

**PROGRESS HAS BEEN MADE IN REDUCING  
RUNWAY INCURSIONS, BUT RECENT  
INCIDENTS UNDERSCORE THE NEED FOR  
FURTHER PROACTIVE EFFORTS**

*Federal Aviation Administration*

*Report Number: AV-2007-050*

*Date Issued: May 24, 2007*



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

# Memorandum

Subject: **ACTION:** Report on Runway Incursions:  
Progress Has Been Made in Reducing Runway  
Incursions, but Recent Incidents Underscore the  
Need for Further Proactive Efforts  
Federal Aviation Administration  
Report Number AV-2007-050

Date: May 24, 2007

From: David A. Dobbs   
Principal Assistant Inspector General  
for Auditing and Evaluation

Reply to  
Attn. of: JA-10

To: Federal Aviation Administrator

This report provides the results of our review of the Federal Aviation Administration's (FAA) actions to address runway incursions at Boston Logan, Chicago O'Hare, Philadelphia, and Los Angeles International Airports. Our objectives were to assess the actions taken by FAA to (1) identify and correct the causes of recent runway incursions at those airports and (2) address those issues that could affect safety system-wide. We added Los Angeles International Airport to our review in October 2006 as a result of several serious incidents that occurred at that location between July and September of 2006 and in response to concerns expressed by Senator Barbara Boxer to our office regarding those incidents.

Our review, conducted between May 2006 and April 2007, included site visits to those four locations and FAA Headquarters. Exhibit A details our review scope and methodology. Exhibit B lists the specific organizations that we contacted or visited during the audit. Exhibit C provides a summary of our prior reports pertaining to runway incursions.

We focused on FAA programs for reducing runway incursions; this audit did not evaluate the status of runway safety technologies. Our office is reviewing those issues as part of two ongoing audits on the status of FAA's Airport Surface Detection Equipment-Model X Program and FAA's air traffic modernization efforts (which will also include a review of the Automatic Dependent

Surveillance-Broadcast Program). We will issue the results of those audits later this year.

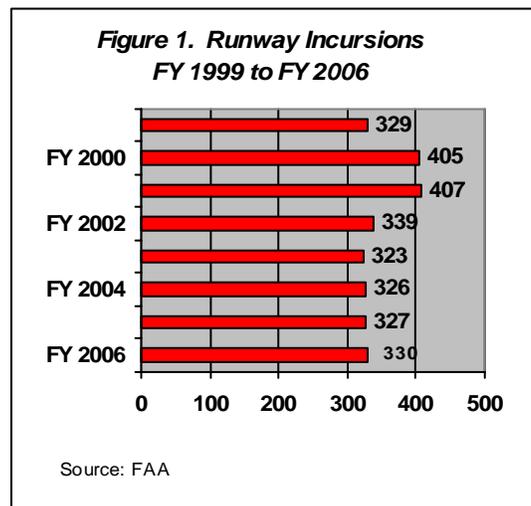
FAA defines a runway incursion as any incident at an airport involving an aircraft, a vehicle, person, or an object on the ground that creates a potential collision hazard or results in a loss of separation with an aircraft taking off, intending to take off, landing, or intending to land. Runway incursions are classified into three types of operational categories:

- Operational Errors—when the actions of a controller cause an incident,
- Pilot Deviations—when the actions of a pilot cause an incident, and
- Vehicle/Pedestrian Deviations—when the actions of a vehicle operator or pedestrian cause an incident.

Runway incursions are also graded by severity of the incident (A through D). Category A runway incursions represent incidents in which a collision was barely avoided, whereas Category D runway incursions represent incidents where there was little or no chance of a collision.

Because runway incursions can be caused by different groups, responsibility for their prevention falls on all users of the National Airspace System—FAA, airlines, and airport operators. Within FAA, its lines of business; including the Air Traffic Organization, Aviation Safety, and Airports Division; share the responsibility for preventing and correcting the root causes of runway incursions.

From 1998 to 2001, we reported<sup>1</sup> that runway incursions were increasing at alarming rates. To its credit, FAA took decisive action, and the total number of runway incursions decreased from a high of 407 in fiscal year (FY) 2001 to a low of 323 in FY 2003 (see figure 1). The most serious incidents have decreased from a high of 69 in FY 1999 to a low of 28 in FY 2004. However, since 2003, the number of runway incursions has leveled off, and very serious runway incursions continue to occur.<sup>2</sup>



Recently, there has been an increase in the

<sup>1</sup> OIG reports can be found on our website at [www.oig.dot.gov](http://www.oig.dot.gov). Our prior reports regarding runway incursions are also listed at exhibit C.

<sup>2</sup> The rate of runway incursions per 1,000,000,000 operations has also remained relatively constant since FY 2003—from 5.22 in FY 2003 to 5.40 in FY 2006.

number and severity of runway incursions at four major airports—Boston Logan, Chicago O’Hare, Philadelphia, and Los Angeles International. During the period of FY 2005 through FY 2006, Boston Logan had 22 incidents (1 severe), Chicago O’Hare had 15 incidents (5 severe), Philadelphia International had 16 incidents (1 severe involving a collision), and Los Angeles International had 16 incidents (2 severe). Those were the highest number of runway incursions among the Nation’s large commercial airports. In several instances, a fatal collision was barely avoided. For example:

- On March 21, 2006, at Chicago O’Hare, a controller (during on-the-job training) mistakenly cleared two commercial aircraft for take off on intersecting runways. Another controller spotted the error and ordered both aircraft to abort their take-off rolls. However, before stopping, the 2 aircraft came within 100 feet of one another at the runway intersection.
- On September 30, 2006, at Los Angeles International, a collision was barely avoided when a Skywest aircraft aborted a take-off roll after the pilot of a British business jet mistakenly crossed the active runway, deviating from a controller’s instructions to hold short<sup>3</sup> at the taxiway. The 2 aircraft were less than 100 feet from one another when the Skywest aircraft managed to stop.

Several serious airport surface incidents have recently occurred at other airports as well. For example:

- On August 27, 2006, 49 people lost their lives and 1 was critically injured when Comair flight 5191 crashed while attempting to take off from the wrong runway at Lexington, Kentucky.
- On October 28, 2006, Continental flight 1883 (with 152 passengers on board) mistakenly landed on an active taxiway at Newark International airport. Fortunately, there were no other aircraft or vehicles occupying the taxiway at the time of the incident, and no one was injured.

Although these two incidents are not classified as runway incursions under FAA’s current definition, the Lexington accident would be considered a runway incursion under the International Civil Aviation Organization’s definition; FAA plans to adopt this definition in FY 2008.

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<sup>3</sup> “Hold short” is terminology used by controllers when instructing pilots to stop and not enter onto or cross a runway.

## RESULTS IN BRIEF

At the Boston, Chicago, Philadelphia, and Los Angeles airports, we found that FAA, airlines, and airport operators had taken concerted actions in response to an increase in the number and severity of runway incursions occurring at those locations. For example:

- At Boston, where pilot deviations were the primary cause of runway incursions, FAA revised its local air traffic procedures to change or eliminate certain operations and runway configurations. Airport managers were also making structural improvements to the airport itself to help prevent runway incursions. Those improvements include new airport lighting, signage, and markings on the airfield and construction of a new center-field taxiway to reduce runway crossings and airfield congestion.
- At Philadelphia, where controller operational errors were the primary causes of runway incursions, FAA has taken actions to improve management oversight of air traffic operations, including hiring a new air traffic manager and more supervisors and operational managers to provide additional oversight in the tower cab. Air Traffic management at the tower also took steps to improve controller performance, including establishing an operational position responsible for coordinating runway crossings, providing controllers with refresher training and team briefings on air traffic procedures, and establishing new procedures to minimize runway crossings.

However, at all four locations, the actions were taken only after an increase in the number and severity of incidents at those airports. For example, at Boston, significant actions did not occur until after a Category A runway incursion happened on June 9, 2005, when 2 aircraft came within 171 feet of a collision. That marked the ninth runway incursion in FY 2005—a significant increase over the previous year when only one runway incursion occurred during the entire year. This incident and six subsequent runway incursions that occurred in FY 2005 sparked reviews by the National Transportation Safety Board and FAA's Air Traffic Terminal Services and eventually led to the creation of a special team (consisting of FAA and airport officials) to identify solutions to Boston's runway incursion problems.

Compared to 5 years ago, FAA has made significant progress in reducing runway incursion incidents. However, the serious risks associated with runway incursions underscore the need for maintaining vigilant oversight and a proactive approach for preventing severe incidents. During our review at the four locations, we identified the following three areas where FAA could take additional proactive actions at the national level to help prevent runway incursions system-wide.

**Better information sharing is needed to identify root causes of pilot deviations and to communicate best practices that have effectively reduced runway incursions.** It is important that FAA and users have mechanisms in place to identify trends and root causes of runway incursions caused by pilot deviations so that appropriate actions can be taken to mitigate risks. FAA has two programs that obtain detailed information that could help to identify root causes of pilot deviations—the Runway Incursion Information and Evaluation Program (RIIEP) and the Aviation Safety Action Program (ASAP). Both programs provide a mechanism to obtain information that may not otherwise be reported. However, we found the data obtained by these programs were either ineffectively utilized or inaccessible to users.

For example, ASAP is a program in which air carrier employees can report potential safety issues without fear of enforcement action from FAA. An intended benefit of ASAP is that the information obtained may not otherwise be reported. We are currently reviewing ASAP as part of a separate audit to determine the appropriateness of including certain incidents or accidents that by their nature would be known and reported to FAA, such as runway incursions. As part of this review, however, we found that existing ASAP data could be beneficial in identifying root causes and corresponding solutions related to commercial pilot deviations. However, detailed information related to many of these incidents is kept by the individual air carriers participating in the program and is protected from disclosure. This is the case even if the runway incursion is serious.

For instance, on July 18, 2006, a serious pilot deviation occurred at Chicago O’Hare when an American Eagle regional jet turned onto the wrong taxiway and conflicted with an arriving US Airways Boeing 737. The 2 aircraft came within 100 feet of a collision; yet, the final report on the incident provides no details about why the American Eagle pilot was on the wrong taxiway. It simply states that the investigation is being handled under ASAP and that the airline failed to respond to a request for additional information concerning the pilot deviation.

Key stakeholder personnel we interviewed (Regional Runway Safety Program Managers, Flight Standards personnel, and pilot representatives) agreed that ASAP information could help in identifying effective mechanisms to reduce runway incursions. Given that our audit of ASAP is not yet complete, FAA needs to work with the pilot and airline communities to develop a process whereby Regional Runway Safety Program Managers can request site-specific, redacted ASAP information on runway incursions and surface incidents to identify trends and root causes of runway incursions.

At all four locations, we also found that comparable actions were taken to prevent runway incursions. These included increasing management oversight of tower operations; improving controls over airport driver certification and training; highlighting potentially dangerous intersections; and improving airport signage, lighting, and markings. However, other than informal networking, there were no formal mechanisms for users to share effective actions taken at individual locations with other users of the National Airspace System.

Sharing local actions taken, such as changes in airport signage or local air traffic procedures, could be an effective means of enhancing runway safety at other airports with similar layouts. Regional Runway Safety Program Managers in particular expressed frustration at their inability to share best practices through a formal channel, such as an internet posting site specifically dedicated to runway safety issues. FAA should develop such a means for users to share best practices for reducing runway incursions.

**Additional focus is needed on controller human factors issues and training to improve individual, team, and facility performance.** In its last National Plan for Runway Safety (2002), FAA cited human factors and lack of controller teamwork as significant contributing factors of runway incursions caused by controller operational errors. The report also stated that those types of errors could be mitigated through training and procedural interventions. However, we found that FAA has made little progress in addressing human factors training to help reduce the risk of runway incursions caused by controllers.

For example, the National Air Traffic Professional Program (NATPRO) is a human factors initiative that we reviewed in 2003.<sup>4</sup> NATPRO training is designed to sharpen and maintain controllers' mental skills most closely associated with visual attention and scanning. Participants thus gain personal insight into how performance can be influenced (e.g., by distraction, fatigue, and boredom) and how those factors increase the opportunity for operational errors.

The program was tested in FY 2003, and FAA provided this training at its en route centers and plans to implement it at its large terminal radar approach control facilities in FY 2007. However, it has not been implemented at towers where visual attention and scanning are key factors in preventing runway incursions. The managers at all four facilities we visited expressed an interest in this training, but FAA has not yet established milestone dates for implementing NATPRO at air traffic control towers.

Another tool with a high potential for improving facility performance is safety risk analysis. Safety risk analyses consist of a methodology to identify all hazards

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<sup>4</sup> OIG Report Number AV-2003-040, "Report on Operational Errors and Runway Incursions," April 3, 2003.

associated with a specific operation or change in operation so that risks can be mitigated to an acceptable level prior to the change being made. At Boston, such an analysis was key in preventing future runway incursions.

For example, after serious runway incursions occurred on June 9, 2005, and October 4, 2005, a procedure involving aircraft departing on a non-standard runway configuration was discontinued. The facility conducted a safety risk analysis of the operation and found that the operation could resume only if certain precautionary procedures were instituted. After these procedures were instituted, the operation resumed in July 2006; since then, there have been no additional runway incursions involving the use of this departure runway operation at Boston.

The use of safety risk analysis is required for any changes to the National Airspace System. Because safety risk analyses are effective in identifying potential runway safety risks of existing operations (such as what occurred in Boston), FAA needs to determine if they should also be required for evaluating existing operational procedures at airports where potential runway safety risks have been identified.

**Greater authority and accountability at the national level is needed to ensure that runway safety remains a priority for all lines of business.** We found that several Agency-wide efforts, initiated in 2001, have subsequently waned as the number of incidents declined and FAA met its goals for reducing runway incursions. For example, FAA's Runway Safety Office was established in 2001 to provide central oversight and accountability for implementing runway safety initiatives throughout the Agency. However, that office has not had a permanent Director for over 2 years. In addition, the office was re-organized and realigned twice since the establishment of the Air Traffic Organization in February 2004 and was reduced in size by 50 percent (from 18 to 9 staff members), including the elimination of branch offices.

Another example is FAA's National Plan for Runway Safety. This plan defined FAA's strategy and prioritized its efforts to reduce runway incursions by including specific activities, milestones, and the organization responsible for those activities. FAA believed that this plan, along with quarterly status briefings to the Administrator, would improve program accountability by ensuring that initiatives were completed in a timely manner. However, we found that this plan is no longer prepared, and the last time FAA prepared one was in 2002.

FAA officials we spoke with told us that the FAA Flight Plan took the place of the National Plan for Runway Safety and that each line of business is responsible for including runway incursion initiatives in their own annual business plans. The individual business plans, however, do not have the same national focus and emphasis that the National Plan for Runway Safety provided.

For instance, FAA does not require each line of business to include goals in its business plan that are specific to its oversight responsibility, and this may diminish accountability for achieving results within each line of business. For example, while FAA met its FY 2006 overall goal of no more than 34 serious runway incursions, pilot deviations (the responsibility of the Aviation Safety line of business) experienced a 100-percent increase—rising from 9 in FY 2005 to 18 in FY 2006.

## **SUMMARY OF RECOMMENDATIONS**

Our recommendations focus on programmatic actions that could help FAA to reduce runway incursions system-wide. They include the following:

- Providing managers with access to critical data on pilot deviations for specific airports to aid in identifying trends, root causes, and possible local solutions;
- Developing an automated means to share local best practices that successfully reduced runway incursions;
- Implementing human factors training initiatives for controllers at air traffic control towers;
- Requiring the use of safety risk analyses for existing operational procedures at airports where potential runway safety risks have been identified; and
- Requiring each line of business to include goals for reducing runway incursions in its annual business plans that are specific to its responsibilities.

A complete list of our recommendations can be found on page 17 of this report.

## **SUMMARY OF MANAGEMENT COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE**

We provided FAA with a draft copy of this report on April 6, 2007, for comment. On April 30, 2007, FAA gave us its formal response, which is contained in its entirety in the appendix to this report. While FAA senior officials verbally agreed with our recommendations when we briefed them on our audit findings and recommendations, FAA's formal response does not explicitly state whether the Agency concurs or non-concurs. In addition, the actions proposed by FAA were unspecific as to how or when the Agency would address the intent of our recommendations.

For example, FAA's response states that an airman involved in a runway incursion will be given an opportunity to participate in FAA's Runway Incursion Information and Evaluation Program but does not state what specific initiatives will be established to promote increased pilot participation, as we recommended. In another example, FAA's response states that it plans to implement human factors training for controllers but fails to provide milestones beyond FY 2007, which was the basis for our recommendation.

Accordingly, we are requesting that FAA provide us with additional information regarding the specific actions that it plans to take to implement each of our recommendations along with timeframes for completion. A complete summary of FAA's comments and our response can be found on pages 18 through 21 of this report.

## **ACTIONS REQUIRED**

In accordance with Department of Transportation Order 8000.1C, please provide us with additional information regarding the specific actions that FAA plans to take to implement our recommendations along with timeframes for completion within 30 calendar days. We will consider the recommendations unresolved until we receive the requested information.

We appreciate the courtesies and cooperation of FAA representatives during this audit. If you have any questions concerning this report, please contact me at (202) 366-0500 or Dan Raville, Program Director, at (202) 366-1405.

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cc: FAA Deputy Administrator  
Anthony Williams, ABU-100

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## FINDINGS

At the Boston, Chicago, Philadelphia, and Los Angeles airports, we found that FAA, airlines, and airport operators had taken actions to address runway incursions. However, those actions were taken only after an increase in the number and severity of incidents that occurred at those airports. Preventing runway incursions throughout the National Airspace System requires continuous vigilance on the part of FAA and users. Compared to 5 years ago, FAA has made significant progress in reducing those incidents. However, the serious risks associated with runway incursions underscore the need for maintaining a proactive approach for preventing serious incidents.

We identified three areas where FAA needs to take additional measures to further reduce serious runway incursions. Specifically, we found that (1) better information sharing is needed to identify root causes of pilot deviations and to communicate best practices that have effectively reduced runway incursions; (2) additional focus on controller human factors issues and training is needed to improve individual, team, and facility performance; and (3) greater authority and accountability is needed at the national level to ensure that runway safety remains a priority for all lines of business.

### **FAA, Airlines, and Airport Operators Had Taken Concerted Actions at Boston, Chicago, Philadelphia, and Los Angeles in Response to an Increase in the Number and Severity of Runway Incursions at Those Locations**

**Boston Logan:** At Boston Logan International Airport, where pilot deviations were the primary cause of runway incursions, numerous actions were undertaken during FY 2005 and FY 2006 to reverse the increase in runway incursions. However, significant actions did not occur until after a Category A runway incursion occurred on June 9, 2005, when 2 aircraft came within 171 feet of a collision. This marked the ninth runway incursion in FY 2005 (a significant increase over the previous year when only one runway incursion occurred during the entire year) and sparked a June 2005 review by the National Transportation Safety Board.<sup>5</sup>

In October 2005, after 16 runway incursions had occurred within a 12-month period at the airport, FAA's Air Traffic Terminal Services conducted an operational assessment, and the FAA Regional Administrator formed a special team (consisting of FAA and airport officials) to identify solutions to Boston

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<sup>5</sup> The National Transportation Safety Board transmitted the results of its review to the Boston Air Traffic Manager in a June 30, 2005, letter that included four suggested actions to assist in preventing runway incursions.

Logan's runway incursion problems. Actions taken at Boston Logan in FY 2005 and FY 2006 to reduce runway incursions include the following:

- Increasing management oversight of air traffic operations (including hiring additional supervisors);
- Revising air traffic procedures to change or eliminate certain operations;
- Publishing a high-alert intersection brochure to warn pilots of problem areas;
- Providing training to mechanics who taxi aircraft across runways; and
- Improving airport lighting, signage, and markings on the airfield (see figures 2 and 3).

**Figure 2. Example of Improved Airfield Lighting: Picture of an Elevated Runway Guard Light at Boston Logan**



Source: Office of Inspector General

The actions taken by FAA, airlines, and the airport operator have been successful in reducing runway incursions at Boston. The total number of incursions have declined from 15 (1 serious) in FY 2005 to 7 (0 serious) in FY 2006. Additional airport improvements are planned in 2007 and 2008 that should further reduce the risk of runway incursions. These include constructing a new center-field taxiway to reduce runway crossings and airfield congestion and redesigning the southwest corner of the airfield to eliminate the intersection of three taxiways, where many of the runway incursions occurred.

## Findings

**Figure 3. Picture of Enhanced Runway Markings at Boston Logan**



Source: Office of Inspector General

**Chicago O’Hare:** At Chicago O’Hare International Airport, actions to address runway incursions were initiated in March 2006 after several incursions occurred, including one very serious incident. Those actions were still underway when we visited the facility, and we were unable to assess their effectiveness at the time of our review. Most of those actions focused on improving air traffic operations, since historically 76 percent of runway incursions at Chicago O’Hare have been the result of controller errors. Actions taken to reduce runway incursions include the following:

- Increasing management oversight of air traffic operations (including hiring additional supervisors and operational managers to oversee operations in the tower cab),
- Providing controller training and team briefings on air traffic procedures,
- Removing potential distractions from the air traffic control tower,
- Hiring additional staff to train controllers,
- Establishing a local air traffic work group to evaluate procedures,
- Developing a “hot-spots” map (which depicts where runway incursions have occurred at the airport) for all users at the airport and including the hot spots on airport diagrams used by pilots,
- Improving airport signage and markings on the airfield, and
- Closing a potentially hazardous intersection (see figure 4).

## Findings

**Figure 4. Picture of Taxiway at Chicago O'Hare Closed Because of Repeated Incidents at That Intersection**



Source: Office of Inspector General

Since initiating actions after the March 2006 incidents, Chicago O'Hare experienced seven more incursions (two serious) through February 2007 (including four controller errors).

**Philadelphia:** At Philadelphia International Airport, during FY 2005 and FY 2006, actions to reduce runway incursions caused by controller errors appear to have been effective. At the time of our field work, however, actions to prevent vehicle/pedestrian deviations, which constituted the majority of runway incursions in FY 2006, had just been initiated. Actions taken to reduce runway incursions include the following:

- Increasing management oversight of air traffic operations (including hiring a new air traffic manager and additional supervisors and operational managers to become more actively engaged in managing the operations of the tower cab);
- Establishing an air traffic operational position responsible for coordinating runway crossings;
- Providing controllers with training and team briefings on air traffic procedures;
- Establishing new procedures to minimize runway crossings;
- Developing a hot-spots map for all users at the airport;
- Implementing new training requirements and disciplinary actions for airfield vehicle drivers; and
- Improving airport signage, lighting, and markings on the airfield.

## Findings

The number of runway incursions caused by controllers decreased from six in FY 2005 to three in FY 2006. However, the number of incursions caused by vehicle drivers increased from two in FY 2005 to four in FY 2006. Because the airport's new training program for drivers was not implemented until June 2006, it was too early to determine if it had been effective at the time of our field work. Since June 2006, Philadelphia experienced one additional vehicle deviation (not serious) that caused a runway incursion.

**Los Angeles:** At Los Angeles International Airport, most of the actions were geared toward preventing pilot deviations because historically over 80 percent of the runway incursions at that location were caused by pilots. Actions taken to reduce runway incursions include the following:

- Revising controller staffing requirements to ensure adequate coverage during the night shift;
- Revising controller phraseology to ensure that pilots hold short when instructed;
- Developing hot-spot maps and training materials on the complexity of the airport for pilots; and
- Improving airport signage, lighting, and markings on airfield.

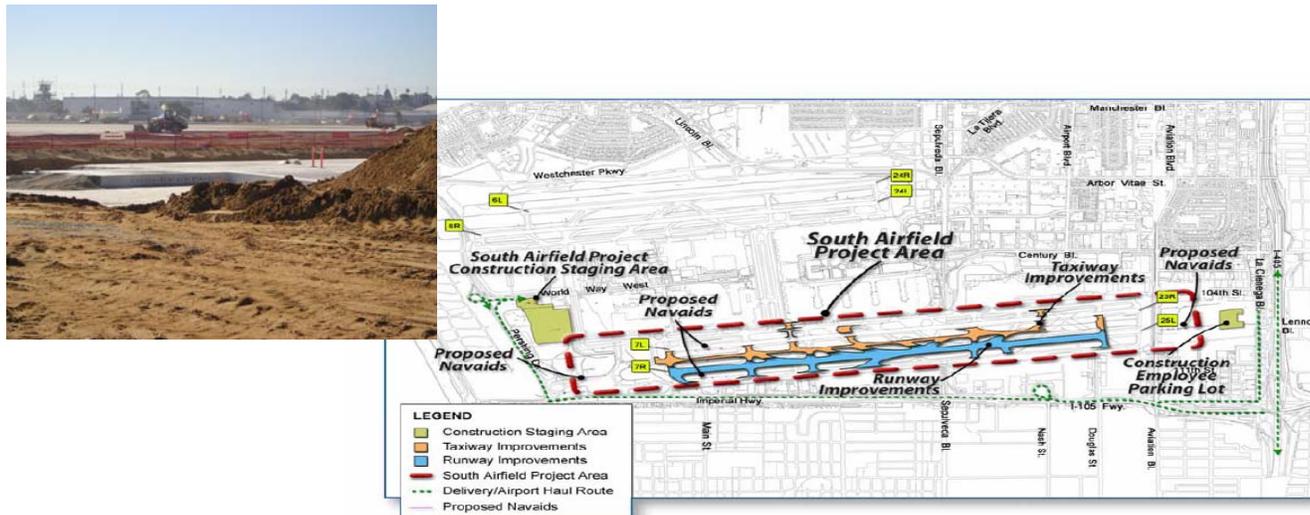
Since February 2006, the Los Angeles airport has not had any runway incursions caused by controller errors, but pilot deviations continue to occur—two such incidents (neither were serious) occurred in February 2007. However, the airport is in the process of moving 1 runway 55 feet farther away from a parallel runway so that a center-field taxiway can be added. This action has the most potential for preventing runway incursions because the majority of pilot deviations occurred when aircraft were exiting one runway but, due to the close proximity of the parallel runway, were unable to hold short of the second runway as instructed. The center-field taxiway will be completed in 2008 (see figure 5).<sup>6</sup>

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<sup>6</sup> We also provided this information to Senator Boxer in a March 22, 2007, letter from the Inspector General (CC-2007-07). The letter can be found on our website at [www.oig.dot.gov](http://www.oig.dot.gov).

## Findings

**Figure 5. Runway Construction at Los Angeles International**



Source: Los Angeles Airport Authority

### **Additional Proactive Measures Could Be Taken by FAA at the National Level To Help Prevent Runway Incursions System-Wide**

The serious risks associated with runway incursions underscore the need for maintaining a proactive approach for preventing these incidents. During our review, we identified opportunities that could help FAA to further reduce runway incursions. Specifically, we found the following:

- Better information sharing is needed to identify root causes of pilot deviations and to communicate best practices that have effectively reduced runway incursions;
- Additional focus on controller human factors issues and training is needed to improve individual, team, and facility performance; and
- Greater authority and accountability is needed at the national level to ensure that runway safety remains a priority for all lines of business.

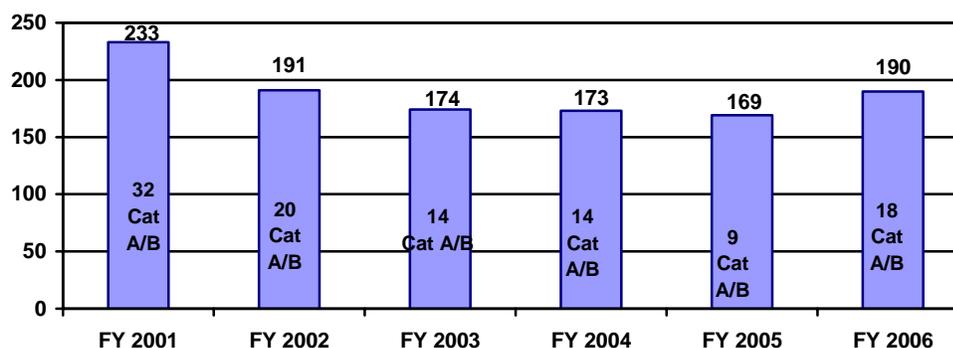
#### *Better Information Sharing Is Needed To Identify Root Causes of Pilot Deviations and To Communicate Best Practices That Have Effectively Reduced Runway Incursions*

Pilot deviations have historically been the cause of 50 percent or more of all runway incursions. In FY 2006, both the total and the most serious runway incursions caused by pilots increased to their highest levels since FY 2002 (see figure 6). Given those statistics, it is important that FAA have mechanisms in

## **Findings**

place to share information about pilot deviations that could be used to identify trends and potential causal factors.

**Figure 6. History of Pilot Deviation Runway Incursions  
FY 2001 to FY 2006**



Source: FAA data

FAA has two programs that obtain detailed information that could help to identify root causes of pilot deviations—the Runway Incursion Information and Evaluation Program (RIIEP) and the Aviation Safety Action Program (ASAP). Both programs provide a mechanism to obtain information that may not otherwise be reported. However, we found that the data contained in these programs were either ineffectively utilized or inaccessible to users.

**RIIEP:** RIIEP was designed to provide additional human factors data on runway incursions and surface incidents caused by pilot deviations. The RIIEP questionnaire gathers human factors information from pilots involved in a runway incursion about activity in the cockpit, pilots' comprehension of air traffic instructions, and physiological conditions of the pilots. For example, a RIIEP report filed for a recent Los Angeles pilot deviation provided valuable insight that was not provided in the investigation report, including crew communication information, the impact of fatigue, and a suggestion on how to prevent the reoccurrence of a similar pilot deviation.

The program (which is voluntary) was originally tested in FY 2000 for a 1-year period. Based on the results of that test, FAA believed that the program could provide valuable safety information that would help determine root causes and develop effective corrective actions to reduce runway incursions caused by pilot deviations. As a result, FAA renewed the program for a 2-year period in July 2004. However, we found that the program was not being utilized effectively.

## Findings

For example, only 19 percent of all runway incursions and surface incidents that occurred during that 2-year period had a completed program questionnaire. In addition, FAA was unable to provide us with evidence that any data analyses were performed on the information that was collected.

FAA has subsequently initiated efforts to revitalize RIIEP. In October 2006, FAA renewed RIIEP for another 2 years. FAA also established goals to increase pilot participation by 10 percent annually over the next 2 years. In addition, FAA plans to provide all regional and field inspectors with training on the program to increase its utilization. The program manager for RIIEP stated that given these improvements, he believes the program will be more successful at identifying root causes and solutions to reduce runway incursions.

Renewing RIIEP is, in our opinion, a step in the right direction. In order to meet its participation goals, we recommend that FAA establish initiatives to promote increased voluntary pilot participation in RIIEP so that the necessary data can be accumulated and appropriately analyzed to identify and mitigate runway incursion causal factors.

**ASAP:** ASAP is a program in which air carrier employees can report potential safety issues without fear of enforcement action from FAA. An intended benefit of ASAP is that the information obtained may not otherwise be reported. We are currently reviewing ASAP as part of a separate audit to determine the appropriateness of including certain incidents or accidents that by their nature would be known and reported to FAA, such as runway incursions. As part of this review, however, we found that existing ASAP data could be beneficial in identifying root causes and corresponding solutions related to commercial pilot deviations. However, detailed information related to many of these incidents is kept by the individual air carriers participating in the program and is protected from disclosure. This is the case even if the runway incursion is serious.

For example, on July 18, 2006, a serious pilot deviation occurred at Chicago O'Hare when an American Eagle regional jet made a wrong turn onto Taxiway Q and conflicted with an arriving US Airways Boeing 737 on a short final to Runway 27L. The 2 aircraft came within 100 feet of a collision. The final report on the incident, however, provides no details about why the American Eagle pilot was on the incorrect taxiway. It simply states the investigation is being handled under ASAP and that the airline failed to respond to a request for additional information concerning the pilot deviation.

Obtaining detailed information contained in ASAP reports could identify possible common causes that may exist among different air carries, which each air carrier by itself may not see as a trend.

## Findings

For example, at Boston Logan, where pilot deviations represent the largest percentage of runway incursions, stakeholders recognized and acted upon the need for pilot deviation information to be shared. As a result, a team of pilot and air traffic representatives meet regularly to review tapes of local pilot deviations and develop solutions specific to Boston Logan. However, the amount of information available to the team is limited since any pilot deviation reported under ASAP is restricted and kept by the individual participating air carriers.

Key stakeholder personnel we interviewed (Regional Runway Safety Program Managers, Flight Standards personnel, and pilot representatives) agreed that ASAP information could help in identifying effective mechanisms to reduce runway incursions. Given that our audit of ASAP is not yet complete, FAA needs to work with the pilot and airline communities to develop a process whereby Regional Runway Safety Program Managers can request site-specific, redacted ASAP information on runway incursions and surface incidents to identify trends and root causes of runway incursions.

**Best Practices:** At all four locations, we found several comparable actions that were taken to prevent runway incursions. However, other than informal networking, there were no formal mechanisms for users to share effective actions taken at individual locations with other users of the National Airspace System. Examples of effective actions at all four airports include the following:

- Air Traffic managers adopted tools for tracking controller performance. At Boston, managers implemented the use of an automated software program for performance oversight, while the other facilities adopted the use of other tools or forms to better track employee performance until automated software is available.
- Air Traffic managers also increased the minimum required time for management to work in the operational area. At Chicago O'Hare, managers implemented a requirement for operational managers to spend at least 80 percent of their time in the operational area.
- Airport operators tightly controlled the testing of drivers in the airfield driver certification process. Each airport operator imposed punitive action for non-compliance of driver rules, some resulting in revocation of driver privileges or enforcement of fines.
- Airport operators and the FAA Runway Safety Office created maps or brochures to highlight potentially hazardous intersections (known as hot spots) on the airport movement area. At Philadelphia, the airport operator created user-specific hot-spot maps, which identified different hot spots for vehicle drivers and for pilots. At Boston, Regional Runway Safety Program Managers

## Findings

developed a high-alert intersection brochure that identified hot spots and distributed it to airport users.

- All airport operators improved airport lighting, signage, and markings in response to runway incursions. For instance, the airports upgraded surface-painted, hold-short surface markings in advance of FAA's mandatory implementation date of June 2008. The airports also added unique signage to prevent runway incursions. For example, to prevent general aviation pilots from inadvertently taxiing onto an active runway at Chicago, the airport operator added above-ground signage near the general aviation ramp that instructs general aviation aircraft to hold and contact the ground controller before continuing (see figure 7).

**Figure 7. Picture of Ground Signage at Chicago O'Hare Instructing General Aviation Pilots To Hold and Contact Ground Control Before Proceeding**



Source: Office of Inspector General

While the implementation of these actions varied among the airports, they all had common threads that have the potential to reduce runway incursions system-wide. However, other than informal networking, there were no formal means for the various users to share actions with other users that had been effective at reducing or preventing runway incursions at their locations. Regional Runway Safety Managers in particular expressed frustration at their inability to share best practices through a formal channel, such as an intranet posting site specifically dedicated to runway safety issues.

In addition, the special team established at Boston experienced a similar problem in obtaining information on industry best practices. The team identified a need to distribute site-specific training material, including industry best practices, to its local users. However, it was unable to accomplish this initiative because there

## Findings

was no central source to turn to for gathering examples of best practices used at other locations.

We are recommending that FAA develop an automated means, such as establishing an intranet site through the Regional Runway Safety Offices, to share best practices for reducing runway incursions with all users of the National Airspace System.

### *Additional Focus on Controller Human Factors Issues and Training Is Needed To Improve Individual, Team, and Facility Performance*

In its 2002 National Plan for Runway Safety, FAA cited human factors (such as memory lapses) and lack of controller teamwork as significant contributing factors of runway incursions caused by controller operational errors. The report also stated that those types of errors could be mitigated through training and procedural interventions. However, we found that FAA has made little progress in implementing initiatives to address human factors training to help reduce the risk of runway incursions caused by controllers. Some of these initiatives were identified over 6 years ago but have not been implemented.

Based on our review of the four airports and FAA documentation, we have identified several initiatives that have significant potential to reduce runway incursions by improving (1) individual performance through human factors training, (2) team performance through team effectiveness training, and (3) facility performance through the use of simulators and safety risk analyses.

**Improving Individual Performance:** In April 2003, we reported that since almost 90 percent of controller errors were due to human factors issues rather than procedural or equipment deficiencies, it was important that FAA develop initiatives to prevent these types of errors. In FY 2002, FAA initiated two key human factors studies to improve controller performance—JANUS and National Air Traffic Professional Program (NATPRO).

- JANUS is a technique designed to improve the data collection process for operational errors by applying human factors principles so that interventions can be developed to enhance performance. The overall purpose is to understand the role of the individual, situation, and work-related factors as they influence air traffic controllers' operational performance. The objectives are to develop an improved understanding of the human factors relating to individual performance and the occurrence of operational errors and to broaden the role of cognitive factors as they influence the performance of air traffic controllers. FAA began testing JANUS in FY 2002 but has not implemented this program.

## **Findings**

- NATPRO (i.e., memory enhancement training) is designed to sharpen and maintain controllers' mental skills most closely associated with visual attention and scanning. Participants thus gain personal insight into how performance can be influenced (e.g., by distraction, fatigue, and boredom) and how those factors increase the opportunity for performance errors.

NATPRO was tested in FY 2003, and FAA provided this training at its en route centers and plans to implement it at its large terminal radar approach control facilities in FY 2007. However, it has not been implemented at towers where visual attention and scanning are key factors in preventing runway incursions. The managers at all four facilities we visited expressed an interest in having this training for controllers at their locations.

**Improving Team Performance:** Crew Resource Management (CRM) training focuses on teamwork in the tower with an emphasis on operations. Therefore, it has the potential to reduce runway incursions through improved team performance. This initiative was originally included in FAA's 2000 National Plan for Runway Safety, yet only three facilities have completed this training through FY 2006.

At Philadelphia, which is one of the three air traffic control towers to complete this training nationwide, CRM training was used as a tool to reduce runway incursions. The CRM training at Philadelphia was site-specific and geared toward open discussions that would improve teamwork, improve individual performance, and manage operational errors. According to managers at Philadelphia, CRM was extremely effective at improving overall team performance and a contributing factor in reducing controller errors.

FAA needs to keep this valuable training on target. During the first 5 months of FY 2007, three additional tower facilities have completed CRM training (Chicago, Boston, and Miami); FAA plans to complete CRM at one additional tower (Los Angeles) before the end of the year. However, FAA officials could not provide us with implementation milestones for FY 2008 and beyond.

**Improving Facility Performance:** Tower simulators have the potential to improve overall facility performance by reducing runway incursions through enhanced initial and proficiency training. They provide controllers with a virtual replica of the tower environment, which can be used to train controllers using real-life scenarios such as day-versus-night operations, varying weather conditions, different runway configurations, or emergency situations (see figure 8). Simulators are currently being tested at Miami, Ontario, Phoenix Sky Harbor, and Chicago O'Hare and have been used by other facilities to mitigate safety risks of proposed and existing operations and to improve runway safety.

## Findings

For example, Boston Logan used a tower simulator to aid in establishing necessary safety procedures in conjunction with the use of a newly constructed runway. Likewise, the National Aeronautics and Space Administration used a tower simulator to study several alternatives for improving runway safety at Los Angeles International Airport and to evaluate the effectiveness of adding a center-field taxiway between its parallel runways.

**Figure 8. Picture of a Tower Cab Simulator**



Source: FAA

Utilizing a tower simulator has also been identified as an effective tool for training new controllers and providing proficiency training for experienced controllers. In doing so, simulator training can aid in reducing the risk of runway incursions that occur while training new controllers (such as the March 21, 2006, incursion at Chicago O'Hare) and those caused by more experienced controllers.

For example, at Philadelphia, we found that 70 percent (14 of the 20) runway incursions caused by controllers over a 4-year period occurred during periods when an infrequently used runway configuration was in use. We found that this particular configuration was used only 30 percent of the time at Philadelphia. Therefore, it was difficult for controllers to maintain their proficiency on that particular configuration. According to Air Traffic officials, proficiency training using a simulator has a high potential for eliminating such errors.

The need for tower simulators for controller training was originally identified in FAA's 2000 National Plan for Runway Safety; yet, over 6 years later, only four towers have simulators installed. While FAA is still in the testing phase of this initiative, it must stay on track and implement simulators in a timely manner. This is especially important in light of the fact that FAA will be hiring over 11,800 new controllers (many of which will be for tower facilities) to replace those expected to leave over the next 10 years.

## Findings

Another tool with a high potential for improving facility performance is safety risk analysis, which is required for any changes to the National Airspace System. Safety risk analyses are used to identify all hazards associated with a specific operation or change in operation so that all associated safety risks can be mitigated to an acceptable level prior to implementing a change.

At Boston Logan, safety risk analysis was used to develop procedures to prevent runway incursions during use of an existing non-standard departure operation after two runway incursions occurred during this operation on June 9 and October 4, 2005 (rated as Category A and C runway incursions, respectively). The operation involved aircraft departing on a runway that was not normally used for departures.<sup>7</sup>

As a result of those incidents, the use of this non-standard operation was discontinued in December 2005. The facility conducted a safety risk assessment analysis of the operation and found that the operation could resume if certain precautionary procedures were instituted. After these procedures were instituted, the operation resumed in July 2006; since then, there have been no additional runway incursions involving the use of this runway operation at Boston.

In our opinion, the use of a safety risk analysis at airports where potential runway safety risks exist could improve facility performance by ensuring that appropriate control mechanisms are in place to reduce the risk of runway incursions. FAA should require the use of safety risk analyses to evaluate existing operational procedures when potential runway safety risks exist and train appropriate personnel in conducting such analyses.

### *Greater Authority and Accountability Is Needed at the National Level To Ensure That Runway Safety Remains a Priority for All Lines of Business*

We found that several national initiatives (some established as early as 2000) that could promote runway safety have subsequently waned as the number of incidents declined and FAA met its goals for reducing runway incursions. At the national level, FAA's Runway Safety Office is responsible for overseeing FAA's runway safety program. The original purpose of establishing this office was to have one central office responsible for overseeing actions taken by all of the lines of business involved in runway safety. However, we found that the Runway Safety Office has been in a state of flux since 2003.

For example, from 2003 to 2006, the office incurred a 50-percent reduction in staff (from 18 to 9 staff members), including the elimination of branch offices. The

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<sup>7</sup> The runway configuration was not normally used at Boston, but pilots on international flights sometimes requested it if weather permitted because the runway heading provided more direct routing for trans-Atlantic departures.

## **Findings**

office has not had a permanent Director for over 2 years and has been re-organized and realigned twice since the establishment of the Air Traffic Organization.

We found that several efforts previously performed by the Runway Safety Office are no longer accomplished. For instance, the Runway Safety Office no longer prepares an annual report detailing runway incursion trends and ongoing initiatives, conducts periodic program evaluations of regional runway safety efforts, or prepares a National Plan for Runway Safety.

FAA's National Plan for Runway Safety, a proactive, Agency-wide effort, was last prepared in 2002. The plan defined FAA's strategy and prioritized its efforts to reduce runway incursions from 2002 through 2004. The plan included specific activities and objectives that FAA was to undertake to improve runway safety, included the organization responsible for completing specific tasks, and required that milestones be established for completion of the tasks.

FAA believed that the National Plan for Runway Safety would be the key for improving program accountability by ensuring that initiatives were completed in a timely manner. FAA assigned responsibility to the Runway Safety Office for providing quarterly briefings to the Administrator on the status of activities included in the National Plan for Runway Safety. However, during this review, we found that a National Plan for Runway Safety is no longer prepared and quarterly meetings are no longer conducted.

FAA officials indicated that the National Plan for Runway Safety was replaced by the FAA Flight Plan and that each line of business is responsible for including runway incursion initiatives in its own annual business plan. However, we found that the individual business plans do not provide the same level of detail as the National Plan for Runway Safety.

For example, the 2002-2004 National Plan for Runway Safety included 11 initiatives assigned to FAA's Flight Standards Office to help reduce pilot deviations. However, the FY 2005 through FY 2007 business plans for Aviation Safety (the line of business that includes Flight Standards) did not include any initiatives specific to runway incursions. This was despite the fact that runway incursions caused by pilot deviations continue to account for over 50 percent of all runway incursions and were at their highest levels in FY 2006 since FY 2002.

FAA does not require each line of business to include goals in its business plan specific to its oversight responsibility (e.g., Aviation Safety for reducing runway incursions caused by pilots or Air Traffic for reducing runway incursions caused by controllers) and does not hold each organization accountable for reducing runway incursions in its area of responsibility. While FAA experienced success in meeting its FY 2006 overall goal of no more than 34 serious runway incursions,

## **Findings**

pilot deviations (the responsibility of the Aviation Safety line of business) experienced a 100-percent increase, rising from 9 in FY 2005 to 18 in FY 2006.

We found that only one line of business (Airports) included goals specific to its direct oversight responsibilities (reducing vehicle/pedestrian deviations) in its annual business plan. In our opinion, to improve accountability, FAA should require each line of business to establish quantitative runway incursion goals specific to its oversight responsibility. In addition, FAA should designate the Runway Safety Office as the authority to review and approve all runway safety initiatives included in each annual business plan submitted by the lines of business.

## **RECOMMENDATIONS**

We recommend that FAA:

1. Establish initiatives to promote increased voluntary pilot participation in RIIEP and ensure that the data collected are analyzed to identify and mitigate runway incursion causal factors.
2. Work with the pilot and airline communities to establish a process whereby Regional Runway Safety Program Managers can request site-specific, redacted ASAP information on runway incursions and surface incidents to aid in identifying trends, root causes, and possible local solutions.
3. Develop an automated means to share local best practices that were successful in reducing runway incursions. One such mechanism would be establishing an intranet site through the Regional Runway Safety Offices.
4. Establish milestones for implementing JANUS, NATPRO, and CRM training and tower simulator training technologies at air traffic control towers that have a history of a high number of runway incursions caused by controller operational errors.
5. Require the use of safety risk analyses to evaluate existing operational procedures at airports where potential runway safety risks have been identified and train appropriate personnel in conducting such analyses.
6. Require each line of business to include quantitative goals in its annual business plans for reducing runway incursion risks that are specific to its oversight responsibilities and designate the Runway Safety Office as the authority to review and approve all runway safety initiatives submitted by all lines of business.

## **AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE**

We provided FAA with a draft copy of this report on April 6, 2007, for comment. On April 30, 2007, FAA gave us its formal response (see appendix). While FAA management officials verbally agreed with our recommendations when we briefed them on our audit findings and recommendations, FAA's formal response does not explicitly state whether it concurs or non-concurs. In addition, the actions proposed by FAA were unspecific as to how or when the Agency would address the intent of our recommendations. Accordingly, we consider all six recommendations unresolved. FAA's comments, our response, and the specific information needed to resolve each recommendation are listed below.

**Recommendation 1:** Establish initiatives to promote increased voluntary pilot participation in RIIEP and ensure that the data collected are analyzed to identify and mitigate runway incursion causal factors.

**FAA's Response:** FAA states that it has established goals for RIIEP participation and that an airman involved in a runway incursion will be offered an opportunity to participate in the RIIEP program. It also states that additional aviation inspectors have been trained for administering the RIIEP questionnaire and that the information collected is being analyzed and reported to management.

**OIG's Response:** FAA's response does not address the intent of our recommendation—to establish initiatives to increase voluntary pilot participation in RIIEP and ensure that data collected are analyzed. Instead, FAA's response simply states the current program requirements and guidelines. FAA needs to elaborate on the specific initiatives it has established (or plans to establish) to encourage pilots to participate in the program. We are requesting that FAA clarify its position regarding this issue. We are also requesting that FAA provide us with a list of the management controls that it has established (or plans to establish) to ensure that data collected are being analyzed. Additionally, we are requesting that FAA provide us with target dates for completion.

**Recommendation 2:** Work with the pilot and airline communities to establish a process whereby Regional Runway Safety Program Managers can request site-specific, redacted ASAP information on runway incursions and surface incidents to aid in identifying trends, root causes, and possible local solutions.

**FAA's Response:** FAA states that it is expanding the data collected through the Voluntary Safety Information Sharing (VSIS) program with both the domestic and international aviation community. FAA states that this program allows

participants to share archived voluntary redacted safety data, including ASAP reports. FAA also states that the VSIS working group includes a representative from the Runway Safety Office.

**OIG's Response:** While FAA's plans to include ASAP reports in the VSIS program appear to meet part of our recommendation's intent (to use ASAP data in conjunction with efforts to reduce runway incursions), it is unclear how these data will be made available to Regional Runway Safety Program Managers to aid them in identifying trends, root causes, and possible local solutions. Therefore, we are requesting that FAA explain to us how VSIS information will be made available to Regional Runway Safety Program Managers. We are also requesting that FAA provide us with target dates for implementation of the VSIS expansion.

**Recommendation 3:** Develop an automated means to share local best practices that were successful in reducing runway incursions. One such mechanism would be establishing an intranet site through the Regional Runway Safety Offices.

**FAA's Response:** FAA states that it is in the process of consolidating all of its regional runway safety web pages into one main website. As part of this effort, FAA states that it plans to include an area for sharing best practices.

**OIG's Response:** FAA's proposed action meets the intent of our recommendation for sharing best practices. However, we are requesting that FAA provide us with a target date for completing this effort.

**Recommendation 4:** Establish milestones for implementing JANUS, NATPRO, and CRM training and tower simulator training technologies at air traffic control towers that have a history of a high number of runway incursions caused by controller operational errors.

**FAA's Response:** FAA states that it has identified 33 facilities for the initial phase of NATPRO training and will have a cadre of instructors for these facilities ready by the end of FY 2007. FAA also indicated that for CRM training, six additional facilities will be included in this training by the end of FY 2007 and a CRM course is being developed to support training on a larger scale. In addition, FAA stated that the Joint Resource Counsel has approved the initial investment for field tower simulators and that the first simulators could be deployed as early as January 2008. Finally, FAA states that target dates associated with these training programs will be included in future business plans

**OIG Response:** FAA's response is, for the most part, responsive to our recommendation's intent but does not provide sufficient details. First, FAA's

response does not address milestones for JANUS, and we are requesting that FAA clarify whether it intends to implement this training. Second, it is not clear whether the 33 facilities FAA has identified for NATPRO training include only towers or if terminal radar approach control facilities are also included in this number. Third, while the response addresses near-term milestones for NATPRO, CRM, and tower simulators, it does not provide milestones beyond FY 2007 or FY 2008. We recognize that outside factors (such as shifting Agency priorities or budget constraints) may affect FAA's ability to complete training according to a strict schedule; however, in our opinion, a long-term strategic approach should be taken to ensure that the training remains a priority and implementation delays are limited. We are requesting that FAA provide us with additional details on estimated long-term milestones for completing the implementation of these training programs.

**Recommendation 5:** Require the use of safety risk analyses to evaluate existing operational procedures at airports where potential runway safety risks have been identified and train appropriate personnel in conducting such analyses.

**FAA's Response:** In its response, FAA states that Safety Risk Management analyses have been used to address operational procedures where runway safety risk had been identified and that it will continue to use this process to address risk identified with operational procedures.

**OIG Response:** FAA's response does not address the intent of our recommendation—to require the use of safety risk analyses to evaluate existing operational procedures at airports where potential runway safety risks have been identified. FAA's response states that it will continue to use Safety Risk Management analysis to address risk identified with operational procedures; however, it is unclear whether FAA plans to *require* the use of safety risk analyses to evaluate existing operational procedures where potential runway safety risks exist, as we recommended. We are requesting that FAA clarify this issue and provide us with target dates for implementation.

**Recommendation 6:** Require each line of business to include quantitative goals in its annual business plans for reducing runway incursion risks that are specific to its oversight responsibilities and designate the Runway Safety Office as the authority to review and approve all runway safety initiatives submitted by all lines of business.

**FAA's Response:** FAA states that it includes quantitative goals on reducing runway incursions within the Agency's FY 2007-2011 Flight Plan, which contains FAA's corporate strategy and plan for reducing the risk of runway incursions. Each line of business develops an annual business plan with initiatives and goals

that support this strategy. Many of these initiatives require support from and collaboration with the other lines of business to be successful.

**OIG Response:** FAA's response does not address the intent our recommendation—to require each line of business to establish quantitative goals in its annual business plan for reducing runway incursion *that are specific to its area of responsibility*. FAA's response also does not address whether it will provide the Runway Safety Office with the authority to review and approve runway safety initiatives submitted by the lines of business. Instead, FAA's response only reiterates the current process, which does not hold individual lines of business accountable for reducing incidents specific to their oversight responsibility. FAA's response is unclear as to whether FAA intends to require each line of business to establish quantitative goals for its own area of responsibility. Accordingly, we are requesting that FAA clarify its response to this recommendation.

In accordance with Department of Transportation Order 8000.1C, please provide us with the information requested above within 30 calendar days. We will consider the recommendations open and unresolved until we receive the requested information.

## **EXHIBIT A. SCOPE AND METHODOLOGY**

This performance audit was conducted in accordance with generally accepted Government Auditing Standards prescribed by the Comptroller General of the United States and included such tests as we considered necessary to provide reasonable assurance of detecting abuse or illegal acts. We conducted this review between May 2006 and April 2007 using the following methodology.

We selected the initial three airports (at Boston, Chicago, and Philadelphia) for review because these three airports led the Nation in the number of runway incursions for large commercial airports during the 19-month period from October 1, 2004, through April 30, 2006. We added the fourth airport (Los Angeles) to our review in October 2006 after two serious runway incursions occurred in July and September 2006 and in response to concerns expressed by Senator Barbara Boxer to our office concerning those incidents.

To evaluate runway incursion trends at each of the four airports included in our review, we analyzed runway incursion data for the 4-year period from FY 2003 through FY 2006 using the national runway incursion database and individual investigation reports. We also obtained trend analysis information performed by Regional Runway Safety Program Managers and air traffic control facilities.

To evaluate the actions taken to reduce runway incursions at each airport, we:

- Interviewed FAA representatives from Air Traffic, Airport, and Flight Standards regional and local offices.
- Interviewed Airport Operators and Airline personnel (such as pilots, air traffic liaisons, safety officials, and maintenance representatives).
- Interviewed controller, pilot, and mechanic union representatives.
- Verified the status of recommended actions contained in Runway Safety Action Team, TIGER team, air traffic facility evaluations, or National Transportation Safety Board reports.
- Reviewed any additional actions taken or planned that were designed to reduce runway incursions.
- Observed air traffic operations and toured the airport movement area.
- Analyzed whether actions taken were effective at reducing runway incursions.

To assess actions taken or planned to address runway incursions at the national level, we:

- Interviewed FAA Headquarters representatives from Air Traffic, Airport, and Flight Standards offices.
- Reviewed FY 2005 through FY 2007 business plans for FAA's lines of business, i.e., Air Traffic Organization, Airports Division, and Aviation Safety (we also reviewed business plans from Flight Standards for the same period).
- Reviewed FAA's National Plan for Runway Safety, dated October 2000 and July 2002.
- Reviewed FAA's Runway Safety Report, dated August 2005.

We also evaluated changes made to the structure and operation of the Runway Safety Office since FY 2001, including staffing and budget changes.

To determine the accuracy and completeness of the national runway incursion database, we judgmentally sampled runway incursion investigation reports for pilot deviations, operational errors, and vehicle/pedestrian deviations and compared these reports to the runway incursions listed on the national runway incursion database.

## **EXHIBIT B. ORGANIZATIONS VISITED OR CONTACTED**

### **Federal Aviation Administration**

- FAA Headquarters, Washington DC
- Philadelphia Air Traffic Control Tower, Philadelphia, PA
- Boston Logan Air Traffic Control Tower, Boston, MA
- Chicago O'Hare Air Traffic Control Tower, Chicago, IL
- Los Angeles Air Traffic Control Tower, Los Angeles, CA
- Eastern Region Headquarters, Jamaica, NY
- New England Region Headquarters, Burlington, MA
- Great Lakes Region Headquarters, Des Plaines, IL
- Western-Pacific Region Headquarters, Lawndale, CA
- Central Terminal Service Area, Fort Worth, TX
- Eastern Terminal Service Area, Jamaica, NY
- Los Angeles Flight Standards District Office, El Segundo, CA
- Boston Flight Standards District Office, Lexington, MA
- Philadelphia Flight Standards District Office, Philadelphia, PA

### **Airport Operators**

- City of Philadelphia, Philadelphia International Airport
- Massachusetts Port Authority, Boston Logan International Airport
- Department of Aviation, Chicago O'Hare International Airport
- Los Angeles World Airports, Los Angeles International Airport

### **Airlines, Industry Associations, and Other Federal Agencies**

- |                 |  |
|-----------------|--|
| • Air Wisconsin | • Air Line Pilots Association                  |
| • American      | • National Air Traffic Controllers Association |
| • Cape Air      | • Aircraft Mechanics Fraternal Association     |
| • JetBlue       | • National Transportation Safety Board         |
| • Piedmont      |  |
| • Skywest       |  |
| • Southwest     |  |
| • United        |  |
| • US Airways    |  |

## **EXHIBIT C. PRIOR OIG REPORTS**

Since 1998, we have issued four audit reports on FAA's efforts to reduce runway incursions.

- OIG Report Number AV-1998-075, "Runway Incursion Program," February 9, 1998.
- OIG Report Number AV-1999-114, "Follow-Up Review of FAA's Runway Safety Program," July 21, 1999.
- OIG Report Number AV-2001-066, "Despite Significant Management Focus, Further Actions Are Needed To Reduce Runway Incursions," June 26, 2001.
- OIG Report Number AV-2003-040, "Report on Operational Errors and Runway Incursions: Progress Made, but the Number of Incidents Is Still High and Presents Serious Safety Risks," April 3, 2003.

FAA actions taken as a result of the two most recent audit reports are described below.

In April 2003, we reported that FAA had made progress in reducing runway incursions during FY 2002 due in part to a reduction in air traffic operations but also because of site-specific improvements at airports. Despite this progress, further actions were still needed. We recommended that FAA (1) implement recommendations in its Runway Incursion Airport Assessment Report published in January 2003 and (2) conduct reviews at 4 airports that had 10 or more runway incursions over a 4-year period to determine whether technological solutions were needed. FAA has completed actions to implement these recommendations.

In our April 2003 report, we also emphasized the need for FAA to complete actions on recommendations made in our June 2001 report. At that time, FAA had not taken actions on our recommendations to (1) advance low-cost technologies to high-risk airports, (2) expedite technologies (such as in-cockpit surface moving map displays) to aid pilots, and (3) improve program accountability.

FAA subsequently completed its evaluation of three low-cost technologies and found one (the Final Approach Runway Occupancy Signal)<sup>8</sup> to be viable. An operational evaluation of this technology is being conducted and is expected to be completed this year. FAA has not taken actions concerning in-cockpit surface moving maps because the full use of this equipment, according to FAA, depends

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<sup>8</sup> Final Approach Runway Occupancy Signal provides a visual alert to pilots on approach that it is unsafe to land due to an aircraft or vehicle occupying a critical position on the runway.

upon implementation of other new technology, such as the Automatic Dependent Surveillance-Broadcast Program.<sup>9</sup>

Finally, FAA took actions to improve program accountability by implementing a National Plan in 2002 that required each line of business to establish initiatives and milestones addressing runway safety and by providing the Administrator with quarterly status briefings on these initiatives. As we discuss further in this report, however, we found that some of the Agency-wide emphasis on reducing runway incursions has subsided as the number and severity of incidents declined.

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<sup>9</sup> Automatic Dependent Surveillance-Broadcast will provide pilots with a moving map display that shows where other aircraft are located on the runways and taxiways.

**EXHIBIT D. MAJOR CONTRIBUTORS TO THIS REPORT****THE FOLLOWING INDIVIDUALS CONTRIBUTED TO THIS REPORT.**

<b><u>Name</u></b>	<b><u>Title</u></b>
Daniel Raville	Program Director
Mary (Liz) Hanson	Project Manager
Annie Glenn Bungo	Senior Analyst
Kimberly Leading	Senior Auditor
Mark Gonzales	Analyst
Kevin Montgomery	Analyst
Andrea Nossaman	Writer-Editor

## APPENDIX. AGENCY COMMENTS



# Federal Aviation Administration

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## Memorandum

Date: April 30 2007

To: Robin Hunt, Acting Assistant Inspector General for Aviation and Special Program Audits

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

Prepared by: Anthony Williams, x79000

Subject: "Draft Report: Progress Has Been Made in Reducing Runway Incursions, but Recent Incidents Underscore the Need for Further Proactive Efforts"

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As requested in your memorandum dated April 6, I have reviewed the subject draft report. Attached is FAA's position to the six recommendations contained in the report.

Thank you for allowing the FAA the opportunity to review the report and provide the specific action taken or planned for each recommendation. If you have any questions, please contact Anthony Williams, Budget Policy Division, at (202 267-9000).

Attachment

**Federal Aviation Administration's (FAA) Response to the  
Office of Inspector General's (OIG) Draft Report on  
Progress Has Been Made in Reducing Runway Incursions,  
But Recent Incidents Underscore The Need For  
Further Proactive Efforts**

**Recommendation 1:**

Establish initiatives to promote increased voluntary pilot participation in RIIEP and ensure that the data collected are analyzed to identify and mitigate runway incursion causal factors.

**Response:**

The FAA has established goals for RIIEP participation. An airman involved in a runway incursion will be offered an opportunity to participate in the RIIEP program. Additional aviation inspectors have been trained for administering the RIIEP questionnaire and addressing the pilot's questions about the program. The information collected is being analyzed and reported to management.

**Recommendation 2:**

Work with the pilot and airline communities to establish a process whereby Regional Runway Safety Program Managers can request site-specific, redacted ASAP information on runway incursions and surface incidents to aid in identifying trends, root causes, and possible local solutions.

**Response:**

The FAA is currently participating in the process of expanding the data collected through the Voluntary Safety Information Sharing (VSIS) program with both the domestic and international aviation community. This archive of voluntary aviation safety data allows participants to share redacted data. The airline Aviation Safety Action Plan (ASAP) reports will be one of the data sources being shared through this program. The FAA and aviation industry participate in the VSIS working group which includes a representative from the Runway Safety Office.

**Recommendation 3:**

Develop an automated means to share local best practices that were successful in reducing runway incursions. One such mechanism would be establishing an intranet site through the Regional Runway Safety Offices.

**Response:**

The FAA is in the process of updating the Runway Safety webpage by consolidating the regional pages into areas within the main website. By reducing the duplication of multiple websites, the relevant information becomes easily discernable. The updated website will contain an area for sharing best practices.

**Recommendation 4:**

Establish milestones for implementing JANUS, NATPRO, CRM training, and tower simulator training technologies at air traffic control towers that have a history of a high number of runway incursions caused by controller operational errors.

**Response:**

The FAA has identified 33 facilities for the initial phase of NATPRO training. The goal is to have the cadre of trainers for these facilities trained by the end of FY 2007. The FAA has recently completed CRM training at three facilities with six additional facilities identified for training by the end of FY 2007. A CRM Cadre course is being developed to support training on a larger scale. The JRC has approved the initial investment for the deployment and initial operation of field tower simulators. The first simulators could be deployed as early as January 2008. Initiative targets associated with these training programs will be included within future business plans.

**Recommendation 5:**

Require the use of safety risk analyses to evaluate existing operational procedures at airports where potential runway safety risks have been identified and train appropriate personnel in conducting such analyses.

**Response:**

The FAA is currently providing training to air traffic control facilities on the application of Safety Risk Management (SRM) as part of the Safety Management System (SMS). This process has been used to address operational procedures where runway safety risk had been identified. The agency will continue to use this process to address risk identified with operational procedures. We suggest the recommendation be clarified to read as follows:

“Require the use of safety risk management analyses to evaluate existing air traffic control operational procedures at airports where potential runway safety risks have been identified, and train appropriate personnel in conducting such analyses.”

**Recommendation 6:**

Require each line of business to include quantitative goals in their annual business plans for reducing runway incursion risks that are specific to their oversight responsibilities and designate the Runway Safety Office the authority to review and approve all runway safety initiatives submitted by all lines of business.

**Response:**

The FAA includes quantitative goals on reducing runway incursions within the agencies FY 2007-2011 Flight Plan. The Flight Plan contains the FAA’s corporate strategy and plan for reducing the risk of runway incursions. Each line of business develops an annual business plan with initiatives and goals that support this strategy. Many of these initiatives require support from and collaboration with the other lines of business to be successful.

The following pages contain textual versions of the graphs and charts found in this document. These pages were not in the original document but have been added here to accommodate assistive technology.

**Progress Has Been Made in Reducing Runway Incursions, but Recent Incidents Underscore the Need for Further Proactive Efforts**

**Section 508 Compliant Presentation**

**Figure 1. Runway Incursions Fiscal Year 1999 to Fiscal Year 2006**

- In fiscal year 1999, there were 329 runway incursions.
- In fiscal year 2000, there were 405 runway incursions.
- In fiscal year 2001, there were 407 runway incursions.
- In fiscal year 2002, there were 339 runway incursions.
- In fiscal year 2003, there were 323 runway incursions.
- In fiscal year 2004, there were 326 runway incursions.
- In fiscal year 2005, there were 327 runway incursions.
- In fiscal year 2006, there were 330 runway incursions.

Source: Federal Aviation Administration

**Figure 2. Example of Improved Airfield Lighting: Picture of an Elevated Runway Guard Light at Boston Logan**

Photograph shows guard light elevated from the runway.

Source: OIG

**Figure 3. Picture of Enhanced Runway Markings at Boston Logan**

Photograph shows new runway markings painted on the runway surface.

Source: OIG

**Figure 4. Picture of Taxiway at Chicago O'Hare Closed Because of Repeated Incidents at That Intersection**

Photograph shows blocking devices placed to demarcate the closed taxiway.

Source: OIG

### **Figure 5. Runway Construction at Los Angeles International**

Photograph of runway area and construction diagram show plans to complete the center-field taxi runway.

Source: Los Angeles Airport Authority

### **Figure 6. History of Pilot Deviation Runway Incursions Fiscal Year 2001 to Fiscal Year 2006**

- In fiscal year 2001, there were 233 pilot deviation runway incursions. Thirty-two of these were rated as Category A or B incidents.
- In fiscal year 2002, there were 191 pilot deviation runway incursions. Twenty of these were rated as Category A or B incidents.
- In fiscal year 2003, there were 174 pilot deviation runway incursions. Fourteen of these were rated as Category A or B incidents.
- In fiscal year 2004, there were 173 pilot deviation runway incursions. Fourteen of these were rated as Category A or B incidents.
- In fiscal year 2005, there were 169 pilot deviation runway incursions. Nine of these were rated as Category A or B incidents.
- In fiscal year 2006, there were 190 pilot deviation runway incursions. Eighteen of these were rated as Category A or B incidents.

Source: FAA data

### **Figure 7. Picture of Ground Signage at Chicago O'Hare Instructing General Aviation Pilots To Hold and Contact Ground Control Before Proceeding**

Photograph shows a large sign on the ground near runway. The sign message is, "HOLD HERE CONTACT GROUND."

Source: OIG

### **Figure 8. Picture of a Tower Cab Simulator**

Photograph shows the screens and other equipment used for tower cab simulation.

Source: FAA