
Office of Inspector General

*Despite Significant Management Focus, Further
Actions Are Needed To Reduce Runway Incursions*

Federal Aviation Administration

Report Number: AV-2001-066

Date Issued: June 26, 2001



Memorandum



**U.S. Department of
Transportation**

Office of the Secretary
Of Transportation

Office of Inspector General

Subject: ACTION: Despite Significant Management
Focus, Further Actions Are Needed to Reduce
Runway Incursions
AV-2001-066

Date: June 26, 2001

From: Alexis M. Stefani 
Assistant Inspector General for Auditing

Reply to
Attn of: JA-10:x60500

To: Federal Aviation Administrator

This report summarizes our audit of FAA's Runway Incursion Technologies. We are providing this final report for your information and use. In preparing this report, we considered FAA's June 21, 2001 comments to our draft report.

FAA agreed with our recommendations to reevaluate the Airport Movement Area Safety System deployment schedule, reexamine airport needs for a full Airport Surface Detection Equipment-X system, and determine if technological solutions are needed for airports that are not receiving any technology. These actions, when implemented, should help FAA make progress in reducing runway incursions. These recommendations are considered resolved subject to the follow-up provisions of Department of Transportation Order 8000.1C.

FAA's proposed actions to expedite the use of in-cockpit moving map displays and Automatic Dependent Surveillance - Broadcast and to improve the authority and accountability of the Runway Safety Program Director are ambiguous. Also, it is not clear to us what milestones, if any, apply to implementing these recommendations. We request that you reconsider your response to both recommendations and provide further clarification by July 27, 2001, with target dates for implementation.

We appreciate the cooperation and assistance provided by your staff during the audit. If I can answer any questions or be of further assistance, please feel free to call me at (202) 366-1992, or David A. Dobbs, Deputy Assistant Inspector General for Aviation, at (202) 366-0500.

Attachment

Despite Significant Management Focus, Further Actions Are Needed to Reduce Runway Incursions

Federal Aviation Administration

Report No. AV-2001-066

June 26, 2001

Background and Objectives

Runway incursions,¹ incidents on the runway that create a collision hazard, can have serious consequences. The worst aviation accident in history occurred in 1977 on a runway in the Canary Islands in Tenerife where 583 people were killed. Another accident occurred in October 2000 at Taipei's Chang Kai Shek International Airport when a Boeing 747 took off on a closed runway and collided with construction equipment killing 81 people onboard. While these accidents did not occur in the United States, they show the extent of the safety risk posed by runway incursions. Since 1990, there have been 7 runway accidents in the United States that claimed 63 lives and damaged 13 aircraft. One of these accidents occurred in March 2000 when two general aviation aircraft collided at Bradenton International Airport in Sarasota, Florida, killing four people onboard both aircraft.

The National Transportation Safety Board (NTSB) has expressed concern that the expected increase in air traffic activity may result in further increases in runway incursions, which may lead to additional accidents. NTSB has included reducing runway incursions on its annual "Most Wanted" list of transportation safety improvements since 1990. A November 2000 study titled "Fatal U.S. Runway Collisions Over the Next Twenty Years" performed under contract for the Federal Aviation Administration (FAA) projected that 15 fatal runway collisions at towered airports could kill 700 to 800 people and seriously injure 200 others over the next 20 years if nothing more is done.²

FAA has been pursuing technologies to reduce runway incursions and prevent accidents for over a decade. It funded \$376 million for such projects during fiscal years (FY) 1985 to 2000 and an additional \$52.6 million for FY 2001

¹ FAA defines a runway incursion as any occurrence at an airport involving an aircraft, vehicle, person, or object on the ground, that creates a collision hazard or results in a loss of separation with an aircraft taking off, intending to take off, landing, or intending to land. FAA's definition applies only to airports with operating air traffic control towers.

² The study treated 2003 through 2022 as "the next twenty years."

(see Exhibit A). All funds have been obligated and expended through FY 2000.

The majority of the funds for runway incursions technology projects has been used for Airport Surface Detection Equipment, Model 3 (ASDE-3) and Airport Movement Area Safety System (AMASS) to assist air traffic controllers at 34 of the largest airports. ASDE-3, which costs approximately \$7 million per unit and is designed to aid controllers in the safe movement of aircraft especially in low visibility conditions, is operational at 32 airports. ASDE-3 is expected to be operational at two more airports by October 2002. AMASS, a software enhancement to ASDE that will cost an additional \$4 million per unit, is designed to alert controllers of impending collisions. AMASS has been commissioned at 2 of the 34 airports.

The audit objective was to evaluate the adequacy of the FAA's efforts to identify and deploy (commission for operational use) new technologies to reduce runway incursions. Additionally, we determined whether FAA implemented recommendations contained in our previous reports.³ We conducted the audit between November 1999 and May 2001.

Results-in-Brief

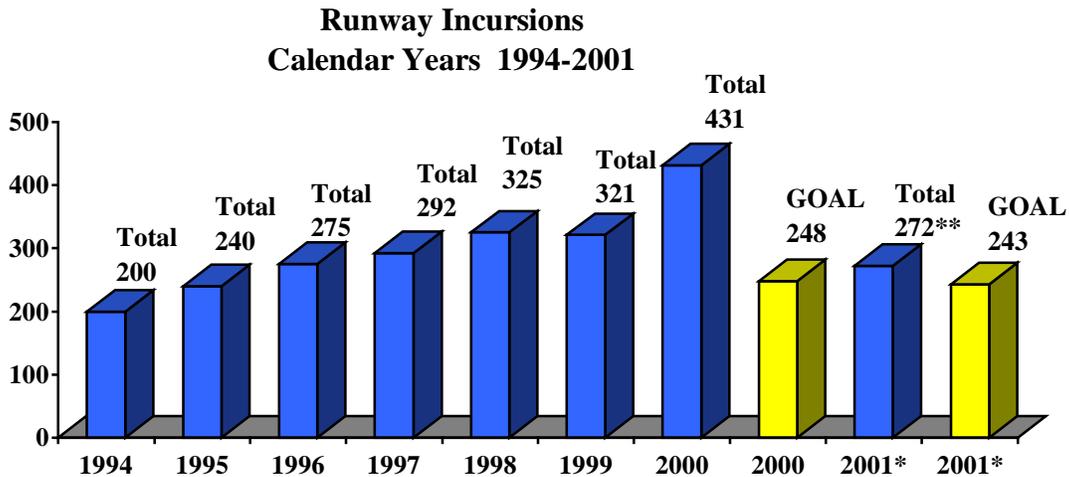
FAA has taken many steps to reduce runway incursions. FAA has had 3 plans since 1991 that included over 260 actions to reduce runway incursions. Actions included such things as improving markings, signs, and lighting, and training vehicle operators. FAA also made procedural changes such as requiring pilots to read back their clearances before entering an active runway and establishing uniform procedures for airport surface movement in low visibility conditions.

In the past 2 years, the FAA Administrator has made reducing runway incursions a top agency priority and appointed a new Director of Runway Safety as the single point of contact for all runway safety activities. In 2000, FAA conducted nine regional runway incursion workshops, a Human Factors symposium, and a Runway Safety National Summit, and published a National Blueprint to reduce runway incursions. FAA appointed nine new full-time Regional Runway Safety Managers to strengthen its focus on reducing runway incursions at the regional and local levels. FAA also revised its standards to

³Report on Audit of the Runway Incursion Program (Report Number AV-1998-075, February 9, 1998) and Report on Follow-up Review of FAA's Runway Safety Program (Report Number AV-1999-114, July 21, 1999).

increase the size of various holding position runway markings to make them more noticeable.

Despite FAA’s significant management focus on reducing runway incursions, it is apparent that what FAA is doing is not sufficient. The number of runway incursions, as shown on the following chart, continues to go in the wrong direction. Runway incursions, which increased 60 percent from 200 in 1994 to 321 in 1999, reached a new high of 431 in 2000. *This number was 74 percent higher than FAA’s goal of having no more than 248 runway incursions by the end of 2000.*



* Beginning with October 2000, FAA changed its goal from a calendar year to a fiscal year basis

**As of May 31, 2001 (Total includes 106 runway incursions from October-December 2000)

Runway incursions continue to be a serious aviation safety risk. Based on preliminary FAA data on runway incursions from 1997 to 2000, close calls on the runway have remained a serious problem. During the 4-year period, there were 256 close calls, between 59 and 66 a year. Sixty-three percent or 161 of the close calls involved at least one commercial aircraft. Close calls are those runway incursions that barely avoid a collision or that posed a significant potential for a collision.

In our opinion, FAA has taken many steps toward reducing runway incursions, but two significant factors have constrained FAA’s progress. Actions FAA needs to take to reverse the upward trend in runway incursions are indicated in the following paragraphs.

- First, FAA has not provided technologies to airports with continued runway incursion problems.

- FAA has been developing, evaluating, and testing AMASS since 1991. FAA commissioned the first two AMASS at the San Francisco and Detroit airports in June 2001. Based on longstanding problems with false alerts during evaluation and testing, however, there is uncertainty as to how well the system will work at the remaining sites and whether the schedule to commission 31 additional sites by November 2002 will be met. Accordingly, FAA needs to revisit the AMASS schedule and develop a realistic schedule to commission the remaining sites. The current schedule is unlikely to be met unless Airway Facilities resources are adequate to commission the remaining sites and time is allowed to ensure controller acceptance of AMASS.
- FAA has not provided small to medium airports with low-cost technologies to reduce runway incursions. FAA awarded a contract in October 2000 to provide ASDE-X technology to 25 small to medium airports. However, FAA used a “top down” approach, rather than evaluating the specific technological needs of airports with continued runway incursion problems and determining if low-cost solutions are available.

ASDE-X is not a “one size fits all” system and can be tailored to the needs of each airport. In May 2001, FAA decided to reevaluate the need for a full ASDE-X system at each of the 25 airports. We agree with FAA’s decision, and FAA should revise its ASDE-X cost and schedule baseline after the reevaluation.

- FAA’s major technology efforts have been focused on helping air traffic controllers prevent accidents, but these tools will not help pilots avoid runway incursions before they happen. Runway incursions caused by pilot errors, which represented 60 percent of the runway incursions in 2000, continue to be the leading cause of runway incursions.

Technologies to help pilots know where they are on the runway and where others are on the runway, such as in-cockpit moving map displays and Automatic Dependent Surveillance Broadcast (ADS-B), must be expedited to avoid close calls that continue to happen and pose a serious safety risk to airline crews and passengers. ADS-B differs significantly from other technologies because it creates a redundancy, a “*second set of eyes*”, by including the pilot in the loop to help detect and alleviate hazardous surface situations. FAA must expedite the use of these technologies. FAA should determine if its process to certify new equipment could be accelerated to expedite these technologies. FAA

should also issue an Advanced Notice of Proposed Rulemaking to obtain comments from the airline industry and general aviation community on implementing in-cockpit moving map displays and ADS-B.

- Second, to successfully reverse the upward trend in runway incursions, strong program oversight is needed to ensure follow-through on planned initiatives to reduce runway incursions.
 - We found improvement in program oversight is needed because initiatives are not completed on time, completed initiatives are not evaluated to determine if they are working, and regional efforts are not periodically assessed to ensure that progress is being made to reduce runway incursions at airports.
 - We found that an important factor constraining strong program oversight is that, even though the Runway Safety Program Director is the single point of contact for all runway safety activities, the Director has little authority to ensure initiatives undertaken by various FAA lines of business (Air Traffic, Flight Standards, Airports, and Research and Acquisition) are completed. FAA needs to provide the Director with the authority needed to ensure that employees from other lines of business are fully supporting the Runway Safety Program mission.

We acknowledge that many offices in FAA have a role in ensuring runway safety, and it is not practical to have the Runway Safety Program Director be in charge of all employees involved in some way with reducing runway incursions. For example, the Safe Flight 21 program office, under the Office of Communications, Navigation and Surveillance, demonstrates technologies to improve the efficiency and capacity of the National Airspace System. This includes technologies such as ADS-B to reduce runway incursions. These employees do not report to the Runway Safety Program Director. However, the Director should have a mechanism to provide input on individual performance appraisals and bonuses if the employee's performance can impact FAA's progress in reducing runway incursions. Such mechanisms are needed to hold people involved with runway safety accountable for completing initiatives within established milestones.

Principal Finding and Recommendations

FAA Made Reducing Runway Incursions a Top Priority. Since the fall of 1999, the FAA Administrator has made reducing runway incursions a top agency priority. The administrator appointed a new Director of Runway Safety as the single point of contact for all runway safety activities. In the spring of 2000, FAA conducted nine regional runway incursion workshops, followed by a Human Factors symposium and a Runway Safety National Summit. These events brought together all the stakeholders in runway safety to develop additional ways to reduce runway incursions.

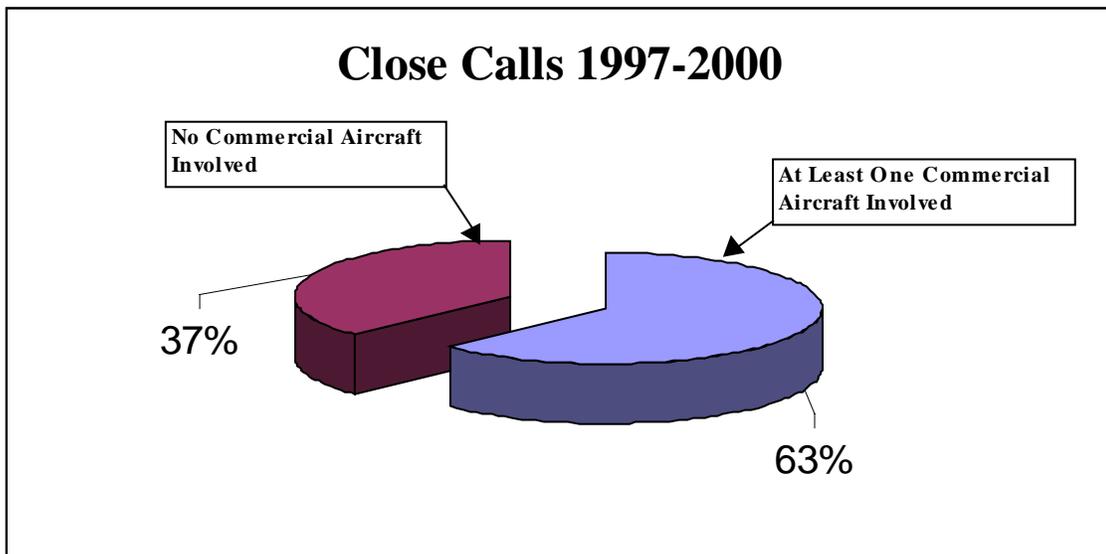
In August 2000, FAA identified 10 initiatives most likely to reduce runway incursions in the near term. These initiatives included reviewing pilot/controller communications phraseology, providing runway incursion training for pilots and controllers, implementing a technology assessment program, and improving airport surface operations and markings. In October 2000, FAA included these 10 initiatives together with certain initiatives selected from its 1998 Action Plan and published a National Blueprint to reduce runway incursions. In FY 2001, Congress appropriated \$52.6 million for runway incursion initiatives, almost \$19 million more than in FY 2000. FAA has requested a total of \$73.6 million in the FY 2002 budget in support of Runway Safety Programs.

FAA also took action to improve regional and local efforts to reduce runway incursions and to improve data to better identify causes of runway incursions. In October 2000, FAA appointed nine new full-time Regional Runway Safety Program Managers. These managers plan to direct evaluations on runway safety at 167 airports this year, over 140 more than last year. To improve runway incursion data, FAA is developing a new process to identify and investigate those incursions where there was a high risk of collision. This process should help FAA identify the related causes and contributing factors of runway incursions and develop an effective prevention strategy. FAA has identified whether commercial or general aviation aircraft are involved for all runway incursions. In the past, this information was only available for runway incursions involving pilot error. FAA plans to implement its new runway incursion data system by the end of June 2001.

Runway Incursions Continue to Rise. Despite FAA's significant management focus on reducing runway incursions, the numbers are going in the wrong direction. Runway incursions, which increased 60 percent from 200 in 1994 to 321 in 1999, reached a new high of 431 in 2000. *This number was 34 percent higher than the 321 occurrences in 1999 and 74 percent higher than FAA's goal of having no more than 248 runway incursions by the end of 2000.*

The rate⁴ of runway incursions per 100,000 operations (takeoffs and landings) has also increased, not just the absolute number.

The number of close calls (runway incursions where a high risk of collision exists) over the 4-year period from 1997 to 2000 have remained constant, with between 59 and 66 close calls occurring a year. There was at least one commercial aircraft involved in 161 (63 percent) of the 256 close calls that occurred during that 4-year period. When commercial aircraft are involved, the potential loss of life due to a runway accident is much greater.



Close calls involving commercial aircraft are continuing in 2001 as shown in the following examples.

- In January 2001 an American Airlines MD-80 was cleared to taxi and hold short of an active runway just after landing at Seattle-Tacoma International Airport. The pilot instead crossed the runway as a Trans World Airlines MD-80 was taking off. The two aircraft missed colliding by about 60 feet.
- In March 2001 a Delta Airlines 767 was cleared to land at Fort Lauderdale International Airport while a US Airways 737 had been told to taxi onto the runway to await takeoff. The two jets were within about 100 feet from a collision.
- In May 2001 at Dallas-Ft. Worth International Airport, a cargo plane mistakenly taxied onto an active runway directly in the path of an American

⁴ The rate has increased from .32 in 1994 to .64 in 2000.

Airlines jet, rolling down the runway. The American Airlines jet flew over the cargo plane and missed it by less than 100 feet.

In the Department of Transportation FY 2002 Performance Plan, FAA's goal is to reduce runway incursions to no more than 243 by the end of FY 2001. (In prior years, runway incursion goals were based on calendar years, but DOT changed its reporting of runway incursions to a fiscal year basis to facilitate timely performance reporting.) As of May 31, 2001, the number of runway incursions for FY 2001 was already 272,⁵ surpassing FAA's goal of 243 for FY 2001, with 4 months remaining in the fiscal year. FAA's FY 2002 goal is to reduce runway incursions to no more than 236.

Airports With Continued Runway Incursions Need Technological Solutions. Airports with continued runway incursion problems have been relying on non-technological solutions such as improving airport markings and lighting, and providing additional training to pilots and vehicle operators to reduce runway incursions. For example, Los Angeles International Airport, which had a runway accident in 1991 that killed 34 people and has led the Nation with 33 runway incursions over the past 4 years, has not been provided technology to mitigate the risk of another runway accident. Now FAA plans to commission AMASS by the end of August 2001 at Los Angeles International Airport, 10 years after the start of the development of AMASS and 10 years after the fatal accident on the runway. Further, ASDE-X technology designed to help air traffic controllers prevent runway accidents at 25 small to medium airports is not expected to be commissioned at the first 3 sites until FY 2003-2004, with the remaining 22 sites to be commissioned between FY 2005 and FY 2007.

Four of the top 10 airports with the most runway incursions from 1997 to 2000 (North Las Vegas, Long Beach, Fort Lauderdale Executive, and San Diego/Montgomery Field) are not scheduled to receive any technology to reduce runway incursions. Runway incursions at these 4 airports have increased 126 percent from a total of 19 in 1999 to 43 in 2000, primarily due to increases in pilot deviations. While we recognize that these airports, except for Long Beach, do not have commercial air service, FAA needs to determine whether low-cost technological solutions are available to reduce runway incursions and prevent accidents. In addition to these 4 airports, we identified 9 other airports that had a total of 10 or more runway incursions from 1997 to 2000 that are not scheduled to receive any technology. These 13 airports

⁵ This number includes 106 runway incursions from October to December 2000.

represent 35 percent of the 37 airports that had 10 or more incursions over the past 4 years (*see Exhibit E*).

FAA Has Started to Commission AMASS After Major Delays, But Challenges Still Remain. Over the last decade FAA has focused on AMASS to alert air traffic controllers at the 34 largest airports of impending runway incursions and accidents. AMASS is a “one size fits all” software enhancement to the ASDE-3 radar. Since 1991, FAA has been developing and evaluating AMASS, which was initially designed to address the NTSB’s recommendation in 1991 to commission technologies to prevent runway incursions. In October 1999, FAA told NTSB that the focus of AMASS changed from preventing runway incursions to preventing collisions because FAA had not developed an acceptable predictive warning system.

AMASS has experienced cost increases and schedule delays due to software development problems, human factors issues, and operational problems. The following chart shows that AMASS is 6 years behind schedule and \$86 million over cost projections made in 1993.

Plan	Baseline Cost	Last Installation Date
1993	\$59.8 M	1996
1997	\$74.1 M	2000
As of May 2001	\$146.0 M	2002

AMASS has had continued problems with nuisance and false alerts.⁶ In November 2000, FAA’s Air Traffic Services Test Team issued its report on the independent operational test and evaluation of AMASS at San Francisco International Airport and Detroit Metropolitan Wayne County Airport and concluded that *AMASS is not operationally acceptable*. The system was reevaluated at both airports after software modifications were made and found to be operationally acceptable in May 2001.

FAA has been evaluating and testing AMASS for nearly 2 years at San Francisco and Detroit airports. AMASS was commissioned at San Francisco and Detroit airports in June 2001. FAA plans to commission AMASS at 31⁷

⁶ A nuisance alert results when two or more actual targets are incorrectly shown in conflict. A false alert occurs when one actual target and one false target are shown in conflict.

⁷ Ronald Reagan Washington National Airport is not expected to receive AMASS until after November 2002 because a remote tower has to be built for the ASDE-3 radar.

additional sites by November 2002, an average of about 2 sites per month. Before AMASS is commissioned at each site, the system must be adapted to the airport's configuration and operations, and fully tested to ensure that the system functions properly.

Based on longstanding problems with nuisance and false alerts at San Francisco and Detroit airports during evaluation and testing, the aggressive schedule poses a significant risk. *In our opinion, there is uncertainty as to how well the system will work at the remaining sites and whether this schedule will be met.* If controllers do not use AMASS due to excessive nuisance and false alerts, the system may be turned off just like the ASDE-3 radar at Ronald Reagan Washington National Airport, which was removed in the summer of 2000 because controllers were reluctant to use it due to excessive false targets.

FAA's Air Traffic Services Test Team from FAA's Office of Independent Test and Evaluation also has concerns about whether the AMASS schedule will be met. In its May 2001 Independent Operational Test and Evaluation Follow-up Report, the team concluded that Airway Facilities resources may not be sufficient to address requirements of the commissioned AMASS systems (San Francisco and Detroit), while working on commissioning AMASS at other airports. Accordingly, FAA needs to revisit the AMASS schedule and develop a realistic schedule for the remaining 32 AMASS sites.

FAA Needs to Provide Small to Medium Airports with Low-Cost Technologies to Reduce Runway Incursions. FAA has not provided small to medium airports (those not scheduled to receive AMASS), with low-cost technologies to prevent runway incursions as directed by Congress in October 1995. We found that FAA needs to determine technological needs of small to medium airports. Also, FAA needs to follow-through to ensure that runway incursion technologies that may benefit small to medium airports are evaluated in a timely manner.

The Technological Needs of Small to Medium Airports Must Be Determined. Between 1995 and 1999, in response to congressional direction, FAA evaluated three radars at Milwaukee, Salt Lake City, and Norfolk airports. The approximate costs of the radar systems produced by three different vendors were \$489,000, \$990,000, and \$3.2 million, respectively. In August 1999, FAA issued its evaluation report, which indicated that the low-cost radars did not meet reliability and maintainability requirements to work at airports.

Instead of a radar-only system, FAA awarded a contract in October 2000 for ASDE-X at 25 small to medium airports and 4 support systems. ASDE-X,

which is designed to more precisely identify aircraft and vehicles on the ground than just radar alone, has a contract cost of approximately \$2 million per unit. FAA's August 2000 Estimated Acquisition Program Baseline document for ASDE-X projects the life-cycle Facilities and Equipment costs from FY 2000 to FY 2026 to be \$332.6 million for the 29 systems, which comes to about \$11 million per unit (not low-cost as intended by Congress). This amount includes the cost of research and development, installation, initial spare parts, and contract administration, but does not include operations and maintenance costs. ASDE-X is not expected to be commissioned at the first 3 sites until FY 2003-2004, with the remaining 22 sites to be commissioned between FY 2005 and FY 2007.

FAA selected this technology using a "top down" approach, rather than evaluating the technological needs of specific airports with continued runway incursion problems. ASDE-X, which consists of a radar, processor, non-radar sensors,⁸ and a display, can be tailored to each airport's needs. ASDE-X was not designed to be a "one size fits all" technology. For example, one airport may need a radar-only system while another airport may need the full system with multilateration capability. While ASDE-X is not a "one size fits all" system, FAA's cost estimate reflects a full system for each of the 25 airports. On May 1, 2001, FAA decided to reevaluate the need for a full ASDE-X system at each of the 25 airports due to the high cost of the system. We agree with FAA's decision.

Evaluations of Technologies Must Be Completed Timely. FAA needs to follow-through to ensure that runway incursion technologies that may benefit small to medium airports are evaluated in a timely manner. For example, FAA did not give a high priority to completing its evaluation of loop technology at Long Beach airport, which monitors the movement of aircraft and vehicles by using in-ground sensors similar to those used on roads to activate stop lights. In October 1993, FAA told NTSB that it was evaluating loop technology as one of several different technologies for monitoring airport surface movement at lower activity airports. Loop technology was installed and tested at Long Beach airport in 1993. Congress appropriated \$2 million in FY 1996 and another \$1.9 million in FY 1998 to develop the prototype loop system at Long Beach airport. After 8 years, FAA has finally completed testing of loop technology at Long Beach airport and plans to issue a final report in the summer of 2001.

⁸ The purpose of these sensors is to more accurately identify aircraft and vehicles on the airport surface than radar alone.

In September 2000, FAA issued a Broad Agency Announcement (BAA) to solicit ideas from industry to explore new and emerging lower cost technologies to improve surface safety in the near term. In February 2001, FAA awarded contracts to five vendors to demonstrate technologies such as addressable signs and infrared and magnetic sensors that detect aircraft and vehicle movement on the ground. In May 2001, FAA issued a contract to another vendor to demonstrate runway safety lights to help pilots determine if it is safe to cross a runway. Field demonstrations are to be completed within a year of award. This BAA is a step in the right direction, but FAA must follow-through and complete its evaluations of these technologies.

Technologies to Assist Pilots in Preventing Runway Incursions Need to Be Expedited. Runway incursions caused by pilot error (pilot deviations), which represented 60 percent of the runway incursions in 2000, continue to be the leading cause of runway incursions. However, AMASS and ASDE-X are tools to help controllers prevent runway accidents, and they will be at a total of 59 airports. Technologies such as in-cockpit moving map displays and ADS-B satellite navigation technology have the most potential for reducing runway incursions because they help pilots prevent runway incursions. However, these technologies are several years away from becoming fully operational unless efforts are made by FAA, the airline industry, and the general aviation community to expedite their use.

The National Aeronautics and Space Administration (NASA), FAA, and the Cargo Airline Association (CAA) are assessing electronic moving map display technology to increase pilot situational awareness and help reduce pilot errors on runways and taxiways. This technology provides the pilot with a map of the airport on a cockpit display depicting the aircraft's exact location. A system will be available for the general aviation community by summer 2001 and a commercial variation will be available by winter 2001. The system is estimated to cost between \$15,000 and \$90,000, depending on whether the display is fully integrated with an aircraft's avionics. The moving map display is a promising first step in helping pilots know precisely where they are on the airport surface at all times. While FAA has decided not to mandate this equipment to the airline industry, FAA should aggressively promote this technology as a vital first step in increasing flight crews' surface situational awareness.

The second step, which FAA is demonstrating in conjunction with CAA under FAA's Safe Flight 21 program, is to provide pilots, through the use of ADS-B satellite technology, a moving map display that shows where other aircraft are on the runways and taxiways. ADS-B differs significantly from other technologies because it creates a redundancy ("*a second set of eyes*") by

including the pilot in the loop to help detect and alleviate hazardous surface situations. One drawback of this technology is that it requires all aircraft, including general aviation aircraft, to be equipped with this technology. Equipage of ADS-B technology may cost approximately \$15,000 to \$17,000 for each general aviation aircraft. A system for commercial cargo and air carrier aircraft is estimated to cost approximately \$100,000. FAA officials do not think ADS-B technology will be ready for commissioning and full operational use for another 2 to 5 years depending on how long it takes to certify ADS-B for safe operation.

The use of these technologies must be expedited. FAA should determine if its process to certify new equipment could be accelerated to expedite these technologies. FAA should also issue an Advanced Notice of Proposed Rulemaking to obtain comments from the airline industry and general aviation community on implementing in-cockpit moving map displays and ADS-B.

Oversight Authority and Accountability Over the Runway Safety Program Need to Be Strengthened. Another significant factor constraining FAA's efforts to reverse the upward trend in runway incursions is the lack of accountability for completion of actions to reduce runway incursions. While FAA's Runway Safety Program Director is the single point of contact for all runway safety activities, the Director has little authority to ensure initiatives undertaken by various FAA lines of business are completed. FAA needs to provide the Director, who is under Air Traffic, authority to ensure that employees from other lines of business complete tasks to reduce runway incursions on time. FAA needs to develop a mechanism to hold people involved with runway safety accountable, such as directing the Runway Safety Director to provide input on individuals' performance appraisals and bonuses. Additionally, FAA should also consider realigning the Runway Safety Program under FAA's Deputy Administrator office to elevate the program importance above all lines of business.

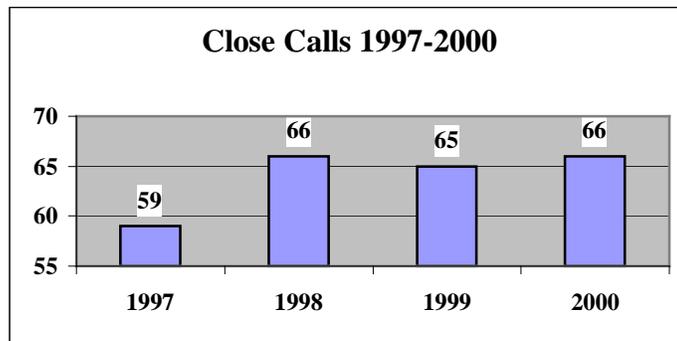
FAA Needs to Measure the Effectiveness of Its Initiatives. While FAA has had three action plans to reduce runway incursions since 1991, it has not determined whether its specific actions are working, or if other actions are needed. Runway Safety Program officials stated that FAA needs to improve its runway incursion data in order to determine why runway incursions occurred before it can evaluate whether initiatives to correct the identified causes are working.

FAA is making progress in improving its runway incursion data. To its credit, FAA has evaluated 1,369 runway incursions that occurred between 1997 and

2000, and grouped them into four risk categories. The four risk categories described in part are:

- A: barely avoid a collision,
- B: significant potential for a collision exists,
- C: ample time and distance exists to avoid a potential collision, and
- D: little or no risk of a collision exists.

During the 4-year period ending in December 2000, there were 256 close calls (those runway incursions in categories A and B) or between 59 to 66 a year. About 63 percent or 161 of close calls involved at least one commercial aircraft.



FAA is planning to use these data to obtain a historical perspective and determine the causal factors contributing to runway incursions and prevention strategies. FAA plans to implement its new runway incursion data system by the end of June 2001. Once the data are improved, FAA needs to measure the effectiveness of its initiatives to ensure that its resources are focused in the right direction.

FAA Needs to Hold Regions Accountable for Making Progress in Reducing Runway Incursions. Before new Regional Runway Safety Program Managers were hired in October 2000, regional focus on local incursion prevention activities was inadequate.

- None of the five regional offices visited during the audit could provide any analyses of runway incursion trends at airports in the region to identify solutions for airport-specific problems.

- Surface Incident Prevention Plans, comprehensive plans that address the prevention of runway incursions and surface incidents⁹ at specific airports, were not prepared for 5 of 11 airports visited.
- Two of five regions (Southern and Eastern Regions) visited did not adequately track the status of Runway Incursion Action Team evaluation recommendations or establish target dates to ensure timely completion.

FAA recently strengthened regional efforts to reduce runway incursions but needs to go farther. The nine new Regional Runway Safety Program Managers will report directly to the Regional Administrator and indirectly to the Director of the Runway Safety Program at headquarters. The new managers will work on runway incursion issues full time, unlike their predecessors who only performed the function as a collateral duty. These managers plan to direct evaluations on runway safety at 167 airports this year, over 140 more than last year. These efforts are steps in the right direction. However, FAA must develop a mechanism to periodically assess whether the Regional Runway Safety Program Managers are making progress in correcting airport-specific problems and reducing runway incursions. Without strong oversight and accountability, FAA's Runway Safety Program Office has no assurance that regional efforts are adequately focused on correcting airport-specific problems.

Recommendations

Our recommendations focus on what FAA needs to do to reverse the upward trend in runway incursions.

- To ensure technologies are provided to airports with continued runway incursion problems, FAA should:
 - Expedite the use of in-cockpit moving map displays and ADS-B for use by pilots in reducing runway incursions. FAA should determine if its process to certify new equipment for safe operation could be accelerated to expedite these technologies. FAA should also issue an Advanced Notice of Proposed Rulemaking to obtain comments from the airline industry and general aviation community on implementing in-cockpit moving map displays and ADS-B.

⁹ An event where authorized or unauthorized/unapproved movement occurs on the airport surface that affects or could affect the safety of flight.

- Develop a realistic schedule to commission the remaining 32 AMASS sites. The current schedule is unlikely to be met unless Airway Facilities resources are adequate to commission the remaining sites and time is allowed to ensure controller acceptance of AMASS.
 - Determine whether some airport needs for ASDE-X can be met by radar alone. After airport needs are identified, FAA should revise its ASDE-X cost and schedule baseline.
 - Complete its evaluations of the six emerging technologies it has identified to assist controllers and pilots in reducing runway incursions and advance the ones most likely to reduce runway incursions quickly to high-risk airports.
 - Conduct reviews at the 13 airports that had 10 or more runway incursions over the past 4 years to determine whether technological solutions are needed.
- To improve oversight authority and accountability over the Runway Safety Program, FAA should:
- Provide the Runway Safety Program Director with authority to ensure that employees from other lines of business complete tasks to reduce runway incursions on time. An accountability mechanism, such as directing the Runway Safety Program Director to provide input on individuals' performance appraisals and bonuses, should be developed to hold people involved with runway safety accountable for completing initiatives within established milestones. Consideration should be given to realigning the Runway Safety Program under FAA's Deputy Administrator office to elevate the program importance above all lines of business.
- To further facilitate accountability over the Runway Safety Program, FAA should:
- Measure whether initiatives are effective in addressing the causes of runway incursions, and periodically assess regional efforts to ensure that progress is being made to reduce runway incursions at specific airports.

Agency Comments and Office of Inspector General Response

With the exception of FAA's proposed actions to expedite the use of in-cockpit moving map displays and ADS-B and to improve the authority and accountability over the Runway Safety Program, we considered its actions taken and planned to be responsive to our recommendations.

FAA's proposed actions to expedite the use of in-cockpit moving map displays and Automatic Dependent Surveillance - Broadcast and to improve the authority and accountability of the Runway Safety Program Director are ambiguous. Also, it is not clear to us what milestones, if any, apply to implementing these recommendations. FAA needs to reconsider its position on both recommendations and provide target dates for implementation.

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Introduction

Background

Runway incursions,¹ incidents on the runway that create a collision hazard, can have serious consequences. The worst aviation accident in history occurred in 1977 on a runway in the Canary Islands in Tenerife where 583 people were killed. Another accident occurred in October 2000 at Taipei's Chang Kai Shek International Airport when a Boeing 747 took off on a closed runway and collided with construction equipment killing 81 people onboard. While these accidents did not occur in the United States, they show the extent of the safety risk posed by runway incursions. In the United States there have been 7 runway accidents since 1990 that claimed 63 lives and damaged 13 aircraft. One of these accidents occurred in March 2000 when two general aviation aircraft collided at Bradenton International Airport in Sarasota, Florida, killing four people onboard both aircraft.

The National Transportation Safety Board (NTSB) has expressed concern that the expected increase in air traffic activity may result in further increases in runway incursions, which may lead to additional accidents. NTSB has included reducing runway incursions on its annual "Most Wanted" list of transportation safety improvements since 1990. A November 2000 study titled "Fatal U.S. Runway Collisions Over the Next Twenty Years" performed under contract for the Federal Aviation Administration (FAA) projected that 15 fatal runway collisions at towered airports could kill 700 to 800 people and seriously injure 200 others over the next 20 years if nothing more is done.²

FAA has been pursuing technologies to reduce runway incursions and prevent accidents for over a decade. It funded approximately \$376 million for such projects during fiscal years (FY) 1985 to 2000. An additional \$18.6 million was appropriated for FY 1999, \$33.7 million for FY 2000, and \$52.6 million for FY 2001.

The majority of the funds for runway incursions technology projects have been used for Airport Surface Detection Equipment, Model 3 (ASDE-3) and Airport

¹ FAA defines a runway incursion as any occurrence at an airport involving an aircraft, vehicle, person, or object on the ground, that creates a collision hazard or results in a loss of separation with an aircraft taking off, intending to take off, landing, or intending to land. FAA's definition applies only to airports with operating air traffic control towers.

² The study treated 2003 through 2022 as "the next twenty years."

Movement Area Safety System (AMASS) to assist air traffic controllers at 34 of the largest airports. ASDE-3, which costs approximately \$7 million per unit and is designed to aid controllers in the safe movement of aircraft especially in low visibility conditions, is operational at 32 airports. ASDE-3 is expected to be operational at two more airports by October 2002. AMASS, a software enhancement to ASDE that will cost an additional \$4 million per unit, is designed to alert controllers of impending collisions. AMASS has been commissioned at 2 of the 34 airports.

Objectives, Scope, and Methodology

The audit objective was to evaluate the adequacy of the FAA's efforts to identify and deploy (commission for operational use) new technologies to reduce runway incursions. Additionally, we determined whether FAA implemented recommendations contained in our previous reports.³ We conducted the audit between November 1999 and May 2001.

We conducted the audit at FAA Headquarters in Washington, DC, 5 regions, and 13 airport facilities. The review was conducted in accordance with the Government Auditing Standards prescribed by the Comptroller General of the United States.

Findings and Recommendations

FAA Made Reducing Runway Incursions a Top Priority

Since the fall of 1999, the FAA Administrator has made reducing runway incursions a top agency priority. The Administrator appointed a new Director of Runway Safety as the single point of contact for all runway safety activities. In the spring of 2000, FAA conducted nine regional runway incursion workshops, followed by a Human Factors symposium and a Runway Safety National Summit. These events brought together all the stakeholders in runway safety to develop additional ways to reduce runway incursions.

In August 2000, FAA identified 10 initiatives most likely to reduce runway incursions in the near term. These initiatives included reviewing pilot/controller communications phraseology, providing runway incursion

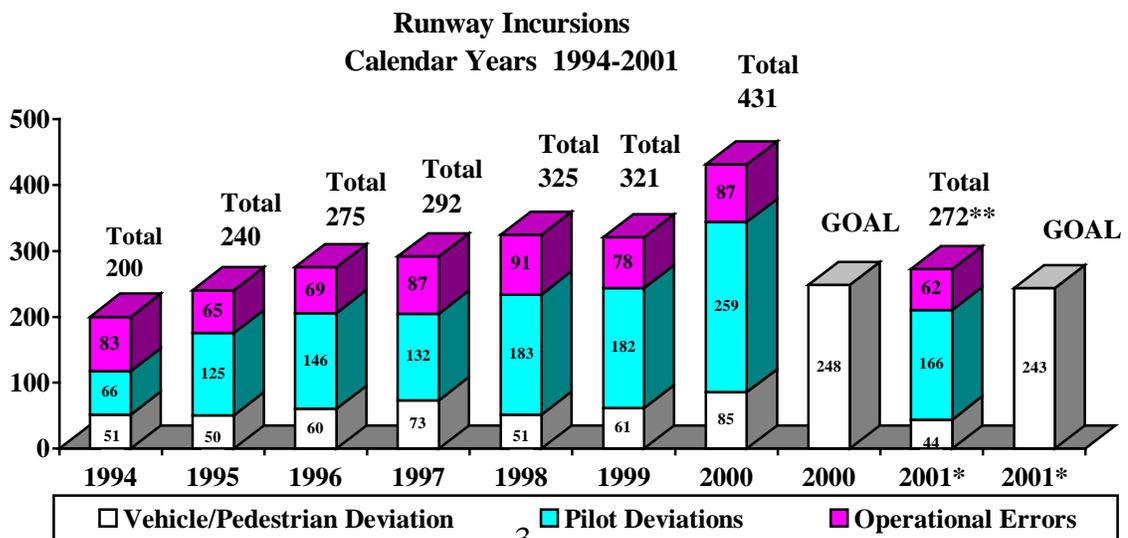
³ Report on Audit of the Runway Incursion Program (Report Number AV-1998-075, February 9, 1998) and Report on Follow-up Review of FAA's Runway Safety Program (Report Number AV-1999-114, July 21, 1999).

training for pilots and controllers, implementing a technology assessment program, and improving airport surface operations and markings. In October 2000, FAA included these 10 initiatives together with certain initiatives selected from its 1998 Action Plan and published a National Blueprint to reduce runway incursions. FAA also revised its standards to increase the size of various holding position markings to make them more noticeable. In FY 2001, Congress appropriated \$52.6 million for runway incursion initiatives, almost \$19 million more than in FY 2000. FAA has requested a total of \$73.6 million in the FY 2002 budget in support of Runway Safety Programs.

FAA took action to improve regional and local efforts to reduce runway incursions and to improve data to better identify causes of runway incursions. In October 2000, FAA appointed nine new full-time Regional Runway Safety Program Managers. These managers plan to direct evaluations on runway safety at 167 airports this year, over 140 more than last year. To improve runway incursion data, FAA is developing a new process to identify and investigate those incursions where there was a high risk of collision. This process should help FAA identify the related causes and contributing factors of runway incursions and develop an effective prevention strategy. FAA has identified whether commercial or general aviation aircraft are involved for all runway incursions. In the past, this information was only available for runway incursions involving pilot error. FAA plans to implement its new runway incursion data system by the end of June 2001.

Runway Incursions Continue to Rise

Despite significant management focus this past year, runway incursions continue to rise and still pose a serious safety risk. The following chart shows the number of runway incursions by three types: pilot deviations, operational errors, and vehicle or pedestrian deviations.



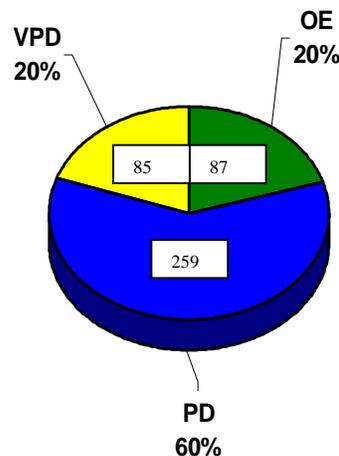
*Beginning with October 2000, FAA changed its goal from a calendar year to a fiscal year basis

** As of May 31, 2001 (Total includes 106 runway incursions from October-December 2000)

Pilot deviations are errors that violate Federal Aviation Regulations. For example, a pilot deviation occurs when a pilot fails to follow air traffic controller instructions to stop short of an active runway, causing another aircraft to abort its departure or arrival. Operational errors are occurrences attributable to air traffic control that result in less than the required separation between aircraft. Vehicle or pedestrian deviations involve the presence of vehicles, non-pilot operated aircraft, or pedestrians on runways or taxiways without authorization from a controller.

The primary cause for the increase in runway incursions during 2000 continues to be attributed to pilot deviations, which accounted for 60 percent of the 431 runway incursions, as shown on the following chart.

Causes of Runway Incursions in 2000



OE-Operational Error
VPD-Vehicle/Pedestrian Deviation
PD-Pilot Deviation

In the Department of Transportation FY 2002 Performance Plan, FAA's goal is to reduce runway incursions to no more than 243 by the end of FY 2001. (In prior years, runway incursion goals were based on calendar years, but DOT changed its reporting of runway incursions to a fiscal year basis to facilitate timely performance reporting.) As of May 31, 2001, the number of runway incursions for FY 2001 is already 272, surpassing FAA's goal for FY 2001 with 4 months remaining in the fiscal year. FAA's FY 2002 goal is to reduce runway incursions further, to no more than 236.

While there is no one solution to reducing runway incursions, it has become apparent, based on the increasing numbers of runway incursions, that technological solutions must be expedited to assist pilots and controllers in preventing runway incursions and accidents. Further, the Runway Safety Program Office must have the authority to hold Headquarters and Regions accountable for making progress in completing runway incursion initiatives and in reducing the number of runway incursions. FAA has had 3 plans since 1991 that included over 260 actions to reduce runway incursions. Actions included such things as training vehicle operators and improving markings, signs, and lighting. FAA also made procedural changes such as requiring pilots to read back their clearances before entering an active runway and establishing uniform procedures for airport surface movement in low visibility conditions. Despite these actions, including FAA's significant management focus on reducing runway incursions since the fall of 1999, close calls on the runway continue to happen.

In our opinion, FAA has taken many steps to reduce runway incursions, but it is apparent that what FAA is doing is not enough to lower the risk of a runway accident. Actions FAA needs to take to reverse the upward trend in runway incursions are indicated below.

Two significant factors have constrained FAA's progress in reducing runway incursions.

- FAA has not provided technologies to airports with continued runway incursion problems.
 - FAA has been developing, evaluating, and testing AMASS since 1991. FAA commissioned AMASS at San Francisco and Detroit airports in June 2001. Based on longstanding problems with false alerts at San Francisco and Detroit airports during evaluation and testing that have only recently been corrected, there is uncertainty as to whether the system will work at the remaining sites and whether the schedule to commission 31⁴ additional sites by November 2002 will be met.
 - FAA has not provided low-cost technologies to reduce runway incursions to small to medium airports. FAA needs to follow-through to ensure that runway incursion technologies are evaluated timely. Also,

⁴ Ronald Reagan Washington National Airport is not expected to receive AMASS until after November 2002 because a remote tower has to be built for the ASDE-3 radar.

FAA needs to evaluate the technological needs of specific airports with continued runway incursion problems and determine if low-cost solutions are available, rather than using a top down “one size fits all” approach.

FAA’s major technology efforts have been focused on assisting air traffic controllers in preventing accidents, but these tools will not help pilots avoid runway incursions. Runway incursions caused by pilot errors, which represented 60 percent of the runway incursions in 2000, continue to be the leading cause of runway incursions. Technologies to assist pilots in knowing where they are on the runway and where others are on the runway to provide “*a second set of eyes*” must be expedited by FAA, the airline industry, and the general aviation community to avoid close calls that continue to happen and pose a serious safety risk to airline crews and passengers.

FAA should determine if its process to certify new equipment could be accelerated to expedite these technologies. FAA should also issue an Advanced Notice of Proposed Rulemaking to obtain comments from the airline industry and general aviation community on implementing in-cockpit moving map displays and Automatic Dependent Surveillance Broadcast (ADS-B).

- Another important factor constraining FAA’s efforts to reduce runway incursions is the lack of strong national oversight and accountability for both Headquarters and regional actions to reduce runway incursions. Without strong oversight of FAA’s Runway Safety Program activities, FAA has little assurance that its actions are completed on time and are effective in reducing runway incursions.

Airports With Continued Runway Incursion Problems Need Technological Solutions

The following chart shows the 10 airports with the most runway incursions over the last 4 years, and indicates whether they are scheduled to receive AMASS or ASDE-X. The chart also indicates whether the airport has commercial airline service and shows the number of airport operations in 2000. *See Exhibit E for the complete listing of airports with a total of 10 or more runway incursions from 1997 to 2000.*

10 Airports With the Most Runway Incursions During 1997-2000

Rank	Airport	Total Number of Runway Incursions	Commercial Service	Number of Airport Operations in 2000	Planned Date to Commission AMASS	Scheduled to Receive ASDE-X Between FY2003-FY2007
1	Los Angeles	33	X	783,684	8/01	
2	St. Louis	30	X	484,224	7/01	
3	Orange County	27	X	387,864		X
4	North Las Vegas	26		225,505		
5	Long Beach	25	X	379,399		
6	Dallas-Forth Worth	23	X	865,777	9/02	
7	San Francisco	21	X	430,554	6/01 (Commissioned)	
8	San Diego/Montgomery Field	20		232,141		
9	Fort Lauderdale Executive	20		259,876		
10	Phoenix	20	X	638,757		X

As shown above, FAA commissioned AMASS at San Francisco airport, and three other airports with the most runway incursions are scheduled to have AMASS commissioned this year. Two airports (Orange County and Phoenix) shown in the above chart, are programmed to receive ASDE-X some time after FY 2003, but a schedule showing when each of the 25 sites will receive ASDE-X has not yet been developed.

However, Long Beach airport and three general aviation airports (North Las Vegas, Fort Lauderdale Executive, and San Diego/Montgomery Field) are not scheduled to receive any technology to reduce runway incursions. Runway incursions at these 4 airports have increased 126 percent from a total of 19 in 1999 to 43 in 2000, primarily due to increases in pilot deviations.

In addition to these 4 airports, we identified 9 other airports that had a total of 10 or more runway incursions from 1997 to 2000 that are not scheduled to receive any technology. These 13 airports represent 35 percent of the 37 airports that had 10 or more incursions over the past 4 years (*see Exhibit E*). Accordingly, FAA should conduct reviews at these airports to determine whether low-cost technological solutions are needed.

FAA Has Started to Commission AMASS After Major Delays, But Challenges Still Remain

Over the last decade FAA has focused on AMASS, a “one size fits all” software enhancement to the ASDE-3 radar designed to alert air traffic controllers at the 34 largest airports of impending runway conflicts. Since 1991, FAA has been developing and evaluating AMASS in response to an NTSB recommendation that FAA expedite efforts to develop and implement a system to alert controllers of impending runway incursions. The recommendation was made after a runway incursion caused an accident on the runway at Atlanta Hartsfield International Airport in January 1990. NTSB then listed runway incursions on its “Most Wanted” list of transportation safety improvements in 1990, and it has been on the list since that time.

In August 1991, FAA advised NTSB that AMASS would address the intent of the Board’s safety recommendation. AMASS was intended to continually monitor airport surface traffic and automatically alert air traffic controllers to potential conflicts. FAA plans to commission AMASS at the 34 largest airports nationwide that have the ASDE-3 radar. The contract for the first three AMASS units was awarded in June 1996.

AMASS will not meet the intent of NTSB’s initial recommendation in 1991, which was to commission technologies to prevent runway incursions. In October 1999, FAA told NTSB that the focus of AMASS changed from preventing runway incursions to preventing collisions because FAA was unable to develop an acceptable predictive warning system. Now NTSB is concerned that AMASS may not even alert air traffic controllers in time to avoid an accident.

AMASS has experienced cost increases and schedule delays due to software development problems, human factors issues, and operational problems. The following chart shows that AMASS is 6 years behind schedule and \$86 million over cost projections made in 1993.

Plan	Baseline Cost	Last Installation Date
1993	\$59.8 M	1996
1997	\$74.1 M	2000
As of May 2001	\$146.0 M	2002

AMASS has had continuous problems with nuisance and false alerts.⁵ In November 2000, FAA's Air Traffic Service test team issued its report on the independent operational test and evaluation of AMASS at San Francisco International Airport and Detroit Metropolitan Wayne County Airport and concluded that *AMASS is not operationally acceptable*. The system was reevaluated at both airports after software modifications were made and found to be operationally acceptable in May 2001.

FAA has been evaluating and testing AMASS for nearly 2 years at San Francisco and Detroit airports. AMASS was commissioned at San Francisco and Detroit airports in June 2001. FAA plans to commission AMASS at 31⁶ additional sites by November 2002, an average of about 2 sites per month. Before AMASS is commissioned at each site, the system must be adapted to the airport's configuration and operations and must be fully tested to ensure that the system functions properly.

Based on the longstanding problems with nuisance and false alerts at San Francisco and Detroit airports, the aggressive schedule poses a significant risk. *In our opinion, there is uncertainty as to how well the system will work at the remaining sites and whether this schedule will be met.* If controllers do not use AMASS due to excessive nuisance and false alerts, the system may be turned off just like the ASDE-3 radar at Ronald Reagan Washington National Airport, which was removed in the summer of 2000 because controllers were reluctant to use it due to excessive false targets.

FAA's Air Traffic Services Test Team from FAA's Office of Independent Test and Evaluation also has concerns about whether the AMASS schedule will be met. In its May 2001 Independent Operational Test and Evaluation Follow-up Report, the team concluded Airway Facilities resources may not be sufficient to address requirements of the commissioned AMASS systems (San Francisco and Detroit), while working on commissioning AMASS at other airports. Accordingly, FAA needs to revisit the AMASS schedule and develop a realistic schedule for the remaining 32 AMASS sites. The current schedule is unlikely to be met unless Airway Facilities resources are adequate to commission the remaining sites and time is allowed to ensure controller acceptance of AMASS.

⁵ A nuisance alert results when two or more actual targets are incorrectly shown in conflict. A false alert occurs when one actual target and one false target are shown in conflict.

⁶ Ronald Reagan Washington National Airport is not expected to receive AMASS until after November 2002 because a remote tower has to be built for the ASDE-3 radar.

FAA Has Not Provided Technologies to Assist Smaller Airports in Reducing Runway Incursions

FAA has not provided small to medium airports (those not scheduled to receive AMASS) with low-cost technologies to prevent runway incursions as directed by Congress in October 1995. We found that FAA needs to determine technological needs of small to medium airports. Also, FAA needs to follow-through to ensure that runway incursion technologies under its Research, Engineering, and Development (R, E &D) Program that may benefit small to medium airports are evaluated timely.

FAA Should Determine Technological Needs of Small to Medium Airports. Between 1995 and 1999, FAA evaluated three radars at Milwaukee, Salt Lake City, and Norfolk airports in response to congressional direction to provide small to medium airports not scheduled to receive AMASS with low-cost technologies to prevent runway incursions. The approximate cost of the radar systems was \$489,000, \$990,000, and \$3.2 million, respectively. In August 1999, FAA issued its evaluation report which indicated that the low-cost radars did not meet reliability and maintainability requirements to work at airports.

Instead of a radar-only system, FAA awarded a contract in October 2000 for ASDE-X at 25 small to medium airports and 4 support systems. ASDE-X consists of a radar, processor, non-radar sensors,⁷ and a display. It is designed to more precisely identify aircraft and vehicles on the ground than radar alone. ASDE-X can be tailored to each airport's needs. For example, one airport may need a radar-only system while another airport may need the full system with multilateration capability.

However, ASDE-X is not low cost and will take several years to commission. The contract cost of the ASDE-X hardware is approximately \$2 million per site. FAA's August 2000 Estimated Acquisition Program Baseline document for ASDE-X projects the life-cycle Facilities and Equipment costs from FY 2000 to FY 2026 to be \$332.6 million for the 29 systems. That comes to about \$11 million per unit, when adding in the cost of research and development, installation, initial spare parts, and contract administration. These costs do not include operations and maintenance costs. Further, ASDE-X is not expected to be commissioned at the first 3 sites until FY 2003-

⁷ The purpose of these sensors is to more accurately identify aircraft and vehicles on the airport surface than radar alone.

2004, with the remaining 22 sites to be commissioned between FY 2005 and FY 2007.

In the October 2000 House of Representatives Conference Report on the Department of Transportation appropriations for FY 2001, Congress questioned the high cost of ASDE-X especially given that it will be placed at small to medium airports. Congress also raised concerns because FAA did not agree to congressional direction to commission the first 10 ASDE-X systems by September 2002. Instead, FAA's proposed schedule for the first 10 systems is 3 years later.

We agree with congressional concerns over the affordability of ASDE-X, given that the airports are small to medium airports and may not need a full ASDE-X system. While ASDE-X is not a "one size fits all" system, FAA's cost estimate reflects a full system for each of the 25 airports.

On May 1, 2001, FAA decided to reevaluate the need for a full ASDE-X system at each of the 25 airports due to the high cost of the system. We agree with FAA's decision because \$11 million per unit is no longer low-cost given that ASDE-X is intended for small to medium airports. FAA selected this technology using a "top down" approach, rather than evaluating the technological needs of specific airports with continued runway incursion problems.

FAA Needs to Ensure that Evaluations of R, E & D Projects Are Completed.
We found that FAA did not always follow through to complete evaluations of runway incursion technologies in a timely manner.

For example, FAA did not give a high priority to completing its evaluation of loop technology at Long Beach airport, which monitors the movement of aircraft and vehicles by using in-ground sensors similar to those used on roads to activate stop lights. In October 1993 FAA told NTSB that it was evaluating loop technology as one of several different technologies for monitoring airport surface movement at lower activity airports. Loop technology was installed and tested at Long Beach airport in 1993. Congress appropriated \$2 million in FY 1996 and another \$1.9 million in FY 1998 to develop the prototype loop system at Long Beach airport. After 8 years, FAA has finally completed testing of loop technology at Long Beach airport and plans to issue a final report in the summer of 2001.

In September 2000, FAA issued a Broad Agency Announcement (BAA) to solicit ideas from industry to explore new and emerging lower cost technologies to improve surface safety in the near term. In February 2001,

FAA awarded contracts to five vendors to demonstrate technologies such as addressable signs and infrared and magnetic sensors that detect aircraft and vehicle movement on the ground. In May 2001, FAA issued a contract to another vendor to demonstrate runway safety lights to help pilots determine if it is safe to cross a runway. Field demonstrations are to be completed within a year of award. This BAA is a step in the right direction, but FAA must follow-through and complete its evaluations of these technologies.

Technologies to Help Pilots Prevent Runway Incursions Need to Be Expedited

Runway incursions caused by pilot error (pilot deviations), which represented 60 percent of the runway incursions in 2000, continue to be the leading cause of runway incursions. AMASS and ASDE-X are tools to help controllers prevent runway accidents, and they are limited to a total of 59 airports. Technologies such as in-cockpit moving map displays and ADS-B satellite navigation technology have the most potential for reducing runway incursions because they help pilots prevent runway incursions. However, these technologies are several years away from becoming fully operational unless efforts are made by FAA, the airline industry, and the general aviation community to expedite their use.

National Aeronautics and Space Administration (NASA), FAA, and the Cargo Airline Association (CAA) are assessing electronic moving map display technology to increase pilot situational awareness and help reduce pilot errors on runways and taxiways. This technology provides the pilot with a map of the airport on a cockpit display depicting the aircraft's exact location. A system will be available for the general aviation community by summer 2001 and a commercial variation will be available by winter 2001. The system is estimated to cost between \$15,000 and \$90,000, depending on whether the display is fully integrated with an aircraft's avionics. The moving map display is a promising first step in helping pilots know precisely where they are on the airport surface at all times. While FAA has decided not to mandate this equipment to the airline industry, FAA should aggressively promote this technology in the aviation industry as a vital first step in increasing flight crews' surface situational awareness.

The second step, which FAA is demonstrating in conjunction with CAA under FAA's Safe Flight 21 program, is to provide pilots, through the use of ADS-B satellite technology, a moving map display that shows where other aircraft are on the runways and taxiways. ADS-B differs significantly from other technologies because it creates a redundancy ("*a second set of eyes*") by

including the pilot in the loop to help detect and alleviate hazardous surface situations. One drawback of this technology is that it requires all aircraft, including general aviation aircraft, to be equipped with this technology. Equipage of ADS-B technology may cost approximately \$15,000 to \$17,000 for each general aviation aircraft. A system for commercial cargo and air carrier aircraft is estimated to cost approximately \$100,000. FAA officials do not think ADS-B technology will be ready for commissioning and full operational use for another 2 to 5 years depending on how long it takes to certify ADS-B.

FAA must expedite the use of these technologies. FAA should determine if its process to certify new equipment could be accelerated to expedite these technologies. FAA should also issue an Advanced Notice of Proposed Rulemaking to obtain comments from the airline industry and general aviation community on implementing in-cockpit moving map displays and ADS-B.

Oversight Authority and Accountability Over the Runway Safety Program Need to Be Strengthened

Another important factor constraining FAA's efforts to reverse the upward trend in runway incursions is the lack of accountability for completion of actions to reduce runway incursions. While FAA's Runway Safety Program Director is the single point of contact for all runway safety activities, the Director has little authority to ensure initiatives undertaken by various FAA lines of business are completed. FAA needs to provide the Director, who is under Air Traffic, with authority to ensure that employees from other lines of business complete tasks to reduce runway incursions on time. An accountability mechanism, such as directing the Runway Safety Program Director to provide input on individuals' performance appraisals and bonuses, should be developed to hold people involved with runway safety accountable for completing initiatives within established milestones. Consideration should be given to realigning the Runway Safety Program under FAA's Deputy Administrator office to elevate the program importance above all lines of business.

FAA Needs to Complete Actions to Reduce Runway Incursions On Time.

FAA had not implemented 50 percent of the initiatives in its 1998 Airport Surface Operations Safety Action Plan with scheduled milestone dates through April 2000. For example, a project tasking the FAA Technical Center to work with aircraft operators and manufacturers to investigate technologies and procedures to improve aircraft lighting had not been completed.

In August 2000, FAA identified 10 initiatives most likely to reduce runway incursions in the near term. FAA included these 10 initiatives in its October 2000 National Blueprint to reduce runway incursions together with certain initiatives selected from its 1998 Action Plan. We evaluated the 10 initiatives and found that 4 were 6 to 12 months behind schedule. For example, an action to enhance operational tower controller training scheduled to be completed by December 31, 2000, is not expected to be completed until the beginning of October 2001 at the earliest. Officials from the Runway Safety Program Office attributed delays in meeting schedule to funds not being allocated in a timely manner and delays in forming workgroups assisting with completing initiatives.

FAA Needs to Measure the Effectiveness of Its Initiatives. While FAA has had three action plans to reduce runway incursions since 1991, it still is not determining whether its specific actions are working, or if other actions are needed. Runway Safety Program officials stated that FAA needs to improve its runway incursion data in order to determine why runway incursions occurred before it can evaluate whether initiatives to correct the identified causes are working.

In May 2000, FAA and industry officials on the Runway Incursion Joint Safety Analysis Team reported that FAA's current reports of operational errors, pilot deviations, and vehicle/pedestrian deviations are inadequate to readily determine why a particular incident occurred. The team recommended standardization and improvements to FAA's data collection and analysis efforts. In October 2000, FAA began developing a process to improve its runway incursion data collection, analysis and reporting.

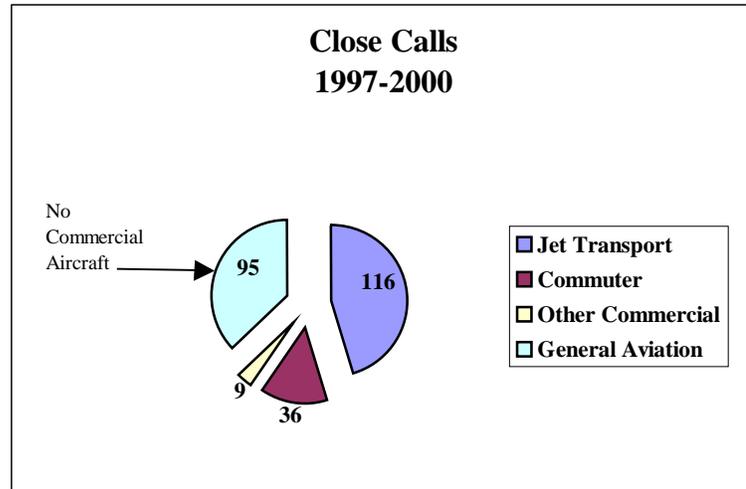
FAA is making progress in improving its runway incursion data. To its credit, FAA has evaluated over 1,369 runway incursions that occurred between 1997 and 2000, and grouped them into 4 risk categories. The four risk categories described in part are:

- A: barely avoid a collision,
- B: significant potential for a collision existed,
- C: ample time and distance exists to avoid a potential collision, and
- D: little or no risk of a collision exists.

FAA is planning to use these data to obtain a historical perspective and determine the causal factors contributing to runway incursions.

The data show that close calls (those runway incursions in levels A and B), totaling 256 over the 4-year period, have remained constant at between 59 to 66

close calls a year. The data also show that about 63 percent or 161 of close calls involve at least one commercial aircraft. The following chart shows the close calls between various types of aircraft.



FAA plans to implement its new runway incursion data system by the end of June 2001. Through its new process, FAA will identify and investigate those incursions where there was an increased risk of collision in order to identify the related causes and contributing factors and develop an effective prevention strategy. The system will also provide details such as aircraft type, airport location, and weather conditions. Once the data are improved, FAA needs to develop a method to evaluate its initiatives to ensure that its resources are focused in the right direction.

FAA Needs to Assess Regions' Progress in Reducing Runway Incursions. Before the new Regional Runway Safety Program Managers were hired in October 2000, we found that FAA's regional focus on local incursion prevention activities was inadequate.

- None of the five regional offices visited during the audit could provide any analyses of runway incursion trends at airports in the region to identify solutions for airport-specific problems.
- Surface Incident Prevention Plans, comprehensive plans that address the prevention of runway incursions and surface incidents⁸ at specific airports, were not prepared for 5 of 11 airports visited.

⁸ An event where authorized or unauthorized/unapproved movement occurs on the airport surface that affects or could affect the safety of flight.

- Two of five regions (Southern and Eastern Regions) visited did not adequately track the status of Runway Incursion Action Team evaluation recommendations or establish target dates to ensure timely completion.

We found that FAA recently strengthened regional efforts to reduce runway incursions, but needs to go farther. In October 2000, FAA hired nine new Regional Runway Safety Program Managers that will report directly to the Regional Administrator and indirectly to the Director of the Runway Safety Program at headquarters. The new managers will work runway incursion issues full-time unlike their predecessors who only performed the function as a collateral duty. These managers plan to direct evaluations on runway safety at 167 airports this year, over 140 more than last year. These efforts are steps in the right direction, as strong regional efforts are needed to identify and correct airport-specific problems. However, FAA must develop a mechanism to periodically assess whether the Regional Runway Safety Program Managers are making progress in correcting airport-specific problems and reducing runway incursions.

Recommendations

Our recommendations focus on what FAA needs to do to reverse the upward trend in runway incursions.

To ensure technologies are provided to airports with continued runway incursion problems, FAA should:

1. Expedite the use of in-cockpit moving map displays and ADS-B for use by pilots in reducing runway incursions. FAA should determine if its process to certify new equipment for safe operation could be accelerated to expedite these technologies. FAA should also issue an Advanced Notice of Proposed Rulemaking to obtain comments from the airline industry and general aviation community on implementing in-cockpit moving map displays and ADS-B.
2. Develop a realistic schedule to commission the remaining 32 AMASS sites. The current schedule is unlikely to be met unless time is allowed to ensure that Airway Facilities resources are adequate to commission the remaining sites and to ensure controller acceptance of AMASS.

3. Determine whether some airport needs for ASDE-X can be met by radar alone. After airport needs are identified, FAA should revise its ASDE-X cost and schedule baseline.
4. Complete its evaluations of the six emerging technologies it has identified to assist controllers and pilots in reducing runway incursions and advance to high risk airports the ones most likely to reduce runway incursions quickly.
5. Conduct reviews at the 13 airports that had 10 or more runway incursions over the past 4 years to determine whether technological solutions are needed.

To improve oversight authority and accountability over the Runway Safety Program, FAA should:

6. Provide the Runway Safety Program Director with authority to ensure that employees from other lines of business complete tasks to reduce runway incursions on time. An accountability mechanism, such as providing the Runway Safety Program Director with input on individuals' performance appraisals and bonuses, should be developed to hold people involved with runway safety accountable for completing initiatives within established milestones. Consideration should be given to realigning the Runway Safety Program under FAA's Deputy Administrator office to elevate the program importance above all lines of business.

To further facilitate accountability over the Runway Safety Program, FAA should:

7. Measure whether initiatives are effective in addressing the causes of runway incursions, and periodically assess regional efforts to ensure that progress is being made to reduce runway incursions at specific airports.

Agency Comments and Office of Inspector General Response

FAA promised to (1) reevaluate the schedule to commission the remaining AMASS sites by September 30, 2001; (2) reexamine airport needs for ASDE-X components by October 31, 2001; (3) complete an evaluation of the 6 emerging technologies to assist pilots and controllers in reducing runway incursions by September 30, 2002; and (4) complete technology reviews during calendar year 2002 at the 13 airports with high numbers of runway incursions. We considered these actions responsive to our recommendations.

FAA's proposed actions to expedite the use of in-cockpit moving map displays and ADS-B and to improve the authority and accountability of the Runway Safety Program Director are ambiguous. Also, it is not clear to us what milestones, if any, apply to implementing these recommendations. FAA needs to reconsider its position on both recommendations.

EXHIBIT A
(1 of 2)

Status and Funding of Runway Incursion Initiatives
(in millions)

Program	Status	Prior Years	FY 1999	FY 2000	FY 2001	Program Total
Airport Surface Detection Equipment-Model 3 (ASDE-3) provides radar surveillance of aircraft and airport service vehicles at high activity airports to aid in the orderly movement of aircraft and ground vehicles on the airport surface, especially during low or no visibility conditions.	Of the 40 systems, 36 of 38 systems are commissioned, plus 2 support systems. First system commissioned in 1993, last system is planned for October 2002.	\$241	\$5.6	\$2.4	\$4.0	\$253
Low Cost Airport Surface Detection Equipment will aid in the orderly movement of aircraft and ground vehicles on the airport surface during low or no visibility conditions at low density airports not qualified to receive ASDE-3.	Three radars were evaluated between 1995 and 1999. No additional funding has been identified for this program because the radars did not meet reliability and maintainability requirements.	\$5.0				\$5.0
Airport Surface Detection Equipment- Model X (ASDE-X) will provide high resolution, short-range, clutter free surveillance information about aircraft and vehicles, both moving and fixed, located on or near the surface of the airport movement area under all weather and visibility conditions.	FAA signed a contract for 25 plus 4 support ASDE-X systems in October 2000. First site planned for FY2003 and the last site for FY2007.			\$7.6	\$8.4	\$16.0
Airport Movement Area Safety System (AMASS) is an enhancement to the Airport Surface Detection Equipment-Model 3 radar to provide air traffic controllers with automated alerts and warnings of potential runway accidents.	Of the 40 systems, 39 have been delivered, 2 are support systems. An In-Service decision meeting was held in May 2001. AMASS was commissioned at San Francisco and Detroit June 2001. FAA plans to commission 31 additional sites by November 2002.	\$64.4	\$9.8	\$18.2	\$20.6	\$113.0
Surface Inductive Loop Technology provides a prototype system that will classify, track, and record aircraft and ground vehicle movement on taxiways and runways.	Long Beach airport has completed testing and the final report is due summer of 2001.	\$3.9		\$0.25		\$4.15

Status and Funding of Runway Incursion Initiatives
(in millions)

Program	Status	Prior Years	FY 1999	FY 2000	FY 2001	Program Total
Runway Incursion Reduction Program is designed to provide air traffic controllers, surface vehicle operators, and pilots with situational awareness, incursion monitoring and alerting information.	Program started in 1997. FAA continues to assess and validate several technologies performance and demonstrate the surface surveillance infrastructure capabilities at DFW airport.	\$5.9	\$3.2	\$1.9	\$11.5	\$22.5
Airport Target Identification System (ATIDS) will provide controllers with aircraft/vehicle identification and position on the airport movement area and in selected ramp and gate areas to augment existing Airport Surface Detection Equipment/Airport Movement Area Safety Systems. NASA's Low-Visibility and Surface Operations demonstration project is part of this system.	Program started in 1992. Since that time program was rolled into Runway Incursion Reduction Program. Work has begun on the installation of ATIDS on the west side of the Dallas/ Fort Worth airport.	\$4.0				\$4.0
Runway Safety Program provides a single focus to integrate and coordinate activities to reduce surface incidents, runway incursions and accidents within FAA and external organizations.	Runway Safety Program Office developed 10 near-term initiatives to address runway incursion problems. Additionally, a Runway Safety National Blueprint was developed in October 2000.			\$3.3	\$8.1	\$11.4
Total		\$324.2	\$18.6	\$33.65	\$52.6	\$429.05

Audit Methodology

We evaluated FAA's process for identifying and commissioning technologies to reduce runway incursions. We also interviewed aviation industry officials to obtain their views on technologies and other methods to assist with the reduction of runway incursions. We analyzed runway incursions from 1997 to 2000 and determined the top airports with a total of 10 or more. We compared these airports to airports designated for AMASS or ASDE-X and identified those airports not designated to receive any technology. Additionally, we reviewed FAA's data collection and evaluation process to determine runway incursion causal factors. Finally, we discussed technology-based initiatives for the prevention of runway incursions with various vendors. See Exhibit F for a listing of FAA, contractors, and industry associations contacted.

To determine whether FAA completed our prior recommendations, we interviewed FAA's Runway Safety Program officials to determine what actions were undertaken to address the recommendations. To evaluate the adequacy of completion of actions in the 1998 Action Plan and other initiatives, we analyzed support documentation provided by FAA to verify implementation of initiatives. In addition, we determined the status of 10 initiatives established in August 2000 most likely to reduce runway incursions in the near-term.

We conducted the audit at FAA Headquarters in Washington, DC, 5 regions, and 13 airport facilities. The review was conducted in accordance with the Government Auditing Standards prescribed by the Comptroller General of the United States.

**Status of Prior Recommendations
as of March 2001**

REPORT	RECOMMENDATIONS TO BE IMPLEMENTED	FAA'S CURRENT STATUS
<p>Report on Audit of the Runway Incursion Program (Report Number AV-1998-075, February 9, 1998)</p>	<ol style="list-style-type: none"> 1. Implement specific responsibilities to oversee and coordinate initiatives and projects in the plan at the Headquarters and regional levels. 2. Institute controls to ensure accurate runway incursion data, and collect and analyze data on the type of aircraft operations involved in operational errors and vehicle/pedestrian deviations on the runways. Use NASA's runway transgression data to aid in identifying potential problem airports. 3. Establish regional focal points to analyze data to ensure that resources are focused on causes of runway incursions. Require regional focal points to implement local action plans directed at airport-specific incursion problems. 4. Require regional offices to periodically analyze runway incursion data for their airports. 	<ol style="list-style-type: none"> 1. FAA is revising its Runway Safety Program order from an Air Traffic to an FAA-wide order to institute better National and Regional controls. Planned completion has yet to be determined. 2. FAA is currently revising its process for collecting, analyzing, and reporting runway incursion data. Expected completion date is June 2001. 3. FAA hired nine new regional runway safety program managers to focus on implementing regional initiatives. However, FAA has yet to develop a system to assess regional efforts. 4. See status of # 1.
<p>Report on Follow-up Review of FAA's Runway Safety Program (Report Number AV-1999-114, July 21, 1999)</p>	<ol style="list-style-type: none"> 1. Establish central oversight authority to ensure follow-through on initiatives in the Action Plan to reduce runway incursions. 2. Develop operating procedures for regional focal points, surface incident prevention plans, and controls for ensuring the accuracy of runway incursion data, by finalizing its Runway Safety Program standard operating procedures. 	<ol style="list-style-type: none"> 1. FAA included all outstanding initiatives in the 1998 Action Plan into its National Blue Print in October 2000. However, FAA has yet to develop a system to monitor implementation. 2. FAA is revising its Runway Safety Program order from an Air Traffic to an FAA-wide order to institute better National and Regional controls. Planned completion has yet to be determined.

**Status of 10 Near-Term Initiatives
as of April 2001**

Actions Related to FAA Runway Safety Program Management and Procedural Changes	Target Date	Revised Date	Status/Remarks
1. Review pilot/controller communications phraseology. Reduce surface incidents by improving, via condensing, modifying, or eliminating, surface related pilot/controller phraseology and associated procedures.	12/31/00	12/31/01	12 months behind schedule
Actions Related to Pilot Education, Training, and Incursion Awareness	Target Date	Revised Date	Status/Remarks
1. Foreign air carrier pilot training, education, and awareness. Develop and promote a runway incursion educational awareness program for Part 129 foreign air carriers in order to promote an enhanced awareness of runway safety and incursion prevention throughout the foreign air carrier community.	4/01/01	9/30/01	6 months behind schedule
2. Education, training, and awareness for pilots, controllers, and vehicle operators.	6/30/01		On schedule
3. Improved pilot evaluation and testing. Require all pilot check (certification) flights to evaluate ground operations performance and test for knowledge of airport signs, lighting, and markings.	4/01/01		On schedule
Actions to Aid Controllers Including Technology-Based Initiatives	Target Date	Revised Date	Status/Remarks
1. Enhanced operational tower controller training. Reduce runway incursions and related surface incidents associated with operational errors by developing enhanced training tools and techniques to enhance focus during controller training on "anticipated separation" and "prioritization of control actions".	12/31/00	10/01/01 to 12/31/01	10 to 12 months behind schedule
2. Memory enhancement techniques training for tower controllers. In an effort to reduce runway incursions, formal memory training on ways to enhance working memory is needed.	1/01/01	7/01/01 to 9/30/01	7 to 9 months behind schedule
3. Air Traffic Teamwork Enhancement (ATTE) training for tower controllers. At least one prior study concluded that there is a strong correlation between teamwork, or more precisely a lack of teamwork, and the occurrence of operational errors.	3/01/01	5/31/01	Complete
4. Technology assessment. Implement a more effective method of identifying and assessing new and emerging surface technologies. FAA completed initial action. FAA will be assessing technologies over the next 12 months.	2/28/01		Complete/Ongoing
Actions to Improve Airport Surface Facilities, Design, and Operations	Target Date	Revised Date	Status/Remarks
1. Advisory circular for airport surface operations. To reduce runway incursion accidents/incidents by finalizing and publishing an advisory circular that emphasizes "Best Practices" for airport surface operations.	12/31/00	5/31/01	FAA plans to issue this circular in June 2001.
2. Airport markings. To reduce runway incursion accidents/incidents and enhance the safe and efficient movement of aircraft by increasing the visibility of runway hold line markings, improving flight crew/vehicular operator recognition.	1/01/01		Complete

EXHIBIT E

**Airports With a Total of 10 or More Runway Incursions
From 1997 to 2000**

Overall Rank	LOCATION	LOC ID	1997	1998	1999	2000	TOTAL	AMASS*	ASDE-X**
1	Los Angeles	LAX	3	12	10	8	33	Aug-01	
2	St Louis	STL	8	9	7	6	30	Jul-01	
3	Orange County	SNA	8	3	9	7	27		X
4	North Las Vegas	VGT	2	4	3	17	26		
5	Long Beach	LGB	7	4	6	8	25		
6	Dallas-Ft Worth	DFW	8	5	7	3	23	Sep-02	
7	San Francisco	SFO	6	4	7	4	21	Jun-01	
8	San Diego/Mont	MYF	1	5	5	9	20		
9	Ft Lauderdale Exec	FXE	3	3	5	9	20		
10	Phoenix	PHX	4	7	3	6	20		X
11	Newark	EWR	2	8	3	5	18	Nov-01	
12	Merrill Field	MRI	7	2	0	8	17		
13	Chicago O'Hare	ORD	3	4	6	4	17	Sep-01	
14	Boston	BOS	1	4	3	8	16	Oct-01	
15	Cleveland	CLE	6	6	3	1	16	Oct-01	
16	Midway	MDW	2	5	5	4	16		X
17	San Jose	SJC	4	5	2	5	16		X
18	Deer Valley	DVT	6	5	2	2	15		
19	Daytona Beach	DAB	2	3	6	3	14		
20	Minneapolis	MSP	6	2	3	3	14	Jan-02	
21	San Antonio	SAT	4	4	4	2	14		X
22	Teterboro	TEB	4	2	3	5	14		
23	Atlanta	ATL	2	2	6	3	13	Jul-01	
24	Las Vegas	LAS	2	5	4	2	13	Jul-02	
25	Concord	CCR	0	1	3	7	11		
26	Detroit Metro	DTW	2	6	1	2	11	Jun-01	
27	J F Kennedy	JFK	4	2	5	0	11	Feb-02	
28	LaGuardia	LGA	3	3	2	3	11	Oct-02	
29	Milwaukee	MKE	1	4	3	3	11		X
30	Providence	PVD	0	2	5	4	11		X
31	Santa Barbara	SBA	2	1	2	6	11		
32	Centennial	APA	1	3	4	2	10		
33	Burbank	BUR	4	3	1	2	10		X
34	Flying Cloud	FCM	2	2	4	2	10		
35	Crystal	MIC	1	3	4	2	10		
36	Philadelphia	PHL	1	5	1	3	10	Jul-02	
37	Salt Lake City	SLC	2	1	3	4	10	Sep-01	

* AMASS commissioning dates.

**The exact dates for commissioning ASDE-X have not been determined

Note: The highlighted airports are not currently scheduled to receive any technology.

Organizations Visited or Contacted

Federal Aviation Administration

FAA Headquarters, Washington, DC
Western-Pacific Region Headquarters, Los Angeles, CA
Great Lakes Region Headquarters, Chicago, IL
New England Region Headquarters, Boston, MA
Southern Region Headquarters, Atlanta, GA
Eastern Region Headquarters, New York, NY
Technical Center, Atlantic City, NJ
Volpe Center, Boston, MA

Airports

Los Angeles International Airport
John Wayne Airport Orange County
Long Beach Municipal Airport
Montgomery Field Airport
San Francisco International Airport
Chicago O'Hare International Airport
Chicago Midway Airport
Detroit Metropolitan Wayne County
Hartsfield Atlanta International Airport
Daytona Beach Regional Airport
John F. Kennedy International Airport
Logan International Airport
T. F. Green State Airport

Contractors and Industry Associations

Thomson CSF-Detexis, Washington, DC
ARINC, Annapolis, MD
ADB, Inc., A Seimens Company
Raytheon, Inc.
Sensis Corporation
Northrop Grumman
United Parcel Service
Cargo Airline Association

EXHIBIT F
(2 of 2)

National Air Traffic Controllers Association
American Association of Airport Executives
Air Transport Association
Aircraft Owners and Pilots Association
Professional Airways Systems Specialists
Air Line Pilots Association

EXHIBIT G

Major Contributors to This Report

The following Office of Inspector General staff contributed to this report.

Richard Kaplan	Program Director
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Robert Drake	Engineer
John Crowson	Senior Auditor
Tanya Rucker	Analyst
Hezekiah Hayes	Analyst



U.S. Department
of Transportation

**Federal Aviation
Administration**

Memorandum

Subject: **INFORMATION:** Further Actions Are Needed
to Reduce Runway Incursions

Date: JUN 21, 2001

From: Assistant Administrator for Financial
Services/CFO

Reply to
Attn. of:

To: Assistant Inspector General for Auditing

As requested in your memorandum dated June 14, attached are the Federal Aviation Administration's (FAA) comments, to the subject report, which include specific actions taken or planned for each recommendation and estimated completion dates.

If you have questions or need further information, please contact Anthony Williams, Budget Policy Division, ABU-100. He can be reached at (202) 267-9000.

A handwritten signature in black ink, appearing to read "Chris Bertram".

Chris Bertram

Attachment

**Federal Aviation Administration (FAA) Response to the
Office of Inspector General Report
Further Actions Are Needed to Reduce Runway Incursions**

1. **OIG Recommendation:** Expedite the use of in-cockpit moving map displays and ADS-B for use by pilots in reducing runway incursions. FAA should determine if its process to certify new equipment for safe operation could be accelerated to expedite these technologies. FAA should also issue an Advanced Notice of Proposed Rulemaking to obtain comments from the airline industry and general aviation community on implementing in-cockpit moving map displays and ADS-B.

FAA Response: Partially concur.

- a. The FAA is taking many steps to accelerate the development and operational availability of in-cockpit moving map displays. The FAA is working with United Parcel Service Aviation Technologies (UPSAT) to approve a Supplementary Type Certificate (STC) for a cockpit moving map display called Cockpit Display of Traffic Information (CDTI) display. The project is on schedule and will be completed in January 2002. The FAA is also establishing an agreement with UPSAT to delineate its long-term goals for these technologies and lay out the complete schedule for certification and operational approvals of ADS-B and CDTI projects. By establishing the end-state goals and completing the safety assessment for the end-state project, the FAA and UPSAT can ensure that operational approval of the system is completed in the quickest and most efficient manner. The criteria to certify the UPS system can be applied to other similar systems developed by other applicants.
- b. FAA has two existing methods to obtain airline industry and general aviation comments on moving map displays and ADS-B. Safer Skies is one forum where industry and FAA are working to prioritize the safety interventions that will reduce the accident rate five-fold by 2007. Determining the role of new technology, including moving maps and ADS-B, in accomplishing that goal is a key focus for the Safer Skies work groups. The Safe Flight 21 program also serves as a government-industry forum, which allows FAA to coordinate ADS-B operational demonstration/validations with commercial and general aviation interests. Through these industry groups, we will determine when to proceed with an ANPRM.

2. **OIG Recommendation:** Develop a realistic schedule to commission the remaining 32 AMASS sites. The current schedule is unlikely to be met unless Airway Facilities resources are adequate to commission the remaining sites and time is allowed to ensure controller acceptance of AMASS.

FAA Response: Partially concur. The FAA will reevaluate the schedule to commission the remaining AMASS sites by September 30.

3. **OIG Recommendation:** Determine whether some airport needs for ASDE-X can be met by radar alone. After airport needs are identified, FAA should revise its ASDE-X cost and schedule baseline.

FAA Response: Partially concur. The FAA is reexamining airport needs for ASDE-X components required to meet the particular needs of individual airports. We will report by October 31.

4. **OIG Recommendation:** Complete its evaluations of the six emerging technologies it has identified to assist controllers and pilots in reducing runway incursions and advance the ones most likely to reduce runway incursions quickly to high-risk airports.

FAA Response: Concur. The FAA will complete evaluation of the six emerging technologies and issue a report of findings and recommendations by September 30, 2002.

5. **OIG Recommendation:** Conduct reviews at the 13 airports that had 10 or more runway incursions over the past 4 years to determine whether technological solutions are needed.

FAA Response: Concur. We will complete technology reviews during calendar year 2002 at the 13 airports that had 10 or more runway incursions during the four-year study (1997-2000) and are not receiving AMASS or ASDE-X.

6. **OIG Recommendation:** Provide the Runway Safety Program Director with authority to ensure that employees from other lines of business complete tasks to reduce runway incursions on time. An accountability mechanism, such as directing the Runway Safety Program Director to provide input on individuals' performance appraisals and bonuses, should be developed to hold people involved with runway safety accountable for completing initiatives within established milestones. Consideration should be given to realigning the Runway Safety Program under FAA's Deputy Administrator office to elevate the program importance above all lines of business.

FAA Response: Partially concur. We will ensure that this recommendation is evaluated as a part of the ongoing administrative review surrounding the development of the Performance-Based Organization.

7. **OIG Recommendation:** Measure whether initiatives are effective in addressing the causes of runway incursions, and periodically assess regional efforts to ensure that progress is being made to reduce runway incursions at specific airports.

FAA Response: Concur. Several actions are already ongoing, including:

- a. publication of our recent report on severity trends from 1997 to 2000 by Booz-Allen-Hamilton;

- b. completion of a MITRE report on causal factors is underway and is scheduled for completion in September, 2001;
- c. Quarterly Program Reviews that we conduct with our Regional Runway Safety Program Managers;
- d. standardization of Runway Incursion Action Team visits conducted by the nine FAA Regional Runway Safety teams;
- e. development of Web-based and other data systems to improve program management.
- f. Additionally, efforts are planned for FY02 to develop improved runway safety metrics.