

**ACTIONS TAKEN AND NEEDED TO IMPROVE  
FAA'S RUNWAY SAFETY AREA PROGRAM**

*Federal Aviation Administration*

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

# Memorandum

Subject: **ACTION:** Actions Taken and Needed To  
Improve FAA's Runway Safety Area Program  
Federal Aviation Administration  
Report Number AV-2009-039

Date: March 3, 2009

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

Reply to  
Attn. of: JA-10

To: Acting Federal Aviation Administrator

This report presents the results of our audit of the Federal Aviation Administration's (FAA) Runway Safety Area (RSA) program. An RSA is a rectangular space around a runway that provides critical safety margins for landing and departing aircraft, thereby helping to minimize the risk to aircraft and passengers from flights that undershoot, overrun, or veer off a runway.

Over the last 10 years, 75 aircraft have overrun or veered off the Nation's runways, resulting in nearly 200 injuries and 12 fatalities. In February 2005, 14 people were injured after an aircraft overran a runway at Teterboro Airport in New Jersey. Ten months later, another aircraft skidded off a runway while landing in icy conditions at Chicago's Midway Airport. The aircraft finally stopped in a public street—killing 1 person and injuring 4 persons in a car and another 18 on board the aircraft. In November 2005, Congress, in consultation with FAA, mandated that all Part 139 airport<sup>1</sup> sponsors enhance passenger safety by improving their RSAs by 2015 and that FAA report annually on its progress toward improving RSAs.

Our audit objectives were to (1) assess airport sponsors' and FAA's progress and challenges, if any, in fulfilling the congressional RSA mandate and (2) evaluate the effectiveness of FAA's process for identifying, prioritizing, and funding needed RSA improvements. We conducted the audit from November 2007 through November 2008 in accordance with generally accepted Government

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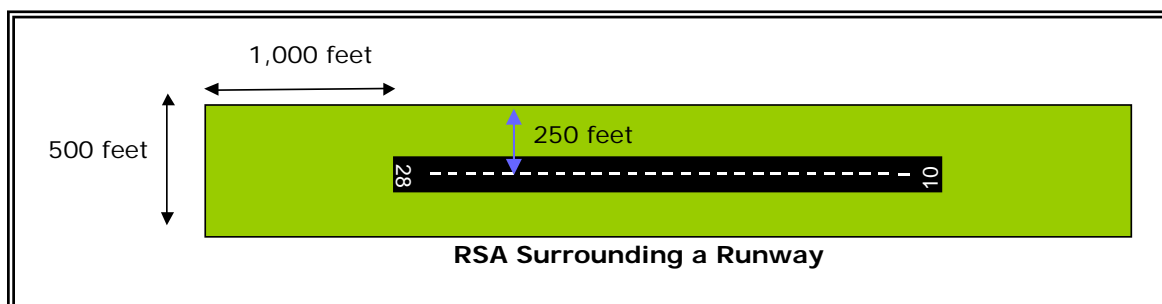
<sup>1</sup> "Part 139" airports conduct commercial passenger flight operations and must comply with standards contained in 14 CFR § 139 (2005).

Auditing Standards prescribed by the Comptroller General of the United States. Exhibit A details our audit scope and methodology, and exhibit B lists the sites visited or contacted.

## BACKGROUND

To reduce the risks associated with aircraft undershooting, overrunning, or veering off runways, in 1988, FAA established the current standards for RSAs.<sup>2</sup> According to these standards, RSAs must be cleared, drained, and capable of supporting the weight of commercial aircraft. They must also meet dimensional requirements, typically 1,000 feet by 500 feet at each runway end and 250 feet from the runway centerline (see figure 1).

**Figure 1. RSA Dimensional Standards**



If an RSA cannot meet dimensional standards, FAA allows airport sponsors to improve RSAs through alternative means, such as declared distances (i.e., declaring the usable runway length to be less than the actual runway length) or an Engineered Material Arresting System (EMAS).<sup>3</sup> Moreover, if improving an RSA costs more than an equivalent EMAS installation,<sup>4</sup> FAA may declare the RSA impracticable to improve. In such cases, FAA works with the airport sponsor to improve the RSA as much as possible (e.g., installing a partial EMAS). However, in about 2 percent of cases, improvements are so expensive that FAA does not require any further action.

In addition, RSAs must be free of objects, such as approach lighting systems (ALS), instrument landing systems (ILS), and other navigational aids (NAVAIDs), unless these objects need to be in the RSA to operate properly. If objects cannot be removed from the RSA, they must be frangible (i.e., designed to break away when hit by a plane) at a height of 3 inches or less from the ground.

<sup>2</sup> 14 CFR I39.309 "Safety Areas."

<sup>3</sup> An EMAS is comprised of porous concrete that can absorb the weight of an aircraft, allowing it to slow or stop. According to FAA, a 600-foot EMAS is equivalent to a 1,000-foot RSA.

<sup>4</sup> According to FAA, the maximum improvement costs range between \$7 million and \$33 million depending on aircraft size and local construction costs.

After a fatal 1999 crash at Little Rock Airport in Arkansas, in which an aircraft overran the runway while attempting to land in bad weather, FAA established the RSA Program to identify and address RSAs needing improvement. The program allowed those improvements to begin at any time, rather than wait until a major runway project was initiated. At that time, FAA identified a universe of 1,024 RSAs needing improvement at commercial service airports and designated 317 of these as priorities because they posed the greatest risk to passengers during an overrun accident. The number of priority RSAs increased to 454 by 2008 due to new technology and policy changes. FAA also developed a schedule to upgrade these priority RSAs by the 2015 congressional deadline. Despite this effort, after an overrun at Burbank Airport in California, the National Transportation Safety Board (NTSB) recommended in 2003 that FAA require *all* Part 139 airports to upgrade RSAs that could, with feasible improvement, be made to meet standards.

FAA and airport sponsor efforts to improve RSAs have resulted in tangible aviation safety enhancements across the Nation. For example, RSA improvements helped prevent significant damage and injuries during a June 2007 runway overrun at Santa Barbara Municipal Airport in California. In addition, EMAS have proved effective in stopping aircraft during several overrun incidents since 1999, including three at John F. Kennedy International and one at Chicago O'Hare International.

## RESULTS IN BRIEF

Overall, we found that FAA and airport sponsors have made significant progress since 2000—with the Agency reporting that 327 of 454 priority RSAs (more than 70 percent) have been improved. Nevertheless, challenges still remain in bringing the remaining RSAs up to standards, especially at 11 of the 30 largest airports.<sup>5</sup> These 11 airports handle over one-fourth of the Nation's passenger traffic and face major man-made, natural, environmental, and legal challenges that may prevent them from achieving needed RSA improvements by the 2015 congressional deadline.

We also found that FAA was generally effective in identifying, prioritizing, and funding needed RSA improvements, with two major exceptions: NAVAIDs and data quality. Specifically, non-compliant NAVAIDs, some of which pose significant safety risks, remained in over 40 percent (67 of 163) of the RSAs we reviewed. Moreover, inaccurate, incomplete, or outdated data have hampered FAA's ability to track and report on RSA improvements. In particular, FAA's annual report to Congress, which was based on these data, was too general and did not provide sufficient detail for decision makers. The report also overstated the

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<sup>5</sup> FAA defines large hub airports as those airports that each account for at least 1 percent of all U.S. passenger enplanements.

number of RSAs meeting full standards, especially those RSAs containing non-compliant NAVAIDs.

Until these challenges and problems are addressed, aircraft will remain vulnerable to damage and, more importantly, their passengers remain at risk of potential injury from flights that undershoot, overrun, or veer off a runway lacking a standard RSA.

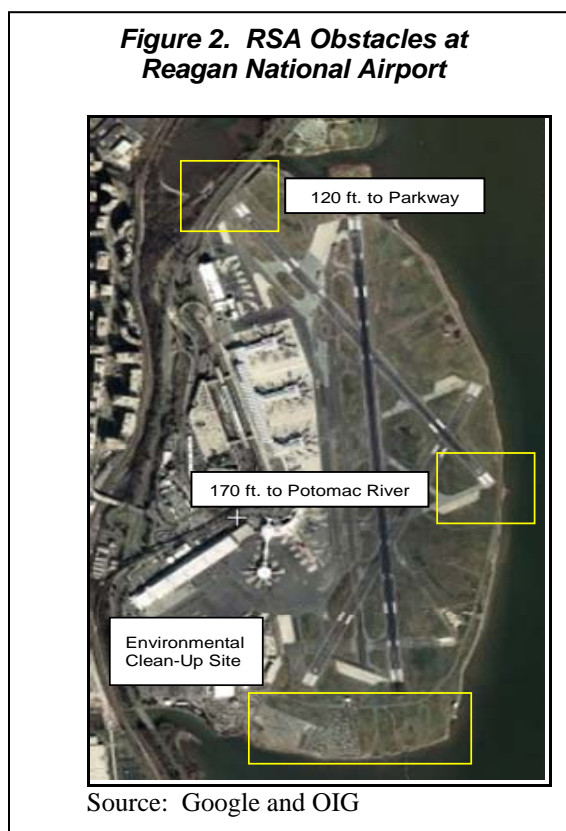
### **RSAs at 11 of the Nation's 30 Largest Airports Face Major Challenges in Achieving Needed Improvements**

Man-made, natural, environmental, and legal challenges have delayed efforts to make needed RSA improvements at 11 of the Nation's largest airports (see exhibit C for a list of these airports and existing constraints). While FAA provides guidance, funding, and oversight for RSA improvements, the airport sponsor has substantial discretion in determining what actions to take and when to take them.

For example, RSA improvements at Reagan National Airport in Washington D.C. (see figure 2) are hindered by the George Washington Parkway, the Potomac River, and an environmental clean-up site.

The airport sponsor has conducted multiple studies over 26 years on how to bring this airport's three RSAs up to standards and has considered options such as installing a partial EMAS, repositioning one or more runways, reducing the operational runway length, and extending one runway into the Potomac River. Although FAA supports the use of EMAS, the airport sponsor has been reluctant to select this option due to concerns about the impact of periodic flooding on this system. Overall, FAA estimates RSA improvements at Reagan National could cost upwards of \$109 million.

Although FAA is working with airport sponsors to bring RSAs up to standards, the Agency needs to expedite ongoing efforts to achieve needed improvements. As the table below illustrates, there have been at least four serious accidents involving



overruns since 1999. In each case, RSA improvements were made *after* the accidents—improvements that could have prevented 80 injuries and 1 fatality had they been completed sooner. As these examples demonstrate, critical RSA improvements need to be made at the 11 large airports sooner rather than later to lower the risk of passenger injuries and aircraft damage in the event of runway accidents.

<b>Airport</b>	<b>Date</b>	<b>Impact</b>
Little Rock National	6/99	105 injuries and 11 fatalities
Bob Hope Burbank Airport	3/00	44 injuries
Teterboro Airport	2/05	14 injuries
Midway International	12/05	22 injuries and 1 fatality

Source: NTSB

### **RSAs Contain NAVAIDs That Pose Safety Risks to Aircraft and Passengers**

Although FAA has made progress addressing non-compliant NAVAIDs, 67 of 163 RSAs we reviewed still had NAVAIDs that needed to be relocated or modified. To comply with FAA standards, NAVAIDs need to be either relocated outside the RSA or made frangible (i.e., breakable) at 3 inches or less above the ground. Non-compliant NAVAIDs can contribute to increased aircraft damage and potential loss of life. For example, in 1975, an aircraft collided with a non-frangible ALS at John F. Kennedy International Airport. As a result, 113 passengers died, and the aircraft was substantially damaged. More recently, in 2007, an aircraft overran the runway at Dekalb-Peachtree Airport, striking a NAVAID. While there were no fatalities or injuries, there was significant damage to the aircraft's wing (see figure 3 on page 6).

Non-compliant NAVAIDs remain in RSAs for various reasons, including (1) insufficient coordination between FAA's Office of Airports and its Air Traffic Organization (ATO)<sup>6</sup> (2) lack of guidance on the use of new frangible bolts for NAVAIDs; (3) inadequate planning regarding NAVAID relocation or modification; and (4) Airport Improvement Program (AIP) funding restrictions. Combined, these factors have resulted in an inconsistent, disjointed process in which some NAVAIDs are corrected, some partially corrected, and some not addressed at all. To reduce the safety risks posed to passengers by non-compliant NAVAIDs, FAA needs to develop and implement a program for relocating or modifying NAVAIDs in RSAs, which should include improved coordination, greater use of new frangible bolts, and a funding plan for targeting those NAVAIDs posing the greatest safety risk.

<sup>6</sup> The Office of Airports oversees compliance with the RSA standards, and the ATO manages Agency NAVAIDs in RSAs.

**Figure 3. Aircraft Damage from Hitting NAVAID at Dekalb-Peachtree Airport**



Source: FAA

### **Incorrect, Incomplete, or Outdated Data Limit FAA's Ability To Oversee and Accurately Report RSA Improvements**

We found errors in the Office of Airports RSA Inventory (i.e., database), including incorrect, missing, or outdated data. Of the 163 RSAs we reviewed, 64 (38 percent) had at least 1 data error (see figure 4 for examples). These errors affect FAA's ability not only to oversee the RSA program but also to provide accurate and comprehensive reports to Congress on the status of RSA improvements and future funding requirements.

Such inaccuracies in the RSA Inventory occur because the Office of Airports (1) does not have sufficient guidance and training on how to properly identify, track, and report on needed RSA improvements;

**Figure 4. Data Errors in FAA's RSA Inventory**

- RSA Inventory states that an RSA at Baltimore Washington International Airport meets standards even though it is less than the required 250 feet on 1 side of the runway.
- RSA Inventory states that an RSA at Dulles International Airport meets standards, even though an ILS needs to be relocated.
- RSA Inventory states that \$39 million was needed for a major runway and RSA project at Los Angeles International Airport when it had been completed 1 year earlier.

(2) focuses on maintaining RSA dimensional data versus information on NAVAIDs; and (3) uses inadequate data verification and validation.

For example, there is no standard form to document determinations<sup>7</sup> to ensure all data elements are captured and consistently identified. As a result, every FAA region uses varying forms and terminology to complete determination paperwork. FAA regions also manually upload their determination data into the national RSA Inventory, with no data verification conducted by either the regions or the Office of Airports. Thus, the information in the determinations and the RSA Inventory is often inconsistent or contradictory. In addition, some of the 327 RSAs reported as “improved” may still need to be addressed. Also, as a result of inaccurate data, FAA’s annual report to Congress overstates the extent to which RSAs fully meet standards, especially those RSAs containing non-compliant NAVAIDs.

Our recommendations to FAA focus on (1) developing an action plan for improving RSAs at 11 large airports to the fullest extent practical; (2) developing and implementing an effective program for addressing NAVAIDs located in RSAs to ensure their timely removal or modification; (3) issuing detailed guidance and conducting training for those responsible for identifying, tracking, and reporting on the status of RSAs; (4) implementing quality control procedures to ensure the accuracy and integrity of RSA data; and (5) expanding the annual report to Congress to better reflect the true status of RSA improvement activities. Our complete recommendations are listed on page 18.

## **FINDINGS**

Overall, we found that FAA and airport sponsors have made significant progress since 2000—with the Agency reporting that 327 of 454 RSAs (more than 70 percent) have been improved. Nevertheless, various challenges still remain in bringing the remaining RSAs up to standards, including 11 of the 30 largest airports. Given the large number of passengers these airports serve, it is critical that FAA and airport sponsors expedite ongoing efforts to achieve needed improvements.

We also found that FAA was generally effective in identifying, prioritizing, and funding needed RSA improvements. For example, FAA has awarded \$1.2 billion in AIP grants for RSA improvements.<sup>8</sup> Nevertheless, FAA needs to make improvements in two significant areas—NAVAIDs and data quality. Specifically,

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<sup>7</sup> Determinations are used by FAA field staff to identify and document the status of the RSA and what improvements are needed. Determinations include such details as RSA dimensions, grading, slope, and whether NAVAIDs are located within the RSA boundaries.

<sup>8</sup> The AIP, which is administered by FAA’s Office of Airports, supports the Nation’s airport system by providing funds to enhance safety and security, maintain the infrastructure, increase capacity, and mitigate airport noise in surrounding communities. In 2007, the program awarded grants worth more than \$3.3 billion to airport sponsors.



over 40 percent of the RSAs we examined contain NAVAIDs that need to be relocated or made frangible. Although FAA has moved or modified some NAVAIDs over the last 3 years, many still remain unaddressed—including some that pose significant safety risks to aircraft and their passengers. Moreover, inaccurate, incomplete, or outdated data have hampered FAA's ability to track and report on RSA improvements. Until such data problems are corrected, it will be difficult for FAA to ensure needed improvements are made by the congressional deadline of 2015. We also found that FAA's annual report to Congress, which was based on these data, was too general and did not provide sufficient detail for congressional decision makers.

### **FAA Needs To Expedite RSA Improvements at 11 Large Airports Facing Significant Challenges in Meeting Standards**

We identified 11 large airports<sup>9</sup> that face significant challenges to bringing their RSAs up to standards, including man-made, natural, and other constraints. These challenges, in turn, have significantly delayed efforts to improve RSAs at airports such as Reagan National and San Francisco International—in the former case for more than 26 years. The challenges also raise questions as to whether the RSAs at some of the 11 airports will ever be improved. Yet, as incidents at Burbank, Midway, and Teterboro airports have demonstrated, only after serious accidents were the resources marshalled and decisions made to achieve needed improvements—improvements that could have prevented injuries and saved lives if done earlier. While FAA and airport sponsors are working to overcome the challenges facing the 11 large airports, it is critical that these efforts be expedited to avoid a repeat of the past and ensure the safety of the flying public.

#### *Past Delays in Improving RSAs Have Resulted in Serious Consequences*

At Burbank, Midway, and Teterboro airports, delays in achieving needed RSA improvements have had significant repercussions during overrun accidents. For example, in 2000, FAA determined that an RSA at Chicago's Midway airport was impracticable to improve because it would require moving roads and result in significant and costly impacts on local neighborhoods. Four years later, the airport sponsor estimated that the project's property acquisition alone would involve moving hundreds of commercial and residential buildings and cost between \$200 million and \$300 million. The sponsor also considered installing an EMAS but concluded that too little space was available. Then in 2005, an aircraft overran the runway at Midway and finally stopped in a public street—killing 1 person and injuring 4 persons in a car and another 18 on board the plane. Two years after the

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<sup>9</sup> Baltimore-Washington, Boston-Logan, Charlotte-Douglas, Fort Lauderdale/Hollywood, John F. Kennedy, LaGuardia, Los Angeles International, Philadelphia International, Phoenix-Sky Harbor, Reagan National, San Francisco International.

accident, the airport sponsor installed a partial EMAS at a cost of \$5.8 million.<sup>10</sup> The EMAS manufacturer estimated that this partial solution, if implemented earlier, could have prevented the aircraft from skidding into the street.

Similarly, FAA determined it was impractical to construct a full RSA at Burbank and Teterboro airports because of urban development and high improvement costs. While both airports had been evaluating improvement options, partial EMAS systems were installed only after serious overruns occurred at both airports that resulted in a total of 58 injuries.

### *Eleven Large Airports Face Serious Challenges in Achieving Needed RSA Improvements*

We found that 11 of the 30 largest airports—representing nearly one-fourth of all passenger enplanements in 2006—are facing significant challenges to bringing one or more RSAs up to standards (see exhibit C for more information on these airports). These challenges are man-made, natural, environmental, and legal.<sup>11</sup> While FAA is working with these airports to overcome such challenges, some of the needed improvements may take some time to complete. For instance, RSA construction projects can be delayed by local lawsuits and community opposition<sup>12</sup> as well as environmental reviews, which can take between 2 and 12 years to finish. Moreover, projects may be delayed if airport revenue drops or financial partners withdraw from airfield improvements. As a result, it may prove difficult for some of these airports to make needed improvements by the 2015 congressional deadline.

For example, over the last 26 years, Reagan National Airport has conducted various studies on how to overcome significant constraints to improving RSAs. Its runways are bordered by the George Washington Parkway, Potomac River, and an environmental clean-up site (see figure 5 on page 10). One of the airport's three RSAs (pictured in green), which is affected by the environmental clean-up site, is undergoing an FAA-required environmental assessment, which must be completed before the RSA improvement can begin. Once the assessment is completed later this year, the airport sponsor plans to extend the runway to the south and use declared distances<sup>13</sup> to fulfill FAA standards.

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<sup>10</sup> FAA officials note that this system represented an improvement over earlier technology, providing added protection from jet blast.

<sup>11</sup> Examples of specific challenges are: man-made (highways, railroad tracks, and urban development), natural (bays and rivers), environmental (noise restrictions and environmental clean-up sites), and legal (local opposition).

<sup>12</sup> For example, improvements to Sikorsky Memorial Airport in Connecticut have been delayed for about 15 years because of disagreements between the airport sponsor and a local community, even though the deficient RSA was a factor in 1994 and 2001 accidents.

<sup>13</sup> To meet FAA's RSA standards, an airport sponsor can declare the usable operational length of a runway to be less than the actual runway length.

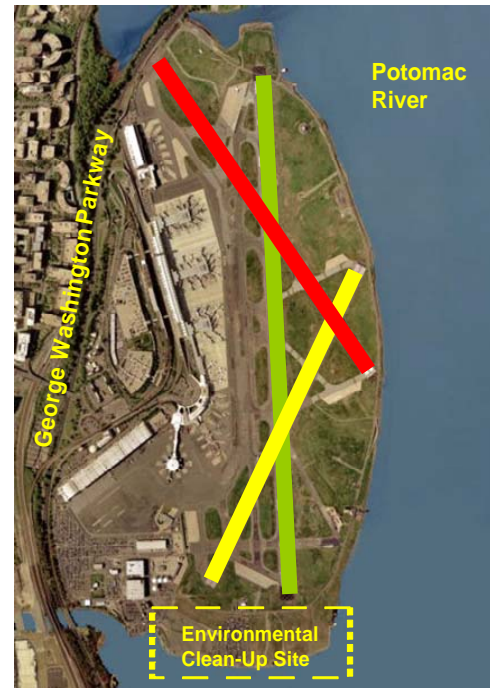
For the second RSA (pictured in red), the airport sponsor is examining several options, ranging from a partial to full EMAS—the latter of which would require an extension into the Potomac River. Since the cost of either option exceeds FAA’s maximum cost figure of \$18 million for determining practicability for this runway, the sponsor and FAA may decide to pursue only a partial improvement.

For the third RSA (pictured in yellow), which is also affected by the environmental clean-up site, the airport sponsor is considering extending the runway, installing a partial or full EMAS, or limiting the runway to smaller aircraft. While FAA has long supported the use of EMAS at Reagan National, airport officials have been reluctant to select this option due to concerns about the impact of seasonal flooding on an EMAS.

For both the red and yellow RSAs, the sponsor does not plan to make a final decision until the environmental review process is completed over the next 2 years. Yet, depending on what decisions are made, additional environmental reviews or legal challenges could cause further delays in completing needed improvements. Overall, the airport sponsor estimates RSA improvements at Reagan National could cost upwards of \$109 million.

Similarly, San Francisco International Airport faces significant challenges in bringing all four of its RSAs up to standards. The runways are bordered by San Francisco Bay and Highway 101 (see figure 6). Although the airport sponsor is conducting a study to determine how best to address the airport’s four RSAs, the sponsor tentatively plans to use declared

**Figure 5. Constrained RSAs at Reagan National Airport**



Source: Google & OIG

**Figure 6. Constrained RSAs at San Francisco Airport**



Sources: Wikipedia & OIG

distances to bring one pair (pictured in yellow) up to standards. The other pair (pictured in red) will be far more difficult to correct. Airport officials stated that it may be impossible to extend these RSAs at each runway end within current airport property limits and, as a result, it may be impracticable to improve the red RSAs to full dimensional standards.

Boston Logan Airport faces similar RSA constraints, including a major waterway, surrounding urban development, and environmental restrictions. Yet, over the last several years, the airport has constructed partial EMAS on two of its RSAs—one of which was fully funded by the airport sponsor as an interim measure. The airport is working with FAA to construct an EMAS on this RSA, which will involve filling in or constructing a ramp into the Boston Harbor (see figure 7). According to FAA officials, this project is estimated to cost more than \$40 million, which exceeds the Agency’s maximum cost figure (i.e., approximately \$24 million) for determining practicability for this runway.

**Figure 7. RSA EMAS Extension Project at Boston Airport**



Sources: Wikipedia & OIG

FAA regional officials, however, were able to get support from the Office of Airports for this project based on a number of key factors, including:

- a 1982 accident in which an aircraft went off the runway into Boston Harbor killing two passengers;
- the runway’s critical role in servicing large jet aircraft (e.g., Boeing 747); and
- Boston Logan’s importance as the domestic and international gateway to New England.

While FAA and airport officials hope to complete the project by the 2015 congressional deadline, the extra effort being taken to bring this RSA to full standards should serve as a model for other airports facing similar challenges.

Because of the safety risk from not improving RSAs—such as with Midway Airport—it is important that FAA and airport sponsors complete RSA improvements as soon as possible at the 11 airports. For Reagan National, San Francisco International, and the other nine airports, FAA regional offices should exhaust all options—as is being done at Boston Logan airport—before declaring

RSAs impracticable to improve or deciding on only partial improvements. In doing so, the Office of Airports should develop an action plan for ensuring RSAs at the 11 large airports are improved as soon as possible and to the fullest extent practical. This plan should include projected milestones and costs, a designated improvement method, and the extent to which RSAs will meet standards.

### **FAA Needs To Ensure the Timely Removal or Modification of NAVAIDs in RSAs**

Although FAA reports having relocated or modified NAVAIDs in more than 60 RSAs over the last 3 years, approximately 38 percent (394 of 1,016) of all RSAs still contain one or more non-compliant NAVAIDs—including some that pose considerable safety risks to aircraft and their passengers. We found that FAA has not addressed these NAVAIDs for various reasons, including insufficient coordination, lack of guidance on the use of new frangible bolts, inadequate planning, and AIP funding restrictions. Combined, these factors have resulted in an inconsistent, disjointed process in which some NAVAIDs are corrected, others only partially corrected, and others—some of which pose safety risks—are not corrected at all.

#### *Non-Frangible NAVAIDs Remain in RSAs and Can Pose a Safety Risk to Aircraft and Their Passengers*

We found that over 40 percent (67 of 163) of the RSAs we reviewed had one or more NAVAIDs that need to be relocated or made frangible. NAVAIDs are lighting and instrument guidance systems—such as ALS and ILS—that aid in the landing of aircraft. Such equipment can vary in height, ranging from several feet to more than 40 feet. While design standards issued by the Office of Airports Engineering Division allow NAVAIDs to be located in RSAs in order to function properly, they must be made frangible at no more than 3 inches above the ground. In addition, FAA's ATO is responsible for installing and maintaining all Agency-owned NAVAIDs in RSAs, as well as ensuring that such equipment meets design standards.

Large NAVAIDs that are not moved or made frangible can pose a considerable safety risk to aircraft and passengers when struck during an overrun. For example, in June 1975 a Boeing 727 crashed into several non-frangible ALS towers while attempting to land at John F. Kennedy Airport in New York. Of the 124 persons aboard, 113 died of injuries received in the crash. Likewise, in November 1976, an aircraft taking off at Stapleton International Airport in Denver Colorado collided into two non-frangible ALS structures resulting in 14 injuries.

In response to the Stapleton incident, the NTSB recommended that FAA expedite retrofitting of ALS structures with frangible materials so that the improvements would be completed within 3 to 5 years. However, more than 30 years later, we

found that non-frangible ALS remain in RSAs and continue to pose a safety risk to aircraft and passengers. For example, the ATO is aware of several non-frangible ALS structures located within the RSAs at Sacramento International Airport, but it has not funded efforts to remove them or make them frangible. We also found that other large non-frangible structures, such as ILS glide slope antennae and associated power sheds, remain in RSAs (see figures 8 and 9).

**Figure 8. Glide Slope Antenna at Long Beach Airport**



Source: OIG

**Figure 9. Power Shed at Long Beach Airport**



Source: OIG

### ***Insufficient Coordination Has Impeded FAA's Tracking of NAVAIDs in RSAs***

We found that the Office of Airports and ATO field offices we visited rarely coordinated to (1) determine the status of all NAVAIDs within RSAs; (2) ensure a plan was in place to relocate those NAVAIDs outside the RSA; or, if relocation was not an option, (3) ensure the equipment met frangibility requirements. While the Office of Airports and the ATO worked together in 2000 and 2005 in identifying NAVAIDs in RSAs, the two organizations have not conducted any further surveys.

Moreover, while the Office of Airports and the ATO have coordinated the relocation or modification of NAVAIDs on a case-by-case basis, they have not developed a nationwide plan to address all NAVAIDs in RSAs, with priority given to those posing the greatest safety risks to aircraft and passengers. As a result, the Office of Airports officials did not always know what NAVAIDs may have been moved or modified over the last 3 years. This was the case for two non-compliant ILS antennae that *had* been relocated at Los Angeles and Sacramento airports after the 2005 survey. In both cases, the RSA Inventory did not reflect that these improvements had been completed. Both the Office of Airports and the ATO recognize that they need to solve this problem and have discussed the need to develop a plan and schedule for moving non-compliant NAVAIDs out of RSAs.

### *Lack of Guidance Has Limited the Use of New Frangible Bolts in Correcting Non-Compliant NAVAIDs*

Insufficient guidance on the use of new frangible bolts has prevented many NAVAIDs from meeting FAA's standards. Certain NAVAIDs, because of their size or location, previously could not meet the 3-inch standard without compromising their structural integrity. However, in 2006, the Office of Airports Engineering Division started approving the use of 3-inch frangible bolts (see figure 10) on ALS and ILS applications. Although some NAVAIDs have been installed or retrofitted with the new bolts, the Office of Airports has yet to issue formal guidance to FAA field personnel on how the bolts should be applied. This has hampered efforts to retrofit existing NAVAIDs and ensure full compliance with FAA's 3-inch frangibility standard.



### *Inadequate Planning and AIP Funding Restrictions Prevent the Timely Relocation and Modification of NAVAIDs*

The ATO, though responsible for installing and maintaining FAA NAVAIDs, has not adequately planned for the relocation or modification of non-compliant NAVAIDs in RSAs. For instance, the ATO's annual Business Plan lists the various projects that are most likely to receive funding. Although the Business Plan supports the maintenance and upgrading of NAVAIDs for operational purposes, it does not prioritize the need to relocate or modify non-compliant NAVAIDs in RSAs. As a result, the ATO has not provided the funding necessary for the relocations and modifications. The one exception is NAVAIDs in RSAs that need to be replaced for operational reasons. In these situations, the ATO works to ensure the new NAVAIDs meet RSA standards.

In contrast, the Office of Airports is responsible for ensuring compliance with RSA standards, but it is restricted from permitting airport sponsors to use AIP funds to address non-compliant NAVAIDs in RSAs. The primary exception is the relocation or modification of a NAVAID affected by a larger project, such as a runway extension (i.e., the NAVAID must be moved). Another exception is a change in runway operations that requires a larger RSA, such as when a runway is used by jet aircraft instead of propeller planes. Consequently, the restrictions placed on the use of AIP funds have prevented the Office of Airports from using

them to help in the removal and modification of non-compliant NAVAIDS remaining in RSAs.<sup>14</sup>

Given the lack of ATO planning and AIP funding restrictions, FAA needs to develop a plan for addressing non-compliant NAVAIDS that places a higher priority on NAVAIDS posing the greatest threat in the event of a runway overrun or undershoot. This plan should identify and prioritize NAVAIDS that need to be addressed, develop a schedule for relocating or modifying them, and request sufficient funds for accomplishing all related tasks.

FAA also needs to improve the coordination between the Office of Airports and the ATO in monitoring NAVAIDS that have been relocated or modified. Further, FAA needs to issue guidance to field personnel on the use of frangible bolts. Finally, FAA needs to develop a plan for addressing those NAVAIDS posing the greatest threat to aircraft and their passengers.

### **FAA Needs To Establish an Effective Process for Identifying, Tracking, and Reporting RSA Improvements**

FAA's ability to effectively identify, track, and report on the status of RSA improvements is hampered by inaccurate, incomplete, or outdated data. Such data problems are due to several factors, including insufficient guidance and training for FAA field personnel responsible for entering data into the RSA Inventory and lack of quality assurance controls. This hinders FAA's ability to monitor the status of its RSA Program and ensure achievement of the congressional mandate. In addition, FAA's annual report to Congress contains inaccurate information and does not identify specific RSAs that do not meet standards (e.g., contain non-compliant NAVAIDS), describe planned improvements, or list challenges that could prevent individual RSAs from meeting the 2015 deadline.

#### *FAA's Oversight of Needed RSA Improvements Is Hampered by Inaccurate or Outdated Data*

During our audit, we compared RSA determinations and inventory records for 163 RSAs and found numerous errors and inconsistencies between the various documents. Of the 163 RSAs we reviewed, 64 (39 percent) contained 1 or more data errors and 59 (36 percent) did not support the information in the RSA records. Inaccuracies included outdated, missing, or erroneous data entries in both the determination and RSA Inventory.

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<sup>14</sup> In an effort to establish an alternative means of funding NAVAID improvements, FAA proposed a pilot program under which the Administrator would transfer ownership and operating and maintenance responsibilities for NAVAIDS to 10 medium or large hub airports. Submitted as part of FAA's 2007 reauthorization bill, Congress never acted upon the proposal.



FAA personnel in the regions and Airport District Offices are responsible for determining the status of RSAs and their needed improvements, to include details on RSA dimensions, grading, and slope and whether objects or NAVAIDs are located within the RSA boundaries.<sup>15</sup> FAA regional personnel manually enter this information into the RSA Inventory database, which was developed in 1999 to help manage the program. FAA uses this database to track progress, measure system-wide compliance of the RSA program, determine future funding needs, and prepare the annual report to Congress.

We found the determinations or RSA Inventory data for some RSAs had either not been updated to reflect changes or contained contradictory information. These inaccuracies are caused by various factors, including insufficient guidance and training, poor coordination among field personnel, and lack of quality controls. Specifically:

- There is no standard form to document determinations to ensure all data elements are captured and consistently identified. As a result, every region uses varying forms and terminology to complete determination paperwork, which leads to inconsistent types of data being gathered.
- Determinations and the RSA Inventory are not linked electronically. Thus, the information between the two is often inconsistent and contradictory.
- Regional FAA offices manually upload their determination data into the national RSA Inventory database; however, they do not always do so in a timely manner, and the data are not verified by the Office of Airports.
- The RSA Inventory does not include current data on NAVAIDs in RSAs due to the lack of coordination between the Office of Airports and the ATO. For example, the RSA Inventory states that (1) an ILS antenna within a Los Angeles International Airport RSA needs to be relocated or made frangible, even though the ATO relocated the ILS antenna approximately 1 year earlier, and (2) an RSA at Dulles International Airport meets standards, even though the determination notes that the RSA does not meet standards due to a non-compliant ILS antenna.

To correct these deficiencies, FAA needs to issue detailed guidance to its regional offices on the proper identification, tracking, and reporting of RSA status nationally. FAA also needs to ensure all regional offices receive training on the new guidance. Finally, FAA needs to implement an effective quality assurance process to ensure the accuracy of data in RSA determinations and the RSA Inventory. This process should electronically link the determination

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<sup>15</sup> FAA Order 5200.8, *Runway Safety Area Program*, 1999.

documentation from FAA regional offices to the RSA Inventory, thereby eliminating errors between the two data sets.

*FAA's Annual Report to Congress Does Not Accurately Reflect Status of RSA Improvements*

FAA's annual report to Congress, which was mandated by law in 2005,<sup>16</sup> contains inaccuracies and therefore does not fully inform Congress on the status of RSA improvements. We found that a number of factors are causing these discrepancies in FAA's report. In particular, we found that FAA:

- primarily relies on the RSA Inventory to summarize RSA status, although the Inventory contains inaccurate or outdated data,
- provides only summary information on the number of improvements completed and the number remaining but does not identify individual airports,
- reports RSA improvements as complete even though some of these improvements did not result in the RSA meeting the full standards,
- fails to address those RSAs that do not meet standards due to non-compliant NAVAIDs and thus over-reports the total number of RSAs fully meeting standards by more than one-fourth, and
- understates the future funding requirements for RSA improvements since it does not include cost estimates for those airport sponsors that have yet to decide on a corrective action.

As a result, Congress does not know which airports have RSAs that do not meet standards (e.g., those containing non-compliant NAVAIDs) or what risks may prevent airports from meeting the 2015 deadline—such as the 11 large airports highlighted in this report.

In our opinion, FAA's annual report to Congress should identify (1) which RSAs do not meet the full design standards and specific reasons for noncompliance, (2) what plans are in place to allow these RSAs to attain the full standards, (3) what risks may prevent these RSAs from meeting standards by 2015, and (4) what financial assistance is needed from FAA to make these improvements. Such enhancements to the annual report will assist Congress and other Government officials in making informed decisions related to RSA funding and program priorities.

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<sup>16</sup> In 2005, Congress mandated in Public Law 109-115 that FAA "shall report annually to the Congress on the agency's progress toward improving runway safety areas" at all Part 139 certificated airports. FAA issued its first report in May 2007 and its second report in July 2008.

## **RECOMMENDATIONS**

We recommend the following actions to FAA's Office of Airports:

1. Develop and implement an action plan for ensuring RSAs at the 11 large airports are improved to the fullest extent practical. This plan should include projected milestones and costs, a designated improvement method, and the extent to which RSAs will meet standards.
2. Work with the ATO to develop and implement an effective program for addressing NAVAIDs located in RSAs. This program should focus on (a) improved coordination, (b) guidance on using new 3-inch frangible bolts, and (c) a plan for relocating or modifying those NAVAIDs posing the greatest safety risk.
3. Issue detailed guidance and conduct training for all field offices on the proper identification, tracking, and reporting of RSA status, including NAVAIDs.
4. Implement quality control procedures to ensure the accuracy and integrity of RSA data. These procedures should (a) standardize documentation for field offices to use in making determinations, (b) electronically link determinations from FAA regional offices with the RSA Inventory, and (c) require periodic tests of data maintained in RSA Inventory.
5. Expand the annual report to Congress to identify (a) which RSAs do not meet the full RSA design standards and specific reasons for noncompliance (e.g., non-compliant NAVAIDs, roadways, or rivers); (b) what plans are in place to allow these RSAs to attain full standards; (c) what challenges exist to prevent these RSAs from meeting the full standards by 2015; and (d) what financial assistance will be needed to achieve planned improvements.

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

We provided FAA with our draft report on December 18, 2008. We received FAA's formal response on February 6, 2009, which is included in its entirety in the appendix to this report. In addition to its response, FAA provided a number of clarifying technical comments. We addressed these comments as appropriate in our final report.

FAA concurred with all five recommendations and plans to take several corrective actions. For example, FAA will direct its regions to energize efforts on completing RSA improvement plans for each of the 11 major airports cited in our report. FAA is also working to identify and address non-compliant NAVAIDs in

RSAs and plans to issue an advisory circular on frangible bolts in March 2009. Finally, FAA will take a number of steps to improve the quality of the RSA Inventory data and its annual report to Congress.

FAA's planned actions are responsive to our recommendations, and we consider all five recommendations to be resolved but open pending completion of the planned actions. 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 Darren L. Murphy, Program Director, at (206) 220-6503.

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cc: FAA Deputy Administrator  
Chief Operating Officer, Air Traffic Organization  
Associate Administrator for Airports  
Anthony Williams, ABU-100  
Martin Gertel, M-1

## EXHIBIT A. SCOPE AND METHODOLOGY

We conducted this performance audit in accordance with generally accepted Government Auditing Standards prescribed by the Comptroller General of the United States. As required by those standards, we obtained evidence that we believe provides a reasonable basis for our findings and conclusions based on our audit objectives. We conducted the audit between November 2007 and November 2008 and included such tests of procedures and records as we considered necessary, including those providing reasonable assurance of detecting abuse and illegal acts.

During our audit, we visited or contacted FAA Headquarters, Airport regional offices, Airport district offices, and ATO service centers. We also visited or contacted a number of airport sponsors, airports, and stakeholder organizations. See exhibit B for a complete list of facilities visited or contacted during the audit.

To assess FAA's and airports' progress and challenges, if any, in fulfilling the congressional RSA mandate, we selected a judgmental sample of 163 of the 1,016 RSAs nationwide.<sup>17</sup> The sample was designed to capture a mix of large, medium, and small airports requiring RSA improvements and associated FAA regional and district offices. As part of this process, we reviewed FAA and airport sponsor documentation showing the status of the 163 RSAs at 30 large, 10 medium, and 13 small airports. We then interviewed FAA and airport officials to determine the status of future RSA improvements and to identify any impediments that would prevent an RSA from meeting standards by the 2015 congressional deadline. Moreover, from the list of 30 large airports, we identified 11 that have RSAs facing major man-made, natural, environmental, and legal challenges to being brought up to standards (see exhibit C). Finally, for RSAs that FAA considers impracticable to improve, we reviewed relevant documentation and discussed FAA's rationale for its decisions.

To evaluate the effectiveness of FAA's process for identifying, prioritizing, and funding needed RSA improvements, we interviewed FAA Headquarters officials; reviewed various planning, funding, and reporting documents; and obtained a list of the RSA universe. We also interviewed personnel at FAA regional and Airport District Offices and obtained documentation showing the current status of RSAs. Due to significant differences in RSA determinations and the RSA Inventory, we could not rely on those data sources. We therefore visited selected airports and their RSAs to validate and test the accuracy of the information. Finally, we discussed our observations with FAA and airport officials.

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<sup>17</sup> Between 2000 and 2007, the total number of RSAs at Part 139 airports decreased from 1,024 to 1,016 due to various reasons, including data errors in the RSA Inventory and decommissioned runways. In addition, the 1,016 RSAs were located at 53 airports (e.g., 30 large hubs, 10 medium hubs, and 13 small hubs).

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

### **Airports**

- Baltimore Washington International, MD
- Bob Hope Burbank, CA
- Boston Logan International, MA
- Charlotte-Douglas International, NC
- Fort Lauderdale/Hollywood Airport, FL
- John F. Kennedy International, NY
- John Wayne-Orange County, CA
- LaGuardia, NY
- Los Angeles International, CA
- Long Beach, CA
- Long Island MacArthur, NY
- Metropolitan Oakland International, CA
- Newark Liberty International, NJ
- Phoenix Sky Harbor International, AZ
- Reagan National, DC
- Sacramento International, CA
- San Diego International, CA
- San Francisco International, CA
- Teterboro, NJ
- White Plains, NY

### **Airport Sponsors/Owners**

- Maryland Aviation Administration, Linthicum, MD
- Metropolitan Washington Airports Authority, Washington, DC
- Port Authority of New York/New Jersey, New York, NY
- Town of Islip, NY

### **FAA Airport District Offices**

- Atlanta Airport District Office, Atlanta, GA
- Honolulu Airport District Office, Honolulu, HI
- Los Angeles Airport District Office, Lawndale, CA
- New York Airport District Office, Garden City, NY
- San Francisco Airport District Office, Burlingame, CA
- Washington Airport District Office, Dulles, VA

**FAA Regional Offices**

- Eastern Regional Office, Jamaica, NY
- Great Lakes Regional Office, Des Plaines, IL
- New England Regional Office, Burlington, MA
- Northwest-Mountain Regional Office, Renton, WA
- Southern Regional Office, College Park, GA
- Southwestern Regional Office, Ft. Worth, TX
- Western-Pacific Regional Office, Lawndale, CA

**FAA ATO Service Centers**

- Central Service Center, Ft. Worth, TX
- Eastern Service Center, College Park, GA
- Western Service Center, Renton, WA

**FAA Headquarters, Washington, DC**

- Office of Airport Safety and Standards, Office of Airports
- Office of Airport Planning and Programming, Office of Airports
- Navigation Services Office, Air Traffic Organization

**Stakeholders**

- Air Line Pilots Association, Washington, DC
- American Association of Airport Executives, Alexandria, VA
- Applied Research Associates, Elkridge, MD
- National Transportation Safety Board, Washington, DC
- Engineered Arresting Systems Corporation, Logan Township, NJ

## **EXHIBIT C. ELEVEN LARGE AIRPORTS FACING SIGNIFICANT CHALLENGES TO IMPROVING RSAS**

**Baltimore Washington International-Thurgood Marshall Airport (State of Maryland) must improve four RSAs.** All four RSAs are constrained by interstate and state highways. The airport sponsor and FAA have agreed on methods for improving the RSAs but will not execute them until the sponsor has updated the airport's long-range Master Plan. This plan may decommission one of the runways, which would eliminate the need to improve one of the four RSAs. In addition, the Master Plan must be approved by FAA and undergo an environmental review. Finally, three of the four RSAs have NAVAIDs that need to be either relocated or made frangible.

**Boston Logan International Airport (Boston, Massachusetts) must improve one RSA.** This airport is constrained by Boston Harbor and urban development. As an interim measure to improving the RSA, the airport sponsor installed a partial EMAS (at its own cost) and is studying the possibility of installing a runway deck or filling in part of Boston Harbor and then installing a full EMAS. In addition, FAA's regional office raised the maximum feasible improvement cost to over \$40 million because the runway is used by Boeing 747 aircraft and was the site of a fatal 1982 accident. The airport sponsor has started assessing the project's environmental impact and plans to complete the project by late 2013.

**Charlotte-Douglas International Airport (Charlotte, North Carolina) must improve two RSAs.** The airport sponsor is installing an EMAS on one RSA but is waiting for that project's completion before deciding on actions for the other RSA. This second RSA is constrained by a parkway and railroad tracks, and may be required to undergo an environmental review.

**Fort Lauderdale/Hollywood Airport (Broward County, Florida) must improve three RSAs.** The first RSA, which is constrained by a canal, an interstate highway, and railroad tracks, will be improved during a runway extension project. This project completed the environmental review process in January 2009. The second RSA is not likely to be improved since the airport sponsor plans to decommission the associated runway once the above extension project is completed. The third RSA—which has been improved with a partial and full EMAS—still contains four non-frangible NAVAIDs.



**John F. Kennedy International Airport (Port Authority of New York and New Jersey) must improve three RSAs.** This airport is constrained by Jamaica Bay, roads, and wetlands. One RSA is being improved during a 2009-2010 runway rehabilitation project, which includes capacity enhancements (e.g., new taxiways). After the project is complete, the airport sponsor plans to begin the other two RSA improvement projects. Completing runway rehabilitation and RSA improvement projects requires careful sequencing so that they do not reduce operations on the airport's runways. As a result, FAA officials noted that it may take more than 7 years to complete the RSA improvements. The airport sponsor is currently designing the improvement projects, which will have to undergo environmental review.

**LaGuardia Airport (Port Authority of New York and New Jersey) must improve two RSAs.** Although partial EMAS have been installed on the airport's two RSAs, final improvements—which involve extending runway decks over Flushing Bay—present engineering challenges and may take more than 8 years to complete. FAA estimates that the cost of these improvements will be more than \$36.5 million. The airport sponsor is designing the project but has not completed the environmental review process.

**Los Angeles International Airport (Los Angeles, California) must improve two RSAs.** These two RSAs are on the airport's north side and are constrained by roads, urban development, and environmentally sensitive areas. The airport has two other RSAs, on the airport's south side, that were brought up to standards in 2008 during runway expansion projects. Improvements to the remaining two have been delayed by legal battles over the airport's Master Plan, which requires the airport sponsor to redesign north side runway expansion projects and submit them to local review. The airport sponsor is conducting a state environmental impact review, which will be followed by a Federal environmental impact statement. These studies, which may be finished as early as 2011, will help determine the preferred design for the north side runways.

**Philadelphia International Airport (Philadelphia, Pennsylvania) must improve two RSAs.** This airport is constrained by the Schuylkill and Delaware Rivers, an interstate highway, a U.S. Army Corps of Engineers dredge disposal site, and an industrial area. One RSA requires the airport sponsor and the U.S. Army Corps of Engineers to reach an agreement on how to mitigate the project's impact on wetlands. The second RSA improvement project is part of a larger program to enhance Philadelphia International's capacity, and that project's draft environmental impact statement is expected to be issued before 2009. Finally, the airport's other two RSAs meet dimensional standards but contain non-frangible ALS structures.

**Phoenix Sky Harbor International Airport (Phoenix, Arizona) must improve one of its three RSAs.** This airport is bordered by a river and urban development. FAA has approved the installation of an EMAS in this RSA; however, the City of Phoenix would like to construct a full, standard RSA extending 1,000 feet beyond each runway end. FAA approves of Phoenix pursuing the full RSA, but the city has not finished a study on how to complete the project. Once the study is complete, the project will must be approved by FAA and undergo an environmental review.

**Reagan National Airport (Washington, D.C.) must improve its three RSAs.** The airport is constrained by the George Washington Parkway and the Potomac River. The airport sponsor plans to improve one RSA by extending the main runway and has already started assessing the project's environmental impact. The sponsor has not yet decided how to improve the other two RSAs but plans to do so after completing a second environmental assessment.

**San Francisco International Airport (San Francisco, California) must improve its four RSAs.** The airport is challenged by San Francisco Bay and Highway 101. Although it is conducting a study to determine how best to address the airport's four RSAs, the sponsor tentatively plans on using declared distances to bring two RSAs up to standards. The other two RSAs may be impossible to extend within current airport property limits and, as a result, may be impracticable to bring up to full dimensional standards.

**EXHIBIT D. MAJOR CONTRIBUTORS TO THIS REPORT**

<b>Name</b>	<b>Title</b>
Darren Murphy	Program Director
Jerrold Savage	Project Manager
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Curtis Dow	Auditor
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Henning Thiel	Auditor
Petra Swartzlander	Senior Statistician
Andrea Nossaman	Writer-Editor

**APPENDIX. AGENCY COMMENTS****Federal Aviation  
Administration**

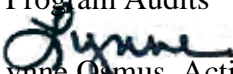
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**Memorandum**

Date: February 6, 2009

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

From:  Lynne Osamus, Acting Administrator, AOA-1

Prepared by: Catherine M. Lang, Acting Associate Administrator for Airports, ARP-1

Subject: Draft Report on the Federal Aviation Administration's Runway Safety  
Area (RSA) Program – Project Number 07A3013A000; Your Memo of  
12/18/08

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Thank you for the opportunity to provide comments on your draft report of December 18, 2008.

Overall, we found your draft RSA report to be very useful. We concur with your recommendations. However, we do have some concerns with portions of the report's findings and incorrect technical statements. We have attached a redlined copy of the draft report that addresses these concerns and provides clear background information on the FAA's RSA program.

We have also attached a response to your five specific recommendations.

Attachments

**Attachment 1**

(Page 1 of 2)

**Recommendation #1:** Develop and implement an action plan for ensuring RSAs at the 11 large airports are improved to the fullest extent practicable. This plan should include projected milestones and costs, designated improvement method, and the extent to which RSAs will meet standards.

**FAA response #1:** FAA agrees. We will direct FAA regions to energize efforts on working with sponsors to complete plans for each of these RSAs. Four of the 11 airports have plans in place for improving RSAs. We will require FAA regions to submit the plans to Headquarters and require status reports at the end of each fiscal year. Summaries of these reports will be included in the report to Congress starting in 2009.

**Recommendation #2:** Work with ATO to develop and implement an effective program for addressing NAVAIDs located in RSAs. This program should focus on (a) improved coordination, (b) guidance on using new 3-inch frangible bolts, and (c) a plan for relocating or modifying those NAVAIDs posing the greatest safety risk.

**FAA response #2:** FAA agrees. The Office of Airports continues to work with the Air Traffic Organization to develop procedures for the two organizations to identify NAVAIDS in RSAs and to take appropriate action to comply with RSA standards by 2015. We will develop these procedures by May 15, 2009. We will develop a plan, schedule, and budget for completing the NAVAID RSA projects to the extent practicable by the end of 2015. This plan will be completed by June 30, 2009. Finally, we will issue an advisory circular providing updated guidance on frangible bolts in March, 2009.

**Recommendation #3:** Issue detailed guidance and conduct training for all field offices on the proper identification, tracking, and reporting of RSA status, including NAVAIDs.

**FAA response #3:** FAA agrees. We will continue to support the RSAI database and provide guidance as needed for reporting purposes. The RSAI database has been through 16 revisions since it was first developed in 2000. There is a detailed user guide posted on a common electronic folder, and internal orders are in place to ensure quality data. Updated guidance will be issued by June 30, 2009. The guidance will address training issues, as we understand one of the problems with the proper data entry is that the responsibility for entering data often shifts to new people due to transfers, retirements, or other actions.

**Recommendation #4** Implement quality control procedures to ensure the accuracy and integrity of RSA data. These procedures should (a) standardize documentation for field offices to use in making determinations, (b) electronically link determinations from FAA regional offices with the RSA Inventory, and (c) require periodic tests of data maintained in RSA Inventory.

(Page 2 of 2)

**FAA response #4:** FAA agrees. The RSA database is being constantly updated. We will review these procedures to identify improvements that can be implemented, including electronically linking determinations from FAA regional offices. We will complete this review by September 30, 2009. The review will address the need for periodic review of the data and sharing of the data with the Airport Development Offices (ADO) who are in the best position to validate the data entries.

**Recommendation #5:** Expand the annual report to Congress to identify (a) which RSAs do not meet the full RSA design standards, (b) what plans are in place to allow these RSAs to attain full standards, (c) what challenges exist to prevent these RSAs from meeting the full RSA design standards by 2015, and (d) what financial assistance will be needed to achieve planned improvements.

**FAA response #5:** FAA agrees and will include this information in the 2009 report to Congress.

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

# **Actions Taken and Needed To Improve the Federal Aviation Administration's Runway Safety Area Program**

## **Section 508 Compliant Presentation**

### **Figure 1. Runway Safety Area Dimensional Standards**

Figure depicts standard runway safety area surrounding a runway with the dimensional requirements noted. Specifically, runway safety areas must typically be 1,000 feet by 500 feet at each runway end and 250 feet from the runway centerline.

### **Figure 2. Runway Safety Area Obstacles at Reagan National Airport**

Aerial photograph shows Reagan National Airport area and notes location of environmental clean-up site, runway distance from Potomac River (170 feet), and runway distance from the George Washington Parkway (120 feet).

Source: Google and Office of Inspector General

### **Table. Examples of Major Runway Accidents Involving Non-Standard Runway Safety Areas**

- Accident at Little Rock National Airport in June 1999 resulted in 105 injuries and 11 fatalities.
- Accident at Bob Hope Burbank Airport in March 2000 resulted in 44 injuries.
- Accident at Teterboro Airport (New Jersey) in February 2005 resulted in 14 injuries.
- Accident at Chicago's Midway International Airport in December 2005 resulted in 22 injuries and 1 fatality.

Source: National Transportation Safety Board

### **Figure 3. Aircraft Damage from Hitting Navigational Aid at Dekalb-Peachtree Airport**

Photograph shows damaged aircraft wing and destroyed navigational aid.

Source: Federal Aviation Administration



#### **Figure 4. Data Errors in the Federal Aviation Administration's Runway Safety Area Inventory**

- Runway Safety Area Inventory states that a runway safety area at Baltimore Washington International Airport meets standards even though it is less than the required 250 feet on 1 side of the runway.
- Runway Safety Area Inventory states that a runway safety area at Dulles International Airport meets standards, even though an Instrument Landing System needs to be relocated.
- Runway Safety Area Inventory states that \$39 million was needed for a major runway and runway safety area project at Los Angeles International Airport when it had been completed 1 year earlier.

#### **Figure 5. Constrained Runway Safety Areas at Reagan National Airport**

Aerial photograph shows three runway safety areas at Reagan National Airport which are constrained by an environmental clean-up site, the Potomac River, and the George Washington Parkway.

Source: Google and Office of Inspector General

#### **Figure 6. Constrained Runway Safety Areas at San Francisco Airport**

Aerial photograph shows four constrained runway safety areas at San Francisco International Airport. The four runway safety areas are bordered by San Francisco Bay and Highway 101.

Source: Wikipedia and Office of Inspector General

#### **Figure 7. Runway Safety Area Engineered Material Arresting System (or EMAS) Extension Project at Boston Airport**

Aerial photograph of Boston Logan Airport shows end of Runway 15R/33L meeting a partial EMAS, which measures 158 feet by 170 feet. Area outlined in red shows how the proposed full-sized EMAS would extend over Boston Harbor.

Source: Wikipedia and Office of Inspector General

**Figure 8. Glide Slope Antenna at Long Beach Airport**

Photograph shows large, non-frangible Instrument Landing System glide slope antennae at Long Beach Airport.

Source: Office of Inspector General

**Figure 9. Power Shed at Long Beach Airport**

Photograph shows large, non-frangible power shed building at Long Beach Airport.

Source: Office of Inspector General

**Figure 10. 3-Inch Frangible Bolt**

Photograph shows frangible bolt required to secure navigational aids located in runway safety areas. The bolt is positioned vertically on a desk next to an ink pen to show actual size.

Source: Federal Aviation Administration.