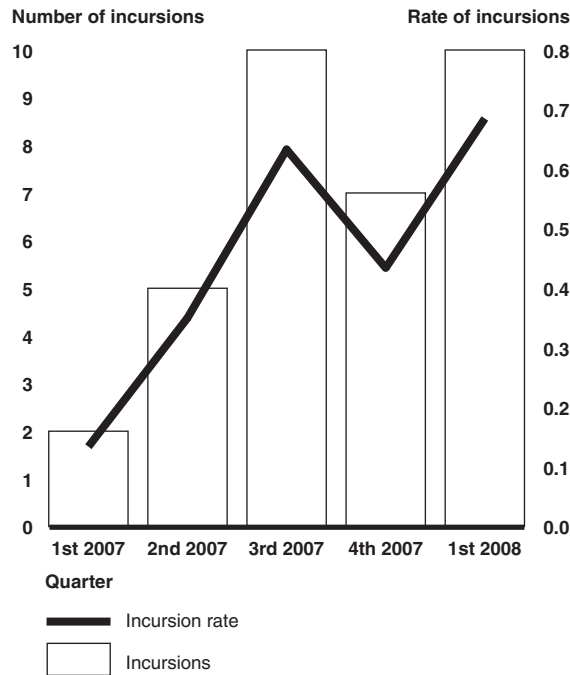
Source: FAA.

Note: Table 2 in the appendix provides the data for fig. 2.

Moreover, the number and rate of serious incursions—where collisions were narrowly or barely avoided—increased substantially during the first quarter of fiscal year 2008, compared to the same quarter in fiscal year 2007.⁵ During the first quarter of fiscal year 2008, 10 serious incursions occurred, compared to 2 serious incursions during the first quarter of fiscal year 2007. (See fig. 3.)

⁵FAA classifies the severity of runway incursions into four categories. FAA defines category A as separation decreases and participants take extreme action to narrowly avoid a collision, or the event results in a collision; category B, separation decreases and there is a significant potential for a collision; category C, separation decreases but there is ample time and distance to avoid a potential collision; and category D, there is little or no chance of collision. Category A and B incursions are considered serious.

Figure 3: Serious Incursions, by Quarter, during Fiscal Year 2007 and the First Quarter of Fiscal Year 2008

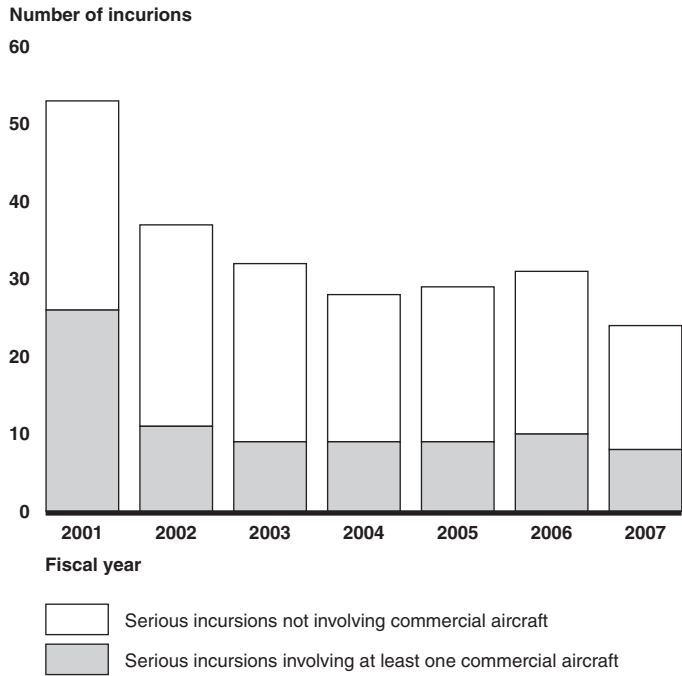


Source: FAA.

Note: FAA's adoption of the ICAO definition of incursions during the first quarter of fiscal year 2008 did not affect the number or rate of serious incursions. Table 2 in the appendix provides data for fig. 3.

Most runway incursions involve general aviation aircraft. According to FAA, 72 percent of incursions from fiscal years 2003 through 2006 involved at least one general aviation aircraft. However, about one-third of the most serious incursions from fiscal years 2002 through 2007—about 9 per year—involved at least one commercial aircraft that can carry many passengers. That number includes two serious incursions that occurred just two months ago, in December 2007. (See table 3 in the appendix for additional information on recent serious incursions.) Figure 4 shows the number of serious incursions involving commercial aircraft from fiscal years 2001 through 2007.

Figure 4: Total Number of Serious Incursions and Number of Serious Incursions Involving At Least One Commercial Aircraft, Fiscal Year 2001 through Fiscal Year 2007

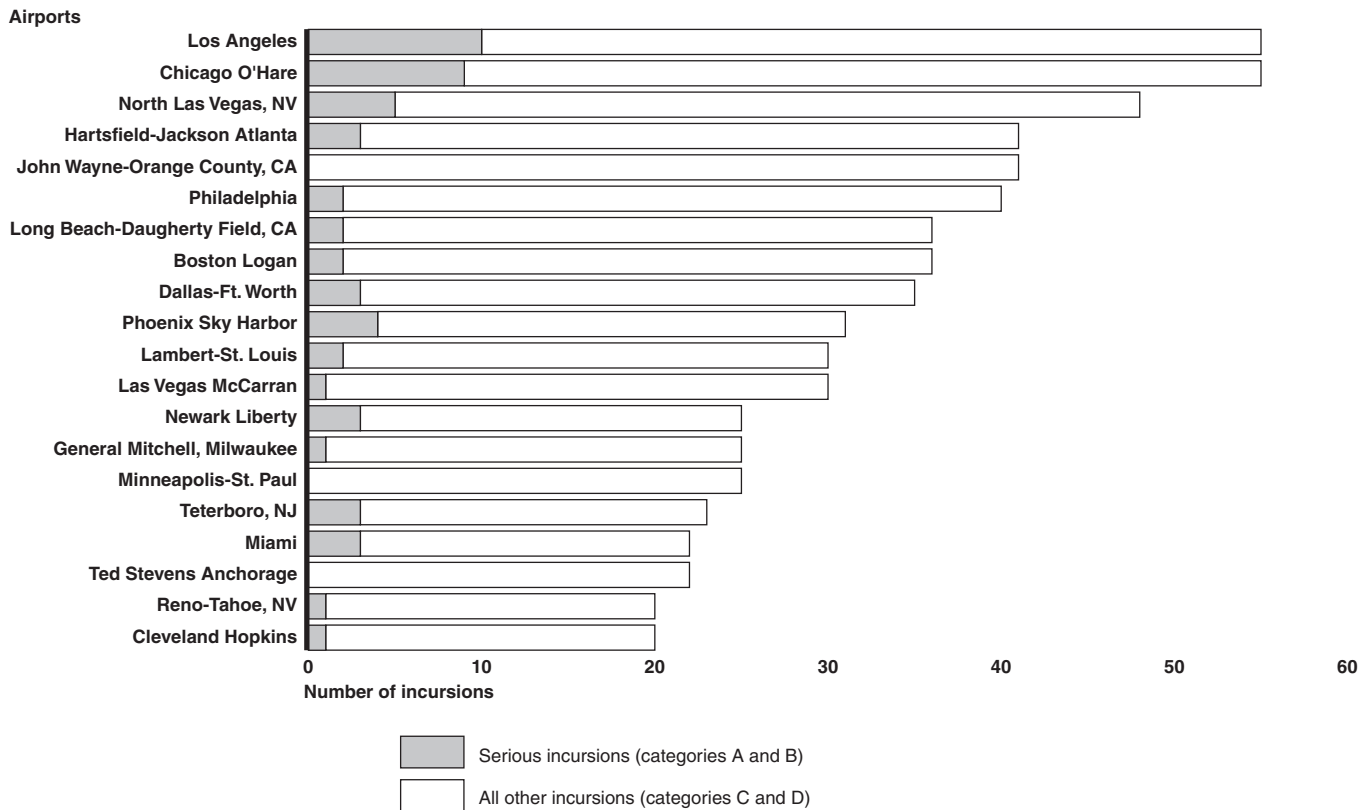


Source: FAA.

Note: Table 4 in the appendix provides the data for fig. 4.

In the United States, most incursions have occurred at major commercial airports, where the volume of traffic is greater. Los Angeles International Airport and Chicago O'Hare International Airport had the greatest number of runway incursions from fiscal years 2001 through 2007, as shown in fig. 5.

Figure 5: U.S. Airports that Experienced the Most Runway Incursions from Fiscal Year 2001 through Fiscal Year 2007

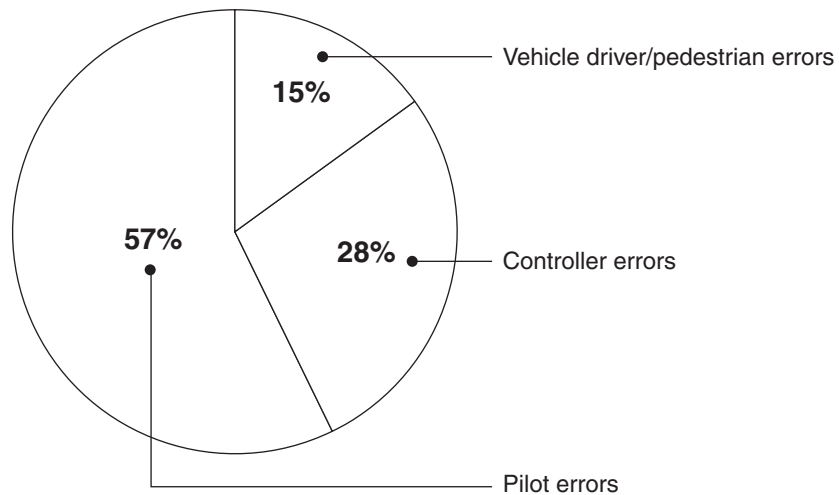


Source: GAO analysis of FAA data.

Note: Information was compiled from a list of airports that experienced 20 or more incursions from fiscal year 2001 through fiscal year 2007 and were certificated under 14 CFR Part 139. This information expands upon the information we presented in GAO-08-29 (fig. 4), which only included the top 10 airports experiencing incursions from fiscal years 2001 to 2006. In addition, we now include three airports—Long Beach-Daugherty Field, John Wayne-Orange County, and North Las Vegas—which were previously identified as general aviation airports. Table 5 in the appendix provides the data for fig. 5.

The primary causes of incursions, as cited by experts we surveyed and some airport officials, include human factors issues, such as miscommunication between air traffic controllers and pilots, a lack of situational awareness on the airfield by pilots, and performance and judgment errors by air traffic controllers and pilots. According to FAA, 57 percent of incursions during fiscal year 2007 were caused by pilot errors, 28 percent were caused by air traffic controller errors, and 15 percent were caused by vehicle operator or pedestrian errors (see fig. 6).

Figure 6: Causes of Incursions during Fiscal Year 2007



Source: FAA.

Challenges Remain Despite Numerous Efforts to Address Runway Safety

FAA, airports, and airlines have taken steps to address runway safety, but the lack of leadership and coordination, technology challenges, lack of data, and human factors-related issues impede further progress. To improve runway safety, FAA has deployed and tested technology designed to prevent runway collisions; promoted changes in airport layout, markings, signage, and lighting; and provided training for pilots and air traffic controllers. In addition, in August 2007, following several serious incursions, FAA met with aviation community stakeholders and agreed on a short-term plan to improve runway safety. In January 2008, FAA reported on the status of those actions, which included

- accelerating the upgrading of airport markings, which were originally required to be completed by June 30, 2008, at medium and large airports,
- upgrading markings at smaller commercial airports, which had not been required,
- completing a runway safety review of 20 airports that were selected on the basis of runway incident data, and
- requiring that nonairport employees, such as airline mechanics, receive recurrent driver training at 385 airports.

According to FAA, since the August 2007 meeting, all 112 active air carriers have reported that they are (1) providing pilots with similar or other training that incorporates scenarios from aircraft pushback through

taxi, and (2) reviewing procedures to identify and develop a plan to address elements that contribute to pilot distraction while taxiing. FAA also indicated that it had completed an analysis of air traffic control procedures pertaining to taxi clearances and found that more explicit taxi instructions are needed, and that it had signed a partnership agreement with the National Air Traffic Controllers Association to create a voluntary safety reporting system for air traffic controllers.

In our November 2007 report, we found that FAA's Office of Runway Safety had not carried out its leadership role to coordinate and monitor the agency's runway safety efforts. Until recently, the office did not have a permanent director for the previous 2 years and staffing levels declined. FAA took a positive step by hiring a permanent director at the Senior Executive Service level for the office in August 2007. The new director has indicated he is considering several initiatives, including establishing a joint FAA-industry working group to analyze the causes of incursions and track runway safety improvements. In our November 2007 report, we also found that FAA had not updated its national runway safety plan since 2002, despite agency policy that such a plan be prepared every 2 to 3 years. The lack of an updated plan resulted in uncoordinated runway safety efforts by individual FAA offices. For example, in the absence of an updated national runway plan, each FAA office is expected to separately include its runway safety initiatives in its own business plan. However, this practice does not provide the same national focus and emphasis on runway safety that a national plan provides. Furthermore, not all offices with runway safety responsibilities included efforts to reduce incursions in their business plans. Until the national runway safety plan is updated, the agency lacks a comprehensive, coordinated strategy to provide a sustained level of attention to improving runway safety.

The deployment of surface surveillance technology to airports is a major part of FAA's strategy to improve runway safety, but it has presented challenges. To provide ground surveillance, FAA has deployed the Airport Movement Area Safety System (AMASS), which uses the Airport Surface Detection Equipment-3 (ASDE-3) radar,⁶ at 34 of the nation's busiest airports and is deploying an updated system, ASDE-X, at 35 major airports. The current deployment schedule will result in a total of 44 airports having AMASS and/or ASDE-X (see table 5 in the appendix). Both systems are

⁶AMASS is essentially the safety logic, which is designed to detect potential collisions, for ASDE-3. This combined technology is usually referred to as ASDE-3/AMASS.

designed to provide controllers with alerts when they detect a possible collision on the ground. As of January 2008, ASDE-X was commissioned⁷ at 11 of the 35 airports scheduled to receive it. FAA is also testing runway status lights, which are a series of lights embedded in the runways that give pilots a visible warning when runways are not clear to enter, cross, or depart on, at the Dallas-Ft. Worth International Airport and the San Diego International Airport. The agency made an initial investment decision last year to deploy the system at 19 airports, starting in November 2009, and is planning to make a final investment decision in June 2008. In addition, FAA is testing the Final Approach Runway Occupancy Signal at the Long Beach-Daugherty Field airport in California, which activates a flashing light visible to aircraft on approach as a warning to pilots when a runway is occupied and hazardous for landing.

However, FAA risks not meeting its current ASDE-X cost and schedule plans, which have been revised twice since 2001, and the system is experiencing operational difficulties with its alerting function. Although it took about 4 years for ASDE-X to be commissioned at 11 airports, FAA plans to deploy the system at the remaining 24 additional airports by 2010.⁸ In addition, not all 11 ASDE-X airports have key safety features of the system. For example, as of January 2008, two ASDE-X airports did not have safety logic, which generates a visible and audible alert to an air traffic controller regarding a potential runway collision. Furthermore, the ASDE-X airports are experiencing problems with false alerts, which occur when the system incorrectly predicts an impending collision, and false targets, which occur when the system incorrectly identifies something on the airfield as an aircraft or vehicle and could generate a false alert. Moreover, most airports in the United States have no runway safety technology to supplement a controller's vision of the airfield and will not have such technology even after FAA completes its plan to deploy ASDE-X at 35 major airports. While FAA is testing additional technology to prevent runway collisions, such as the Final Approach Runway Occupancy Signal, the systems are years away from deployment. Another technology, runway status lights, have had positive preliminary test evaluations, but need a surface surveillance system such as ASDE-3/AMASS or ASDE-X to

⁷FAA refers to ASDE-X as being commissioned after the system has been tested at an airport and demonstrated that the field site personnel can fully operate and maintain it.

⁸According to FAA, the agency's ability to meet its accelerated ASDE-X deployment schedule depends on several factors such as the availability of funding and the cooperation of external organizations.

operate. In addition, FAA is still testing a low cost surface surveillance system that already is being used at 44 airports outside of the United States. Furthermore, systems that provide direct collision warnings to flight crews, which NTSB and experts have recommended, are still being developed.

FAA lacks reliable runway safety data and the mechanisms to ensure that the data are complete. Although FAA collects information about runway incursions and classifies their severity, its tabulation of the number of incursions does not reflect the actual number of incidents that occur. FAA only counts incursions that occur at airports with air traffic control towers, so the actual number of incursions, which includes those that occurred at airports without air traffic control towers, is higher than FAA reports. While the change in definition of incursions that FAA adopted at the beginning of fiscal year 2008 will increase the number of incursions counted, it will not address this problem. In addition, an internal agency audit of 2006 incursion data questioned the accuracy of some of the incursion severity classifications. FAA plans to start a nonpunitive, confidential, voluntary program for air traffic controllers similar to a program that FAA has already established for pilots and others in the aviation community. The new program will enable air traffic controllers to report anything that they perceive could contribute to safety risks in the national airspace system. The benefit of such program is that the information obtained might not be reported otherwise, and could increase the amount of data collected on the causes and circumstances of runway incursions. However, FAA has not indicated when such a program would be implemented.

FAA has also taken some steps to address human factors issues through educational initiatives, such as developing simulated recreations of actual incursions to enhance air traffic controller training. However, air traffic controller fatigue, which may result from regularly working overtime, continues to be a human factors issue affecting runway safety. NTSB, which investigates transportation accidents, has identified four instances from 2001 through 2006 when tired controllers made errors that resulted in serious incursions. We found that, as of May 2007, at least 20 percent of the controllers at 25 air traffic control facilities, including towers at several of the country's busiest airports, were regularly working 6-day weeks. (See table 7 in the appendix for additional information.)

Experts we surveyed indicated that the actions that FAA could take with the greatest potential to prevent runway incursions, considering costs, technological feasibility, and operational changes, were measures to

provide information or alerts directly to pilots. Experts believed that lighting systems that guide pilots as they taxi at the airport, and technology that provides enhanced situational awareness on the airfield and alerts of potential incursions, would be of particular importance.

Recommendations

In our November 2007 report, we recommended that FAA (1) prepare a new national runway safety plan, (2) develop an implementation schedule for establishing a nonpunitive voluntary safety reporting program for air traffic controllers, and (3) develop a mitigation plan for addressing controller overtime. The agency agreed to consider our recommendations.

In closing, although FAA has taken many actions to improve runway safety, the number of serious incursions that are continuing to occur—many of which involved aircraft carrying hundreds of passengers—suggests that this country continues to face a high risk of a catastrophic runway collision. FAA must provide sustained attention to improving runway safety through leadership, technology, and other means. As the volume of air traffic continues to increase, providing sustained attention to runway safety will become even more critical.

Mr. Chairman, this concludes my prepared statement. I would be pleased to respond to any questions from you or other members of the Subcommittee.

GAO Contact and Staff Acknowledgments

For further information on this testimony, please contact Dr. Gerald L. Dillingham at (202) 512-2834 or dillingham@gao.gov. Individuals making key contributions to this testimony include Teresa Spisak, Bob Homan, and David Goldstein.

Appendix: Additional Runway Incident Data

Table 1: Number and Rate of Runway Incursions from Fiscal Year 1998 through Fiscal Year 2007

Fiscal year	Number of incursions	Rate per 1 million tower operations
1998	304	4.66
1999	329	4.83
2000	405	5.9
2001	407	6.1
2002	339	5.2
2003	323	5.1
2004	326	5.2
2005	327	5.2
2006	330	5.4
2007	370	6.05

Source: FAA.

Table 2: Number and Rate of Incursions, by Quarter, during Fiscal Year 2007 and the First Quarter of Fiscal Year 2008

Quarter and fiscal year	Number of incursions	Incursion rate per 1 million tower operations	Number of serious incursions	Rate of serious incursions per 1 million tower operations
First quarter 2007	90	6.03	2	0.134
Second quarter 2007	79	5.533	5	0.3502
Third quarter 2007	106	6.709	10	0.6329
Fourth quarter 2007	95	5.891	7	0.4341
First quarter 2008, using previous FAA incursion definition	94	6.434	10	0.685
First quarter 2008, using ICAO incursion definition	230	15.744	10	0.685

Source: FAA.

Table 3: Serious Incursions Involving At Least One Commercial Aircraft from Fiscal Year 2006 through the First Quarter of Fiscal Year 2008.

Date	Location	Airline(s) and aircraft involved	Number of air passengers
October 13, 2005	Gulfport-Biloxi International, MS	Northwest Airlines DC9 and Cessna C172	N/A
March 21, 2006	Chicago O'Hare International	Lufthansa Airbus A319 and Chautauqua Embraer E145	78
April 29, 2006	Phoenix Sky Harbor International	US Airways Airbus A320 and pedestrian	N/A
May 25, 2006	Miami International	Boeing 747 and American Eagle Aerospatiale AT43	N/A
July 18, 2006	Chicago O'Hare International	American Eagle Canadair CRJ-700 and US Airways Boeing 737	N/A
July 23, 2006	Chicago O'Hare International	ATLAS Boeing 747 and United Airlines Boeing 737	131
July 26, 2006	Los Angeles International	Mesa Canadair CRJ-200 and Skywest Embraer E120	N/A
August 8, 2006	Southwest Florida International, Ft. Myers, FL	Southwest Boeing 737 and vehicle	N/A
September 30, 2006	Los Angeles International	Gulfstream GLF5 and Skywest Canadair CRJ-700	N/A
January 5, 2007	Denver International	Key Lime Air Swearingen SW4 and Frontier Airbus A319	50
February 2, 2007	Denver International	United Boeing 737 and snowplow	101
May 4, 2007	Cyril E. King Airport, Charlotte Amalie, VI	American Airlines Boeing 757 and Cessna C208	N/A
May 6, 2007	Los Angeles International	Skywest Embraer 120 and Virgin Air Airbus A340	N/A
May 26, 2007	San Francisco International	Republic Airlines Embraer 170 and Skywest Airlines Embraer 120	27
July 11, 2007	Fort Lauderdale-Hollywood International, FL	Delta Air Lines Boeing 757 and United Airlines Airbus A320	172
July 19, 2007	Chicago O'Hare International	United Airlines Boeing 737 and US Airways Boeing 737	N/A
August 16, 2007	Los Angeles International	WestJet Boeing 737 and Northwest Airlines Airbus A320	296
December 2, 2007	Baltimore-Washington International	US Airways/America West Airbus A320 and Comair Canadair CRJ-100	N/A
December 6, 2007	Newark Liberty International	Continental Airlines Boeing 737 and Continental Express Embraer E145	N/A

Source: GAO analysis of FAA and NTSB data.

Note: N/A indicates that the information was not contained in the National Transportation Safety Board (NTSB) incident reports.

Table 4: Total Number of Incursions and Number of Serious Incursions Involving at Least One Commercial Aircraft, Fiscal Year 2001 through Fiscal Year 2007

Fiscal year	Serious incursions	Serious incursions involving at least one commercial aircraft
2001	53	26
2002	37	11
2003	32	9
2004	28	9
2005	29	9
2006	31	10
2007	24	8

Source: FAA.

Table 5: U.S. Airports that Experienced the Most Runway Incursions from Fiscal Year 2001 through Fiscal Year 2007

Airport	Number of serious incursions	Number of total incursions
Los Angeles International	10	55
Chicago O'Hare International	9	55
North Las Vegas, Las Vegas, NV	5	48
Hartsfield-Jackson Atlanta International	3	41
John Wayne-Orange County, Santa Ana, CA	0	41
Philadelphia International	2	40
Long Beach-Daugherty Field, CA	2	36
Boston Logan International	2	36
Dallas-Ft. Worth International	3	35
Phoenix Sky Harbor International	4	31
Lambert-St. Louis International	2	30
Las Vegas McCarran International	1	30
Newark Liberty International	3	25
General Mitchell International, Milwaukee, WI	1	25
Minneapolis-St. Paul International	0	25
Teterboro, NJ	3	23
Miami International	3	22
Ted Stevens Anchorage International	0	22
Reno-Tahoe International, NV	1	20
Cleveland Hopkins International	1	20

Source: FAA.

Note: Information was compiled from a list of airports that experienced 20 or more incursions from fiscal year 2001 through fiscal year 2007 and were certificated under 14 CFR Part 139. This information expands upon the information we presented in GAO-08-29 (fig. 4), which only included the top 10 airports experiencing incursions from 2001-2006. In addition, we now include three airports—Long Beach-Daugherty Field, John Wayne-Orange County, and North Las Vegas—which were previously identified as general aviation airports.

Table 6: Airports with Airport Surface Detection Equipment Model 3 (ASDE-3)/Airport Movement Area Safety Systems (AMASS) or the Airport Surface Detection Equipment, Model X (ASDE-X) or Scheduled to Receive ASDE-X

Airport	ASDE-3/AMASS	ASDE-X commissioned	Scheduled ASDE-X deployment ^a
Baltimore Washington International	✓		April 2010
Boston Logan International	✓		July 2009
Bradley International, Windsor Locks, CT		✓	
Camp Springs Andrews Air Force Base	✓		
Charlotte Douglas International		✓	
Chicago Midway			June 2010
Chicago O'Hare International		✓	
Cleveland Hopkins International	✓		
Covington/Cincinnati Northern Kentucky International	✓		
Dallas-Ft. Worth International	✓		April 2010
Denver International	✓		November 2009
Detroit Metro Wayne County	✓		June 2008
Ft. Lauderdale-Hollywood International, FL			April 2009
General Mitchell International, Milwaukee, WI		✓	
George Bush Intercontinental, Houston, TX	✓		November 2009
Hartsfield-Jackson Atlanta International		✓	
Honolulu International-Hickam Air Force Base			May 2010
John F. Kennedy International, New York, NY	✓		August 2008
John Wayne-Orange County, Santa Ana, CA			February 2010
Kansas City International	✓		
Lambert-St. Louis International		✓	
Las Vegas McCarran International	✓		December 2009
Los Angeles International	✓		June 2009
Louis Armstrong New Orleans International	✓		
Louisville International-Standiford Field		✓	
Memphis International	✓		April 2011
Miami International	✓		March 2010
Minneapolis-St. Paul International	✓		March 2010

Airport	ASDE-3/AMASS	ASDE-X commissioned	Scheduled ASDE-X deployment ^a
New York LaGuardia	✓		December 2010
Newark Liberty International	✓		July 2009
Orlando International		✓	
Philadelphia International	✓		December 2009
Phoenix Sky Harbor International			December 2008
Pittsburgh International	✓		
Portland International	✓		
Ronald Reagan Washington National	✓		June 2010
Salt Lake City International	✓		May 2010
San Diego International	✓		August 2010
San Francisco International	✓		
Seattle-Tacoma International		✓	
Ted Stevens Anchorage International	✓		
Theodore Francis Green State, Providence, RI		✓	
Washington Dulles International	✓		July 2008
William P. Hobby, Houston, TX		✓	

Source: FAA.

^aRepresents when the facility first declares the system ready for conditional use. Once the system is formally accepted by the facility, the system is commissioned. FAA's draft accelerated schedule, shown in this table, targets completing ASDE-X deployment by the Fall of 2010, with the exception of the New York LaGuardia and Memphis International airports, where the agency is coordinating ASDE-X implementation with the completion of new air traffic control towers.

Note: As indicated above, 28 airports currently have ASDE-3/AMASS. Six additional airports (Seattle-Tacoma International, Lambert St.-Louis International, Hartsfield-Jackson Atlanta International, Louisville International-Standiford Field, Chicago O'Hare International, and Charlotte Douglas International) originally had ASDE-3/AMASS, but the equipment has since been upgraded to ASDE-X.

Table 7: Air Traffic Control Facilities with 20 Percent or More Employees Working 6-Day Weeks from February through May 2007

Facility	Average percentage of controllers working 6-day weeks	Average percentage of controllers who volunteered to work overtime
Hartsfield-Jackson Atlanta International	52.09	85
Long Beach-Daugherty Field, CA	44.01	27
Atlanta Terminal Radar Approach Control (TRACON)	42.65	48
Shreveport Regional, LA	40.94	83
Jacksonville International, FL	39.77	66
Daytona Beach International, FL	39.62	65
Helena Regional, MT	38.89	100
Buchanan Field, Concord, CA	34.64	100
Boise, ID	33.39	81
Orlando International	32.53	30
Blue Grass, Lexington, KY	32.38	90
Ft. Lauderdale-Hollywood International, FL	31.12	65
Palm Beach International, West Palm Beach, FL	30.87	61
Reno-Tahoe International, NV	29.01	65
Camarillo, CA	29.00	43
Ted Stevens Anchorage International	28.66	58
Nashville International	28.63	75
Las Vegas TRACON	27.66	49
Bradley International, Windsor Locks, CT	26.98	62
Monroe Regional, LA	26.90	82
Sioux Gateway, IA	26.83	0
Los Angeles International	25.73	53
Phoenix TRACON	24.77	75
George Bush Intercontinental Houston, TX	23.28	97
Southern California TRACON	21.96	64

Source: FAA.

Note: Also represents facilities where 4 percent or greater of the employees' work hours were covered by overtime.

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