Message from the
Air Traffic Organization Vice President
For Safety & Technical Training

Runway safety is a critical area of safety oversight in the Federal Aviation Administration's (FAA) safe and efficient operation of the National Airspace System (NAS). Complex operations by a mix of aircraft operating in close proximity within a confined space with considerable differences in speed create increased risk to aircraft and occupants. Consequently, a continuing emphasis on runway safety is critical for our stakeholders.

The FAA has made significant strides toward enhancing runway safety with emerging technologies. Runway Status Lights (RWSL) is a fully automatic, advisory safety system designed to reduce the number and severity of runway incursions and thus prevent runway accidents while not interfering with airport operations. Final Approach Runway Occupancy Signal (FAROS) is another safety technology that activates flashing lights visible to the pilots on approach as a warning when a runway is occupied and a hazard exists.

Through the hard work and dedication of many individuals and lines of business inside as well as outside the Federal Government, the FAA has made significant progress in meeting the goals set forth in the FAA Strategic Plan.

The National Runway Safety Plan covers recent accomplishments and encouraging trends toward the goal of reducing and preventing the severity and number of runway incursions. ATO Safety will be partnering with a variety of government and industry lines of business to expand the level of safety oversight to include runway excursions. We look forward to the opportunity to collaborate with our partners to make our system the safest in the world.

Sincerely,

Joseph Teixeira
Vice President
Safety & Technical Training

ATO Safety

National Runway Safety Plan

Version 1.0

September 22, 2011

Federal Aviation Administration
490 L'Enfant Plaza
Washington, DC 20024

DOCUMENT CHANGE HISTORY

Version	Document Date	Description of Changes
1.0		Initial document
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1.0 EXECUTIVE SUMMARY

Runway safety is a critical area of safety oversight in the Federal Aviation Administration's (FAA) safe and efficient operation of the National Airspace System (NAS). Complex operations by a mix of aircraft and vehicles operating in close proximity within a confined space with considerable differences in speed create increased risk to aircraft and occupants. Consequently, a continuing emphasis on runway safety is critical for our stakeholders.

The goal is straightforward:
By achieving the lowest possible accident rate and always improving safety, all users of our aviation system can arrive safely at their destinations. We will advance aviation safety worldwide.[1] A review of historic data validates the FAA has made significant inroads to improve airport surface safety. The number of serious incursions – Category A and B – continued to fall from a total of 67 in Fiscal Year (FY) 2000 to 6 in FY2010 -- a decline of more than 90 percent. And, eleven months into FY2011, there have been 7 serious runway incursions. Between FY2008 and FY2010, Category A and B events fell, year-over-year, at a rate of 50 percent per year.

The National Runway Safety Plan 2012 – 2014 contains input from other FAA organizations and combines the FAA Destination 2025 guidance with the goals, objectives and initiatives of the various FAA Lines of Business (LOB). The Plan provides a coordinated vision to achieve common goals and objectives, identifies seven key ATO Safety initiatives and a number of activities the FAA LOBs will pursue to improve runway safety, and meet the FAA Destination 2025 goal for runway safety.

The cornerstone for the FAA initiatives will emphasize a collaborative, integrated communications strategy designed to convey the runway safety message effectively to the entire aviation community. A comprehensive, clear and convincing message reaching the largest number of aviation stakeholders is a major goal. Relationships and partnerships amongst the entire aviation community will make the message available at the national, regional and local levels.

[1] *Destination 2025*, Federal Aviation Administration,

2.0 INTRODUCTION

The National Airspace System is vital to the economic well being and security of the United States. In 2007 the civil portion of the air transportation system, which included commercial and general aviation, comprised $1.3 trillion or 5.6 percent of the total U.S. economy.[2]

The FAA is responsible for the safe and efficient operation of the NAS, and runway safety is a critical area of safety oversight. Enhanced and focused attention to runway safety is required. Complex operations related to a mix of aircraft and vehicles operating in close proximity within a confined space with considerable differences in speed result in increased risk to aircraft and occupants. Runway safety is measured by monitoring three areas:

1. Frequency of runway incursions
2. Severity of runway incursions
3. Types of runway incursions

Runway incursions are analyzed and decomposed into casual elements in order to target risk mitigation activities. These activities generally target three areas; pilot actions, Air Traffic Control (ATC) actions and actions by individuals driving or working in the vicinity of taxiways and runways.

The FAA has made significant strides toward the enhancement of runway safety. Since FY2000 Category A and B runway incursions*, the most critical surface errors, have fallen from a high of 67 to 7 as of September 22, 2011.

* Category A: A serious incident in which a collision was narrowly avoided.
* Category B: An incident in which separation decreases and there is a significant potential for collision, which may result in a time critical corrective/evasive response to avoid a collision.

New technology is being developed, evaluated and deployed. The new systems operate automatically with no controller or pilot input to maintain runway safety. These systems include Runway Status Lights (RWSL), which will be deployed at 23 of the Core NAS Airports through FY2016. Another system is the Enhanced Final Approach Runway Occupancy Signal (eFAROS), a system providing direct notification to pilots on approach that a runway is occupied, potentially unsafe for landing. eFAROS is being evaluated for possible implementation in the future. Both of these systems work towards resolution of the National Transportation Safety Board safety recommendation A-00-66: "...provide a direct warning capability to flight crews."

FAA Order 7050.1 formalized the Runway Safety Program in 2002. The purpose of the Order was to create a Runway Safety Program "to improve runway safety by decreasing the number and severity of runway incursions and other surface incidents." ATO Safety "develops,

[2] *The Economic Impact of Civil Aviation on the U.S. Economy December 2009*, FAA Air Traffic Organization AJG-63, page 40.

coordinates, maintains and executes a National Runway Safety Plan (NRSP), which describes a comprehensive and cohesive runway safety strategy." This version of the NRSP is made up of seven primary initiatives, each of which is supported by activities conducted by various FAA lines of business.

3.0 SCOPE, PURPOSE, GOAL and INITIATIVES

3.1 Scope

The NRSP is a broad outline providing a single, overall, national strategy to ensure organizations with runway safety responsibilities are working together. This plan was developed with input from other FAA organizations, airport operators, and operations and airspace system users. The Plan combines the FAA Destination 2025 high-level guidance with the goals, objectives and initiatives of the various FAA LOBs.

3.2 Purpose

The National Runway Safety Plan's purpose is to produce a coordinated vision to achieve common goals and objectives. The Plan identifies activities to improve runway safety, organized into seven broad initiatives. In this document Lines of Business will refer to the following organizations:

Office of Airports – Airport Safety and Standards (Airports): providing leadership and oversight to the aviation and airport community to continue a safe and efficient national airport system.

Aviation Safety – Flight Standards Service (Flight Standards): providing certification for pilots, mechanics and others in safety-related positions and oversight of domestic and international air carriers with operations in the NAS.

Air Traffic Organization (ATO) – ATO Safety and ATO Terminal Services (Terminal): ATO Safety integrates safety standards into the provision of air traffic services; leads organizational efforts to manage risk; assures quality standards and is responsible for policy development and processes improving operational safety within the ATO including the area of runway safety. ATO Terminal Services provides safe and secure air traffic management across the NAS through FAA airport towers, FAA contract towers, and Terminal Radar Approach Facilities (TRACON).

3.3 Goal

The goal is straightforward: "By achieving the lowest possible accident rate and always improving safety, all users of our aviation system can arrive safely at their destinations. We will advance aviation safety worldwide".[3]

[3] *Destination 2025*, Federal Aviation Administration

ATO Safety will meet that goal through the accomplishment of focused actions through seven broad initiatives designed to improve surface safety.

3.4 Initiatives

The NRSP proposes a holistic solution – implement and integrate high technology and low technology solutions to "mistake-proof" human elements that lead to runway incursions. ATO Safety will lead the accomplishment of activities underneath the following initiatives:

1. Guidance
2. Education and Checking
3. Outreach and Collaboration
4. Training
5. Technology
6. Infrastructure
7. Risk Identification and Mitigation

A brief description of each initiative is provided in this Section, along with a list of the various activities assigned to the FAA Lines of Business. Detailed descriptions of each activity can be found in Chapter 7 of this document. The responsible FAA Line of Business for each activity is responsible for providing the resources necessary for the task.

Guidance: Review, revise and validate internal and external runway safety guidance documents to ensure information is current, aligned across all Lines of Business, and incorporates the latest techniques for the prevention of runway incursions and excursions.

Table 1: Guidance

Activity	Responsible LOB	Resources	Timeframe	Success Indicators
6.2.1 Guidance	Flight Standards	Manpower	FY 2012 – 2013	Number of PDs
6.3.2 Safety Management	Airports	Manpower, AIP funding	FY 2012 – 2013	Overall number of events, and vehicle deviations

Education and Checking: Revise testing standards and pilot educational materials to emphasize safe surface operations. General aviation pilots are the single-most prevalent contributor to the total number of runway incursions. Existing training standards are being improved to ensure that pilots are adequately trained and tested on airport surface navigation requirements.

Table 2: Education and Checking

Activity	Responsible LOB	Resources	Timeframe	Success Indicator
6.1.4 Hotspots	ATO Safety	Manpower	Ongoing	Number of PDs
6.2.2 Education	Flight Standards	Manpower	FY 2012	Number of PDs
6.2.3 Training and Checking	Flight Standards	Manpower	FY 2012 - 2013	Number of PDs

Outreach/Collaboration: In cooperation with aviation industry partners, communicate the importance of surface safety and the best practices for safe operations on the surface. Reach out to the aviation community at all levels, local, national, and international, to understand existing problems and how surface safety can be improved.

Table 3: Outreach/Collaboration

Activity	Responsible LOB	Resources	Timeframe	Success Indicator
6.1.1 Communications Strategy	ATO Safety	Manpower, funding	Ongoing	Overall number of RIs
6.1.2 Outreach	ATO Safety	Manpower, funding	FY 2012 - 2013	Overall number of RIs
6.1.5 International Leadership	ATO Safety	Manpower and funding	FY 2012-2013	Number of seminars supported
6.1.8 Call Sign Confusion	ATO Safety	Manpower, funding	FY 2012-2014	Number of incidents involving call signs
6.2.4 Outreach	Flight Standards	Manpower, funding	Ongoing	Number of PDs
6.3.4 Emerging Technologies	Office of Airports	Manpower, funding	FY 2012-2014	Number of meetings supported
6.4.1 Training and Education	ATO terminal services	Manpower	FY 2012-2014	Number of ATC surface events
6.4.3 Terminal Initiatives at the Local Level	ATO terminal services	Manpower	FY 2012-2014	Number of RIs
6.1.9 RSATs	ATO Safety	Manpower, funding	Ongoing	Number of RIs

Training: Provide improved training, and materials for training, pilots, controllers and drivers on safe surface operations.

Table 4: Training

Activity	Responsible LOB	Resources	Timeframe	Success of Indicator
6.4.1 Training and Education	ATO terminal services	Manpower	FY 2012-2014	Number of ATC surface events
6.2.4 Outreach	Flight Standards	Manpower, funding	Ongoing	Number of PDs

Technology: Evaluate and implement new technologies across the aviation industry to mitigate surface safety risks. Educate users on the benefits and operating characteristics of new technologies as they are deployed.

Table 5: Technology

Activity	Responsible LOB	Resources	Timeframe	Success Indicator
6.1.6 Emerging Runway Safety Technologies	ATO Safety	Manpower, funding		Number of operational systems
6.3.4 Emerging Technologies	Office of Airports	Manpower	FY 2012-2014	Number of operational systems
6.4.2 Technology	ATO terminal services	Funding	FY 2012-2014	Number of operational systems

Infrastructure: Improve airport infrastructure to reduce the risk of runway incursions, and address runway excursions.

Table 6: Infrastructure

Activity	Responsible LOB	Resources	Timeframe	Success Indicator
6.3.1 Infrastructure	Office of Airports	Manpower, funding	December 2015	Number of Runway Safety Areas not compliant
6.3.3 Wildlife Mitigation	Office of Airports	Manpower, funding	December 2020	Number of assessments completed

Risk Identification and Mitigation: Analyze data and input from the aviation community to identify the top surface safety risks, and propose and facilitate the implementation of appropriate mitigations.

Table 7: Risk Identification and Mitigation

Activity	Responsible LOB	Resources	Timeframe	Success Indicator
6.1.3 Runway Safety Tracking System	ATO Safety	Manpower, funding	FY-2012-14	Number of completed items
6.1.7 Runway Excursions	ATO Safety	Manpower, funding	FY-2012	Addition of excursions to the Runway Safety Program
6.1.8 Call Sign Confusion	ATO Safety	Manpower, funding	FY 2012-2014	Number of incidents involving call signs
6.1.9 Runway Safety Action Teams	ATO Safety	Manpower, funding	FY-2012	Completion of RAP process, ISO certification
6.3.4 Emerging Technologies	Office of Airports	Manpower, funding	FY-2012- 2014	Number of airports with an active SMS
6.4.3 Terminal Initiatives at Local Level	ATO terminal services	Manpower	Ongoing	Number of RIs
6.1.9 RSATs	ATO Safety	Manpower, funding	Ongoing	Number of RIs

4.0 ATO SAFETY

ATO Safety is responsible for the development and execution of the National Runway Safety Plan 2012-2014.

4.1 ATO Safety, Runway Safety

ATO Safety is the focal point for all FAA runway safety efforts. The Runway Safety Program uses overall planning and support at the headquarters level with activities overseen by Runway Safety Program Managers (RSPM) and ATO Safety Service Area support. ATO Safety is the FAA's primary representative on runway safety issues to the aviation industry including national and international aviation safety groups. To manage its responsibilities, ATO Safety considers and works with other ATO Service Units, FAA Lines of Business and the entire aviation community. Each FAA LOB furnishes their specific runway safety plan and assigns a member

of their organization to provide technical expertise. The result is a coordinated plan managed by the ATO Safety.

Classification and severity assessment policy for runway incursion events resides at the FAA Headquarters ATO Safety office. Data on surface events is collected and a severity assessment is made by the Runway Incursion Assessment Team (RIAT). More information on the RIAT is located in this Plan's Section 5.1.3. The analysis of serious incursions, overall statistics, trends, risk factors and lessons learned assist ATO Safety to identify hazards and influence actions necessary to reduce runway safety risk.

ATO Safety is the repository for products and services to accomplish the organization's guidance, education, outreach, collaboration, and training functions to the aviation community. Research, development and distribution of products to reinforce safe runway operations through publication of best practices for airport operators, pilots and air traffic controllers is conducted by ATO Safety.

Reviews of policies, procedures and practices are periodically conducted by ATO Safety to determine effectiveness and impact.

4.1.1 Expanding Role: Runway Excursions

While runway incursions are serious issues and have been the principal focus of the Agency's runway safety efforts, worldwide data shows that runway excursions may present an even greater hazard. Worldwide, between 1995 and 2008, there were 1,429 commercial aircraft accidents where aircraft suffered substantial damage. Of the 1,429 total accidents, 431 (30 percent) were runway related: incursions, confusion* or excursions.

*Confusion: the unintentional use of the wrong runway or taxiway.

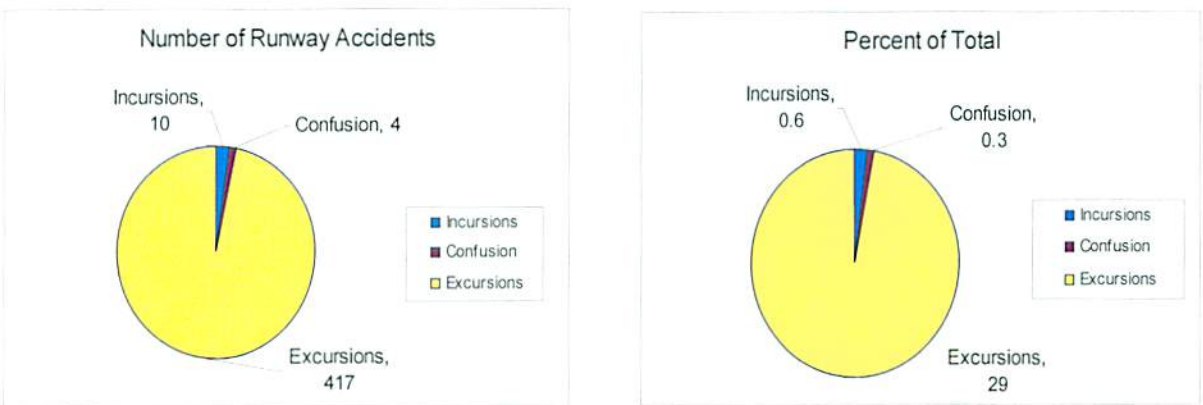

Figure 1: Worldwide Aircraft Accident Data – 1995-2008

The 1429 total accidents included 429 accidents with onboard fatalities. 41 of these fatal accidents were runway related. Runway excursions accounted for thirty-four of the fatal runway related accidents resulting in 712 fatalities.

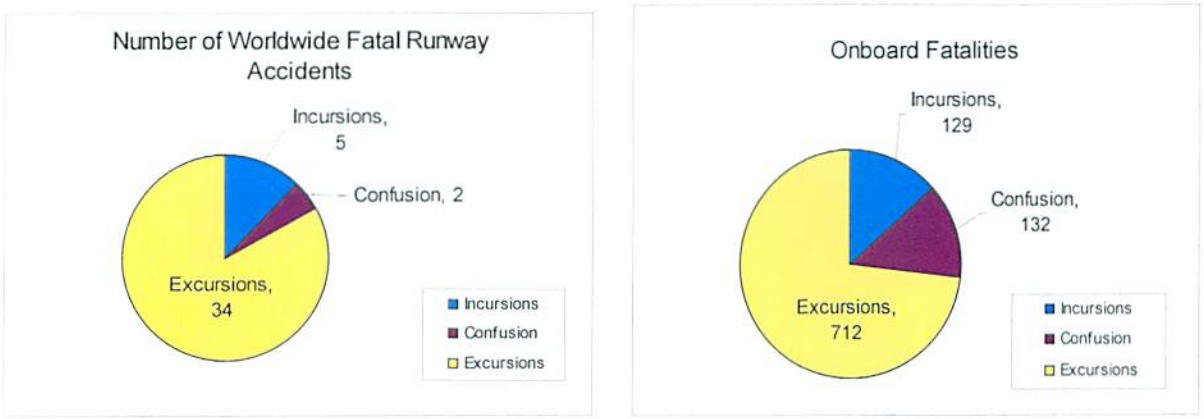

Figure 2: Worldwide Runway Safety Fatality Data – 1995-2008

A runway excursion can occur on landing or takeoff and consists of two types of events: a veer-off or overrun. During a veer-off, the aircraft departs along the side of a runway surface. During an overrun, the aircraft cannot stop within the available runway length and departs the runway surface at the end. By including runway excursions the FAA will have a more inclusive runway safety program, which addresses a broader range of operations.

Runway excursions merit continuous analysis for discovering trends in the types of excursions along with causal and coincident factors and outcomes to help manage risk. The Agency's tasks include developing policies to incorporate runway excursion tracking, data analysis, and plans for future risk mitigation into the Runway Safety Program.

4.2 Structure

4.2.1 Runway Safety Program Managers (RSPM)

ATO Safety uses a targeted, needs based organizational structure to effectively enact and manage the runway safety plans and programs. The Runway Safety Program Managers are the programs' representatives below the headquarters level.

The RSPM is a key element in the effective implementation of the Runway Safety Plan. The RSPM is many things: coordinator, leader, analyst, scheduler and the face of ATO Safety, Runway Safety Program's outreach, collaboration, education and training efforts. The RSPM coordinates with the Regional Administrators and regional LOB team members on runway safety issues. The National Runway Safety Plan is a collaborative action plan with support from multiple lines of business. The RSPM develops and implements a local Runway Safety plan that supports the National Runway Safety Plan.

Among other tasks, the RSPM also schedules Runway Safety Action Teams (RSAT, see Section 4.2.2) at airports and coordinates meeting locations with the other LOBs. Once the Runway Safety Action Plan (RSAP) is in place, the RSPM coordinates the implementation and measures the effectiveness of recommendations in the RSAP to reduce runway incursions.

4.2.2 Runway Safety Action Teams (RSAT)

Runway Safety Action Teams convene to address existing runway safety problems, identify potential runway safety issues, and formulate a Runway Safety Action Plan mitigating the identified concerns. The team includes personnel from the air traffic control tower, airport operator, may include personnel from the various FAA Lines of Business and Service Units (including ATO Safety) and interested users of the airport. Each airport with an operational FAA air traffic control tower (ATCT) or FAA contract tower (FCT) holds an RSAT meeting at least every 12 months and updates the RSAP.

Local RSATs are led by the ATCT manager. The local airport management and the following organizations are invited:

- Local FAA Technical Operations personnel
- Any organizations that have drivers who operate on the Airport Operations Area (AOA)
- Airport tenants and other users
- Runway Safety Program Office
- Airport District Office
- The Flight Standards District Office and FAA Safety Team
- Other stakeholders as deemed appropriate by the airport and/or ATCT manager
- Appropriate ATO Service Center Personnel

Runway Safety Action Plans resulting from local RSATs must be forwarded to the RSPM for review and approval to ensure requirements of FAA Order 7050.1, as revised and associated standard operating procedures are met.

RSATs are the responsibility of the RSPM and led by the Runway Safety Program Office. Priority for RSAT locations is given to airports with the highest risks of runway incursions as determined by ATO Safety. In addition to local airport and air traffic personnel, airport users and major tenants, RSATs will normally include representatives from the following organizations:

- ATCT management
- Flight Standards (including members of the FAA Safety Team)
- Office of Airports
- Technical Operations
- Runway Safety Program Office
- Terminal Operations
- Other stakeholders, as deemed appropriate by the RSPM

4.2.3 Runway Safety Council (RSC)

ATO Safety fulfills it mandate to work across the FAA LOBs, the aviation industry and aviation stakeholders through the chartered Runway Safety Council. The RSC provides government and industry leadership in the implementation of an integrated, data-driven strategy to reduce the number and severity of runway incursions. Decisions by the RSC are made by consensus agreement.

The Runway Safety Council duties include:

1. Review and approval of recommendations made by the Root Cause Analysis Team (RCAT). See Section 4.2.4 for more information about the RCAT.
2. Review, approve and monitor the implementation plan for each approved recommendation.

The RSC is co-chaired by the FAA's Director, Runway Safety and one other individual selected from the aviation industry. Membership includes:

Government - FAA

- Air Traffic Organization (ATO) Safety (AJS)
- ATO Terminal Services (AJT)
- NextGen and Operations Planning (AJP)
- Aviation Safety – Flight Standards Service (AFS)
- Office of Accident Investigation and Prevention (AVP)
- Office of Airports (ARP)
- Air Traffic Safety Oversight Service (AOV)
- Regions & Center Operations

Government Employee Groups

- National Air Traffic Controllers Association (NATCA)
- Professional Aviation Safety Specialists (PASS)

Industry and Labor Groups

- Air Taxi Association (ATXA)
- Air Transport Association (ATA)
- Air Line Pilots Association (ALPA)
- Aircraft Owners and Pilots Association (AOPA)
- National Association of Flight Instructors (NAFI)
- Airports Council International-North America (ACI-NA)
- National Business Aviation Association (NBAA)
- American Association of Airport Executives (AAAE)
- Regional Airline Association (RAA)

Each RSC member organization identifies one principal and one alternate representative with the responsibility and ability to communicate and coordinate with the respective organizations and

constituencies. These individuals have the authority to speak for and make commitments on behalf of the organizations.

4.2.4 Root Cause Analysis Team (RCAT)

The RCAT was chartered by the Runway Safety Council to analyze serious runway incursions. The RCAT is composed of FAA and industry representatives and members of the RSC. The RCAT review and analysis includes a systems approach with integrated causal and human performance perspectives. Interventions or mitigating solutions are proposed to the RSC for consideration and final determination.

5.0 RUNWAY SAFETY PERFORMANCE

5.1 Performance Metrics

Runway safety is measured by monitoring three areas:

1. Frequency of Runway Incursions
2. Severity of Runway Incursions
3. Types of Runway Incursions

5.1.1 Frequency of Runway Incursions

The actual number of runway incursions and the rate of runway incursions are two methods used to understand and describe runway safety trends. The total number of runway incursions provides an overview perspective of the entire NAS. This number is typically influenced by the growth or decline of aviation operations during the reporting period. The rate of runway incursions, on the other hand, is the relationship between total number of aviation runway operations and the number of runway incursions. Because this figure accounts for the differing number of operations at airports and reporting periods, it demonstrates trend information and can be used to compare airports and reporting periods with differing numbers of operations.

5.1.2 Severity of Runway Incursions

Each runway incursion event is reviewed and a severity category (A, B, C, or D) is applied. Category A runway incursion events are the most serious, and Category D events are the least serious. Several factors are used to determine the category of an event. Speeds and performance characteristics of aircraft; the proximity to other aircraft or vehicles and whether or not evasive action was required to avoid a collision are major determining considerations. See APPENDIX A for the definitions used to categorize events.

5.1.3 Runway Incursion Assessment Team (RIAT)

The RIAT is composed of members from the Office of Airport Safety and Standards, Flight Standards Service and ATO Terminal Services. The group meets each week to review surface events and apply the appropriate severity classification per the ICAO Runway Incursion Definition and Severity Classification found in APPENDIX A. Their tools for analysis include radar replays, written reports, airport diagrams, and voice replays. Each of the team members is a subject matter expert on one facet of airport, flight or air traffic operations.

5.1.4 Types of Runway Incursions

Runway incursions are analyzed and categorized by casual factors in order to target risk mitigation activities. These activities generally target three areas; pilot actions, Air Traffic Control (ATC) actions and actions by individuals driving or working in the vicinity of taxiways and runways

5.2 Trends

The number of most serious incursions – Category A and B – continued to fall from a total of 67 in FY2000 to just 7 in FY2011[4]. This decline is more than 90 percent. Between FY2008 and FY2010, Category A and B events fell at a rate of 50 percent per year.

Table 8: Number and Rate of Runway Incursions FY2008 – FY2010

Fiscal Year	Total Number of Runway Incursions	Annual Operations	Rate of Runway Incursions per Million Operations
FY2008	1009	58,562,343	17.2
FY2009	951	52,928,316	17.9
FY2010	966	51,249,476	18.9

[4] This report was written eleven months into FY2011.

Table 9: Runway Incursions Totals

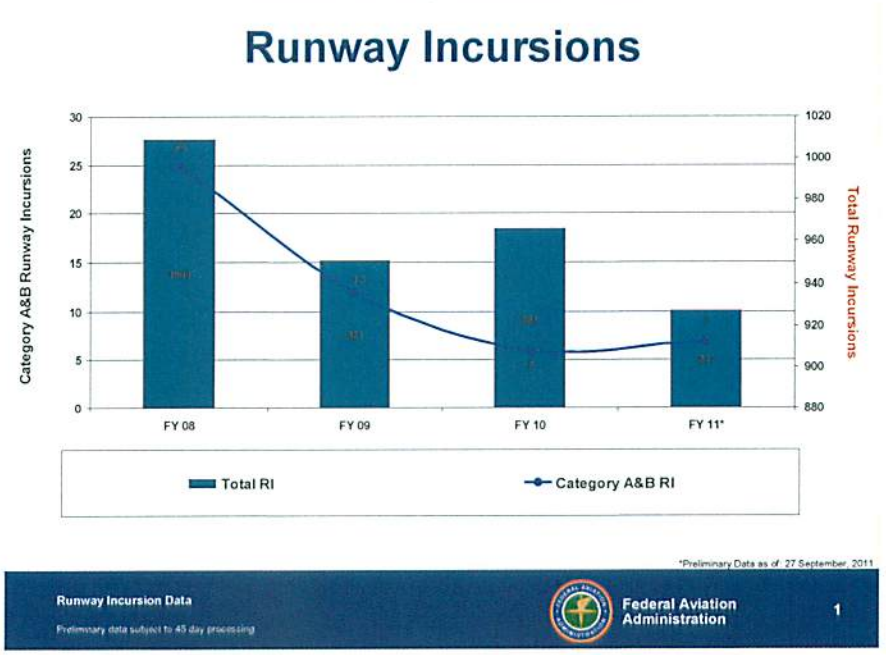

Table 10: Number and Type of Serious Runway Incursions by Year

Fiscal Year	Category A	Category B	Yearly Total
2000	24	43	67
2001	20	33	53
2002	10	27	37
2003	10	22	32
2004	12	16	28
2005	14	15	29
2006	24	7	31
2007	17	7	34
2008	12	13	25
2009	9	3	12
2010	4	2	6

Historically, pilots have been the largest contributors to runway incursions. In the years FY2008 through FY2010, the average percentage of pilot action runway incursions was 63.25 percent. The situation continues in FY2011. As of June 30, 2011, 62 percent of the 708 runway incursions have been pilot deviations.

Table 11: Runway Incursions by Type

Fiscal Year	OE	PD	V/PD	Total
2008	164	637	208	1009
2009	153	599	199	951
2010	156	629	181	966
2011 (As of June 30)	134	436	138	708

Table 12: Runway Incursion Percentages by Type

Fiscal Year	OE	PD	V/PD
2008	16	63	21
2009	16	63	21
2010	16	65	19
2011 (As of June 30)	19	62	19

A further analysis reveals that general aviation pilots are responsible for the majority of the pilot deviations.

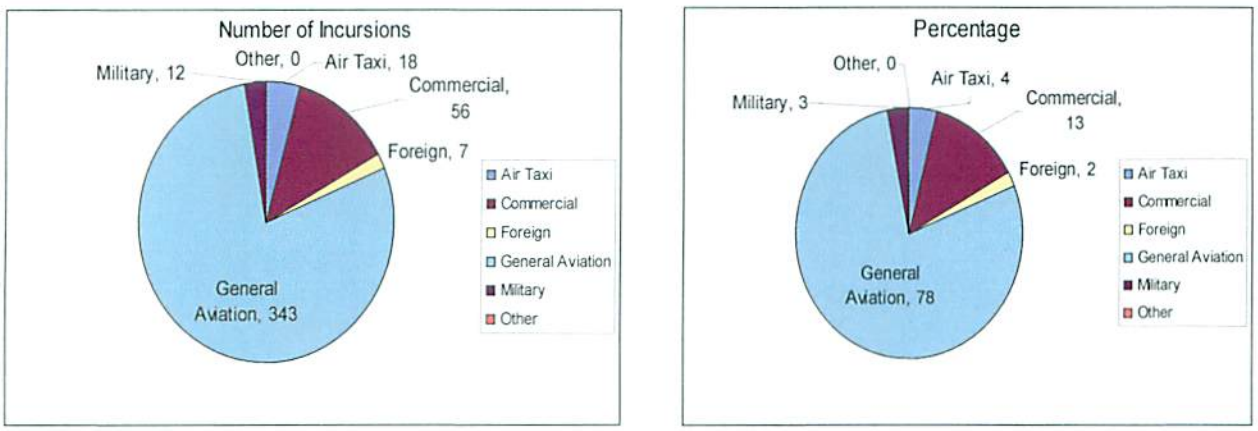

Figure 3: Breakdown of 436 Pilot Deviations by Type, as of June 30, 2011

Improved metrics continue to evolve to ensure that the FAA is responsive to the safety of the NAS.

6.0 RUNWAY SAFETY PLAN DIRECTION FY2012-14

Runway safety is a continuous improvement activity, and the initiatives that follow are designed to build on past initiatives to further improve runway safety.

6.1 ATO Safety, Runway Safety Initiatives

ATO Safety will use guidance, education and checking, outreach and collaboration, training, technology and infrastructure while working closely with its FAA and aviation industry partners.

6.1.1 Communications Strategy

A vital element in the FAA's runway safety communications strategy will include collaborative initiatives and an integrated approach designed to get the runway safety message conveyed effectively to the entire aviation community. That message will continue to be comprehensive, clear and simple, reaching the largest number of aviation stakeholders and optimizing awareness and education. The goal is to continually inform and educate stakeholders about key runway safety issues and information.

Relationships and partnerships with other FAA Lines of Business and the aviation community will make the message available at the national, regional and local levels. As an example, our support of the Department of Transportation's National Safety Week, planned for May 2012, will heighten the awareness of and need for improved runway safety nationally.

National aviation industry trade shows, conferences and conventions are other venues to be used to communicate the national runway safety message. As examples, the Office of Runway Safety will participate as an exhibitor or presenter during FY2012-14 at the following national meetings:

- The EAA AirVenture, Oshkosh, Wisconsin
- Sun 'n Fun International Fly-in &Expo, Lakeland, Florida
- NBAA Annual Meeting & Convention
- Women in Aviation Annual Conference
- Air Traffic Control Association (ATCA) Annual Meeting
- AOPA Aviation Summit
- American Association of Airport Executives (AAAE) Annual Conference and Exposition
- Regional Airline Association Annual Convention

A formal partnership being developed with the Aircraft Owners and Pilots Association could well become a model for relationships with other national aviation organizations. The AOPA partnership will support the Office of Runway Safety outreach to inform and educate the active general aviation pilots on critical and timely runway safety concerns. Additionally, the National Association of Flight Instructors (NAFI) has agreed to publish articles written by members of the Office of Runway Safety in its monthly Mentor magazine. This relationship offers Runway Safety opportunities to address runway safety issues and communicate its outreach, awareness and training messages directly to a large number of active certified flight instructors.

The runway safety message will be transmitted by multiple media, but always with a focus on the runway safety message and the target audiences – the pilots, air traffic controllers, vehicle drivers, airport management and ramp personnel. Some of the media – posters, brochures, promotional giveaways and specialty items – will remain the same, but innovative media methods will be developed to include social media, DVDs and interactive web based tutorials.

One example is an interactive media using micro-simulation and electronic publication designed to reinforce airfield pre-movement planning, routine training exercises, communications

practices and self-evaluation. This tutorial will cover aeronautical judgment through practical tips for avoiding memory lapses and maintaining focus. The working title is: "Ramp to Runway, and Return." The message media, production techniques and delivery methods are all innovative. The result will be an effective runway safety message tool for pilots that can be produced at an economical cost. The anticipated completion and available date for pilot viewing is September 2012.

6.1.2 Outreach and RSATS

ATO Safety will work through the field Runway Safety Offices and the Runway Safety Program Managers to conduct the core activities of guidance, outreach, awareness and training at all levels. Additionally, members of the Regional Offices will participate in meetings across the country conducting outreach and runway safety awareness and training to aviation stakeholders. Flight Instructor and Designated Pilot Examiner Refresher Courses, FAA Pilot Proficiency Awards Programs, FAA Safety Team meetings and Air Traffic Control Safety Awareness Initiatives are several examples where the Regional Teams will meet and spread the runway safety message to the target audience.

Runway Safety Action Teams at regional and local levels are two very important tools where outreach, training and awareness will promote the runway safety message within the local aviation community. Runway Safety Program Managers will plan and conduct RSATs using various criteria such as: the number of surface events, severity of events, and airport geometry. Dozens of RSAT meetings at targeted airports are envisioned each year. In support of the RSAT efforts, ATO Safety will continue to partner with the University of Virginia developing a data based tool to assist RSPMs in determining where RSATs should be held. The tool has data for selected airports organized under various runway safety criteria, i.e., an airport's predominant weather, airport geometry, number of surface events, etc. Using this type database, RSPMs will be able to quickly determine and prioritize airports for RSAT scheduling.

6.1.3 Runway Safety Tracking System (RSTS)

ATO Safety has developed a records tracking system called the Runway Safety Tracking System. The RSTS is an Automated Information System (AIS) that implements the management, tracking, and analysis of RSAT data in a standardized and effective manner. The RSTS is used to record and track Runway Safety Program events such as regional and local RSATs, investigations and audits.

Currently, RSTS tracks recommendations and action items contained in the Runway Safety Action Plan (RSAP), as well as those developed by the Runway Safety Council. The air traffic managers of towered airports are required to develop and maintain a documented RSAP. The plans are site-specific and present strategies to mitigate identified risks for surface operations in the movement area. The plans also record best practices that can be shared with the aviation community. By September 2012 the plan is to upgrade the RSTS capabilities to improve event tracking and data analysis to support enhanced identification and mitigation of system risk.

6.1.4 Hot Spots

Runway Safety will continue to support and expand publication and availability of information about Hot spots located at the nation's airports. Hot spots are defined as a location on an aerodrome movement area with a history or potential risk of collision or runway incursion, where pilot/vehicle operator heightened attention is necessary. Presently 190 airport diagrams with depicted hot spots are published by the FAA in the Airport/Facility Directories (A/FDs) and Terminal Procedure Publications (TPPs). More airport diagrams with hot spots are scheduled for publication in future cycles. Runway Safety transmits requests for hot spot publication through the National Flight Data Center. The process for publishing hot spots is in place and will be used to increase the coverage during FY2012-14. By September 2012 the definition of hot spots will be incorporated into FAA guidance documents and a program will be developed to educate pilots on how best to use this information to improve surface safety.

6.1.5 International Leadership

ATO Safety will continue to collaborate with the International Civil Aviation Organization to emphasize, on a global scale – the most pressing runway safety issues, gain worldwide acceptance for runway safety initiatives, publicize runway safety progress and develop future global runway safety plans. ATO Safety will provide support, as needed, for the International Runway Safety Summit planned for FY2013. Additionally, logistical and staff support, to include briefings, is planned for the ICAO Regional Runway Safety Seminars. The first Regional Seminar is scheduled for October 2011.

Collaboration will continue with other international organizations evaluating emerging global technologies. Examples include participation in the Civil Air Navigation Services Organization (CANSO) Runway Safety Metric Work Group and with EUROCONTROL in the AP-26 Airport Operation Harmonization Committee.

By September 2014 ATO Safety will work with ICAO to develop an international standard for conducting local RSATs and to track associated runway safety action items.

6.1.6 Emerging Runway Safety Technologies

ATO Safety will conduct assessments and analyses of emergent runway safety technologies to evaluate system effectiveness, interoperability, and level of readiness for operational transition to the NAS ground movement safety infrastructure. The Runway Status Lights (RWSL) system is an example of a system that started with a research and development effort sponsored by ATO Safety, and has migrated to a full deployment to 23 airports across the NAS.

There are several projects currently underway to help develop and field improved technology to improve surface safety. These projects include a Low Cost Ground Surveillance System (LCGS), Electronic Flight Bag (EFB) demonstration project, and an enhanced Final Approach Runway Occupancy Signal (eFAROS) project. These projects are described in more detail in APPENDIX D.

ATO Safety will support development of the new runway safety software application called Enhanced Traffic Situation Awareness with Indications and Alerts (SURF IA). The system will use Automatic Dependent Surveillance – Broadcast (ADS-B), Traffic Information System – Broadcast (TIS-B), and Cockpit Displays of Traffic Information (CDTI) to ultimately reduce runway incursions. Safety and performance requirements have been finalized; standardization support and analysis activities have been initiated. During FY2012-14 activities will continue to support the development of flight deck standards and ground requirements needed to introduce SURF IA into the NAS.

6.1.7 Runway Excursions

Runway excursions continue to present a significant safety risk to the aviation community and will be under the auspices of ATO Safety beginning in FY2012. ATO Safety will develop policies to incorporate runway excursion tracking, data analysis, and plans for future risk mitigation into the Runway Safety Program. Initial steps include defining runway excursions and including runway excursions in FAA Order 7050.1, as revised.

6.1.8 Call Sign Confusion

As part of the ATO Partnership for Safety, ATO Safety is conducting an analysis of factors that previous research has identified as contributors to call sign confusions. This analysis will be shared with Air Traffic En Route, who is working with FAA and industry partners to establish call sign recommendations for air carriers. The results of the analysis are due in September 2013.

6.1.9 Runway Safety Action Teams

The purpose of a Runway Safety Action Team (RSAT) is to identify surface safety risks that exist at the airport, and work as a team to propose specific actions to address those risks. The product of an RSAT is a Runway Safety Action Plan. The team uses the collaboration between pilots, controllers and airport operators and ATO Safety subject matter experts to identify practical solutions to local surface safety problems. Local RSATs (LRSAT) are accomplished by the Airport Traffic Control Tower Manager, with support from ATO Safety and the local airport. RSATs involve subject matter experts from ATO Safety, and the FAA lines of business at the regions and/or service area office. RSATs are reserved for the airports which are perceived to have the highest risk of runway incursions and/or excursions. Runway Safety Program Managers identify candidate locations for RSATs using various criteria such as: the number of surface events; severity of events and airport geometry. ATO Safety will continue to partner with the University of Virginia in the development of a data based tool to assist in the targeting of RSAT activity. The tool has data for selected airports organized under various runway safety criteria, i.e., an airport's predominant weather, airport geometry, number of surface events, etc. Using this tool, ATO Safety will be able to effectively analyze risk factors when deciding which airports require RSATs.

6.2 Flight Standards Initiatives

Pilots continue to be the largest contributors to runway incursions. As of June 30, 2011, 62 percent of the 708 runway incursions have been pilot deviations. In the years FY2008 through FY2010, the average percentage of pilot deviations resulting in runway incursions was 63.25 percent. In order to improve runway safety and change the actions of pilots, a change in the FAA's pilot training, testing and checking programs is required.

Aviation Safety (AVS), the organization with overall responsibility for pilot training, certification and renewal of pilot credentials through its Flight Standards Service (AFS), is initiating significant changes to core pilot education, training, testing and checking requirements. Pilot Training Handbooks, the educational foundation for a pilot's knowledge, are being updated to reflect an increased emphasis on runway safety. The Practical Test Standards, the guides examiners use to test applicants for aviation certificates, are also being revised to reflect a greater emphasis on runway safety. A Remedial Training National Standardized Lesson Plan for pilots involved in runway incursions is being developed. A Safety Alert for Operators (SAFO) has been issued that reflects best practices for surface operations to increase runway safety. Each of these activities is discussed in more detail below.

During FY2012-14, AVS will, through individual pilot contact and aviation industry collaboration, continue completing activities changing outreach, guidance, education, training and checking of pilots' understanding and practical application of runway safety practices and issues. The effects of these changes will be monitored and evaluated through runway incursion data. Any necessary adjustments necessitated by runway incursion trend data will be made to meet the FAA's Runway Incursion Reduction goal.

6.2.1 Guidance

Practical Test Standards, the guidance for flight evaluations created by the FAA for each pilot certificate and rating, will be changed. These sequentially arranged guides highlight areas where a pilot applicant must demonstrate knowledge and competency to be issued a pilot certificate or rating. Example areas within the PTS include Preflight Preparation, Takeoff, Landings, Go-Arounds, and Postflight Procedures. An applicant is tested in each of the areas and must demonstrate knowledge and competency. Demonstrated competency in runway safety knowledge – airport runway markings, signage meanings and ATC communications and clearances – will be mandatory during evaluations.

Flight Standards will conduct a review to identify regions or air carriers with higher than average runway incursions, and request assistance from the appropriate RSPM to create mitigation strategies to lower the rates of incursions.

When performing their examiner duties, Designated Pilot Examiners (DPE) will emphasize and test an applicant's understanding and application of procedures that support runway incursion avoidance. Competency and expertise must be demonstrated in airport runway markings, signage meanings, ATC communications and clearances.

Actions will be taken to insure that Part 142 Training Centers' approved curricula address the knowledge of airport markings, runway signage, ATC clearances, crew coordination, sterile cockpit and elapsed time between "line up and wait" instructions and an actual take off clearance. Guidance is being developed directing DPEs and Training Center Examiners to test and check airmen in accordance with the new emphasis on runway incursion avoidance knowledge requirements and procedures.

Guidance for the conduct of remedial training for runway incursion cases is being changed and will represent a significant departure from how the FAA presently conducts remedial training. If a general aviation pilot causes a Category A or B runway incursion, a DPE will be required to conduct any required remedial training. A Certified Flight Instructor (CFI) will be required to conduct any runway incursion remedial training for a pilot causing a Category C or D incursion. A Remedial Training National Standardized Lesson Plan is being developed to assist both the DPE and the CFI in the remedial training process. The new process will close the loop between initial pilot education and appropriately designated directed study/recurrent training to evaluate an airman's runway safety knowledge and skills.

Training materials are being rewritten to better reflect current runway safety topics and requirements. Advisory Circulars AC 91-73A, Parts 91 and 135 Single Pilot Procedures During Taxiing Operations and AC 120-74A, Parts 91, 121, 125 and 135 Flightcrew Procedures During Taxiing Operations are being amended to reflect topics covered in the recently issued Safety Alert For Operators (SAFO) on runway and surface operations safety best practices.

Flight Standards will continue its rule making change to require airline personnel who taxi and tow aircraft to receive approved training. The new regulation will specifically address surface and runway safety during taxi and tow operations.

6.2.2 Education

Educational reference materials used by pilots are undergoing an updating process to properly reflect the importance of runway safety. Specifically, the Pilot's Handbook of Aeronautical Knowledge, FAA-H-8083-25A, and Airplane Flying Handbook, FAA-H-8083-3A, are being revised to include detailed runway safety information, runway incursion avoidance material, procedures and updated information regarding Runway Status Lights, and Engineered Materials Arresting System (EMAS). More information on the EMAS system can be found in APPENDIX D.

6.2.3 Training and Checking

As mentioned above, the Practical Test Standards (PTS) for new pilot candidates and upgrade candidates at all levels are being changed to require demonstrated knowledge and competence in runway incursion avoidance. The Certified Flight Instructor (CFI) Practical Test Standards (PTS) will be the first to specifically require demonstrated runway incursion avoidance knowledge and competence. The Private Pilot PTS will be updated next followed by the Commercial Pilot PTS. The remaining PTS guides will be updated through their standard update

cycle. These actions create programs requiring CFIs to add runway incursion avoidance knowledge and competency to their lesson plans, and DPEs to perform testing and checking duties to access an airman's knowledge of procedures and skill to avoid causing a runway incursion.

An update will be made to all pilot certificate written examinations to include detailed runway safety questions relative to airport signage, runway markings, ATC instructions, and pilot procedures to avoid runway incursions.

6.2.4 Outreach

Flight Standards will continue to partner with ATO Safety to take the Runway Safety message to the grassroots level. Flight Standards will conduct its outreach programs through the FAASTeams, national, regional and local aviation events (e.g., EAA AirVenture, Sun 'n-Fun, local fly-ins, state aviation organization safety events), and aviation industry meetings, and will be an important part of the Runway Safety Program in collaboration with the Flight Standards liaison.

6.3 Office of Airports Initiatives

During FY2012-14, the Office of Airports has four top priorities to increase runway safety.

1. Continue improvements of Runway Safety Areas (RSA) at Part 139 certificated airports. Examples include:
    a. Areas are clear of obstacles and graded with no surface variations.
    b. Include storm sewers to prevent water accumulation.
    c. Areas are capable of supporting snow removal and aircraft rescue/firefighting equipment under dry conditions.
    d. Permitting objects in RSAs only because of specific required function.
2. Implement Safety Management Systems (SMS) internally and externally.
3. Reduce damaging wildlife strikes.
4. Reduce runway incursions and excursions.

These priorities come with significant challenges including:

- Conducting data-driven analysis to make better decisions.
- Solving complex geometry issues at airports.
- Bringing older airports up to current design standards.

Significant steps are already in motion to accomplish the tasks and others will begin during FY2012-14. Additionally, the Office of Airports will continue to partner with ATO Safety lending continued support and expertise to Runway Safety Action Team (RSAT) annual visits to towered airports.

6.3.1 Infrastructure

Continued improvements to Runway Safety Areas at Part 139 Certificated airports will be made. Improvements include:

- Each safety area shall be cleared and graded and have no potentially hazardous ruts, humps, depressions, or surface variations.
- Area must be drained by grading or storm sewers to prevent water accumulation.
- Each safety area must be capable under dry conditions of supporting snow removal and aircraft rescue and firefighting equipment.
- No objects may be located in any safety area, except for objects that need to be located in a safety area because of their function. These objects shall be constructed, to the extent practical, on frangible mounted structures of the lowest practical height, with the frangible point no higher than 3 inches above grade.

At the end of 2010, 87 percent of the RSAs had been improved to the extent practicable. The target is to complete all practicable RSA improvements by the end of 2015. RSAs have been a priority for the FAA since 2000. The timeline for RSA completions for FY2012 to FY2014 is in Table 13.

Table 13: Proposed RSA Completions for FY2012-14

FY2012	25
FY2013	31
FY2014	22

Office of Airports will continue installation of the Engineered Materials Arresting Systems (EMAS). (See APPENDIX D for more information.) Currently, 51 EMAS beds have been installed at 35 airports across the United States. The timeline for EMAS installations during FY2012-14 is in Table 14.

Table 14: Proposed EMAS Installation for FY2012-14

FY2012	6
FY2013	10
FY2014	5

A final rule on the Surface Movement Guidance Control System (SMGCS) will be implemented. SMGCS is a system of lights and procedures used in conjunction with the Airport Surface Detection Equipment –X (ASDE-X) to control aircraft and vehicles during low visibility operations. More information on ASDE-X and SMGCS can be found in APPENDIX D. Typically, where operational, SMGCS procedures go into effect when the runway visibility drops to 1200 feet. SMGCS has proven to be an effective tool for improved safety through the increased control of aircraft and ground vehicles during low-visibility conditions.

6.3.2 Safety Management

Airports will continue implementation of Safety Management Systems (SMS). Implementation of internal SMS will take place at large hub airports with continued development and planned expansion to other airports in FY2012-14. A final SMS rule requiring certificated airports to implement SMS will be published in FY2013. There will be continued data mining of airport accidents and annual updated reports provided to focus resources on airport standards issues in FY2012-14.

6.3.3 Wildlife Mitigation

By the end of FY2013, a final rule is expected to be implemented to require wildlife hazard assessments at all Part 139 certificated airports. There is also a plan to conduct wildlife hazard assessments or site visits at 2,800 general aviation airports. This activity will begin with assessments at the 170 largest and busiest general aviation airports starting in 2011. The completion date is planned to be FY2020.

Avian radar is another emerging technology. Wildlife hazards include many different species of animals with birds the most common and the primary focus of aviation safety. The proper management of birds on and around airports can do much to reduce the risk of bird strikes. Commercial versions of avian radar are being evaluated and a performance specification issued. The FAA is currently evaluating avian radar systems at three major airports: JFK in New York City, Chicago O'Hare, and Seattle-Tacoma (Sea-Tac). The installation at Sea-Tac, in 2007, was the first of its kind at a commercial airport in North America. The FAA's evaluation, to be completed by the end of 2011, will establish how bird radar data can be used operationally and by whom. It could be displayed to controllers in airport tower cabs, for example, but the current thinking is that the data might be a distraction and result in information overload. Research will continue to evaluate the feasibility of incorporating avian radar with ATC tower operations in FY2012-13, and testing will establish how much avian radar data should be made available to air traffic controllers without compromising safety.

6.3.4 Emerging Technologies

Airports will evaluate several emerging technology systems to assess applicability for improving runway safety. Although not specific ATO Safety initiatives, these technologies may advance runway and surface safety. Airport vehicles equipped with transponders, Automatic Dependent Surveillance – Broadcast (ADS-B), and moving maps will be evaluated by the end of FY2013. Foreign Object Debris radar commercial systems have been evaluated and a performance specification issued. Research will continue in FY2012-14. Additionally, actual fire training on non-flyable aircraft will be conducted to improve airport aircraft rescue, firefighting, training and standards in FY2012-14.

6.3.5 International Leadership

Actions will be taken to collaborate with the FAA's international airport partners to improve international runway safety. Support will be provided to ICAO to conduct 12 International Regional Runway Safety Seminars (IRRSS) in FY2012 and FY2013. The FAA will support the first seminar in Miami, Florida in October 2011. Airports will promote the adoption of runway safety technology, such as Runway Status Lights and EMAS at ICAO Aerodrome Panel meetings in FY2012 and FY2013. Airports will also provide technical assistance as resources permit to conduct airport and runway safety training in developing countries in FY2012-14.

6.4 ATO Terminal Services Initiatives

During FY2012-14, Terminal Services will support ATO Safety's Plan by continued participation in Runway Incursion Reduction actions. Terminal will ensure that every airport with an ATO tower has a current Runway Safety Action Plan that is updated at least once every 12 months. Support will be provided to the Runway Safety Council through membership and as members of the Root Cause Analysis Team (RCAT) and Runway Incursion Assessment Team (RIAT).

Local facility managers will provide support to the RSPM to develop and accomplish regional plans to reduce the risk of surface incidents and runway incursions. The facility manager will look for best practices that will be shared with the aviation community.

6.4.1 Training and Education

To heighten controller training and awareness of runway safety, Quality Assurance Alert Bulletins will be issued to communicate runway safety events demonstrating recurring trends or themes. Initial Crew Resource Management (CRM) training will be conducted at all terminal facilities by 2014.

Errors made in hearback and readback of taxi and takeoff clearances are large contributors to runway incursions. Terminal Services Quality Control will continue efforts to gather a better understanding of the issue. A publicity program of outreach, awareness and education will be used to highlight the problem to controllers, increase their situational awareness and mitigate potential runway safety hazards during FY2012-14. Examples of publicity materials include: DVDs, posters and training materials. A series of interactive videos called *Heads Up for Safety* will be produced and used as a training tool at the local level for controllers during their required recurrent training.

ATO Terminal will continue development and refinement of Automated Mandatory Briefing Items (AMBI). The process combines a voice replay of a significant safety event with animation to create a learning tool. AMBIs are created for both surface and airborne events. Controllers listen to voice replays while watching an animated visual recreation of the event as it unfolds. The objective is to create thought provoking lessons that will improve a controller's own techniques, knowledge, and focus on safety. The plan is to produce new videos bi-monthly for

controller training.

"Operation Rain Check" has been an effective program in the past to allow pilot visits with local ATC facilities. An effort will be made to revitalize the Order that controls the program. Additionally, many different outreach programs that present runway safety topics have been developed at the local facility level. ATO Terminal will provide resources and support these opportunities.

A document change proposal to FAA JO 3120.4, Air Traffic Technical Training, is being planned to require airfield vehicle tours for air traffic controllers as part of their initial training. The proposal should be submitted in the beginning of FY2012.

Airport construction introduces risk to air traffic and airport operations. ATO Terminal will develop and produce "Construction" and "Wrong Runway" educational materials to help controllers deal with the runway and airport construction taking place in the NAS during FY2012 through FY2014.

During FY2012-14, new infrastructure and safety systems will be deployed. Examples include the installation of Runway Status Lights at 17 Core NAS Airports and the expansion and standardization of the Surface Movement Guidance and Control System (SMGCS). Integration and expansion of the new systems will necessitate changes to procedures and training for facility controllers. ATO Terminal will develop a coordinated program for introduction of procedures and training.

ATO Terminal will produce and distribute the bi-monthly Runway Safety publication *Surface Sense* to all terminal controllers. ATO Terminal's goal is to present relevant topics for controllers that generate thought, discussion and communicate "best practices."

ATO Terminal will support the Airport Construction Advisory Council to ensure ATO facility managers are actively relaying construction planning and operational constraint information to controllers. This effort also aims to promptly convey information related to construction hazards to appropriate ATO personnel.

6.4.2 Technology

ATO Terminal will continue to support development of the Digital Notices to Airmen (NOTAM) system which is presently being evaluated for deployment into the NAS. NOTAMs transmit to the aviation industry the most up-to-date information about the status of an airport and its systems. Readily available information about an airport and its runways is vitally important to pilots. Digital NOTAMs have safety and efficiency benefits over traditional NOTAMS in several ways. Some examples include:

- Airspace users get easier to read information since the delivery method is not restricted by teletype system limitations.
- Originators enter the information directly into the system, improving the NOTAM's usability, accuracy, and availability.

Evaluation of the system began in January 2010. Initial evaluation facilities included: Southern California TRACON, Denver ATCT, Amarillo ATCT, Tallahassee ATCT, Las Vegas ATCT, and Boise ATCT. Atlantic City International (ACY) is the first facility to use Digital NOTAMs. Other facilities planning for system installation include: Washington Dulles International Airport (IAD), Ronald Reagan Washington National Airport (DCA), Baltimore/Washington International Thurgood Marshall Airport (BWI), Richmond International Airport (RIC), Norfolk International Airport (ORF), Chicago O'Hare International Airport (ORD), Chicago Midway International Airport (MDW), Fairbanks International Airport (FAI), and Fort Wayne International Airport (FWA).

6.4.3 Terminal Initiatives at the Local Level

The local ATCT manager (or designee) will coordinate with the local airport management, aviation stakeholders and Regional Runway Safety Office to plan and conduct local RSAT meetings, and will ensure the site specific RSAP for each local facility is updated and documented. The ATCT will invite Runway Safety personnel to participate in all Safety Risk Management panels evaluating changes in airport or air traffic procedures resulting from physical changes to airport runways, taxiways or the airport operations area. Members of the Terminal Services Quality Control Group will attend select Runway Safety Action Team meetings at local facilities. Their purpose will be to gather runway safety information and learn potential solutions applicable throughout the NAS.

6.5 ATO Safety Initiative

Using the airborne Risk Assessment Program (RAP) as a model, AJS Quality Assurance Directorate will develop and validate a tool to analyze runway incursion events to determine risk and repeatability in the NAS and possible causal factors.

7.0 NEXTGEN – IMPACT ON RUNWAY SAFETY

There is a direct correlation between situational awareness of pilots, air traffic controllers, vehicle operators and runway safety. NextGen technologies will contribute significantly to increasing situational awareness for all three. NextGen systems will increase accuracy, expand readily available information and make communications between pilots, controllers and vehicle operators faster and clearer. Ideally, NextGen is all about situational awareness, accuracy and clear communications. Infrastructure improvements – ASDE-X, RWSL, and SMGCS – are three core runway safety systems and first steps (near-term actions) in our long-term journey to safer NextGen runways. The Electronic Flight Bag (EFB), being demonstrated and tested now (see APPENDIX D) is not technically a NextGen system, but it uses NextGen enabled technology. An EFB with updating visual maps as the aircraft moves along the airport surface will provide much greater situational awareness, especially at night or in low visibility operations.

Advanced NextGen technologies over the next decade will mitigate contributing factors seen today in runway incursions. Data communication systems will mitigate contributing factors like hearback/readback errors, clearance misunderstanding or perception and frequency congestion. During low visibility operations, an aircraft's own airport location information, along with other aircraft and vehicles' airport surface locations will be displayed on moving maps using Cockpit Display of Traffic Information (CDTI).

Ground based RWSL and cockpit-based alert capabilities using EFB or CDTI will be available to alert pilots when it is unsafe to take off or land on a runway. Air traffic controllers' situational awareness will be improved as a result of enhanced surface displays to alert when risk of runway incursion is imminent. Initial surface traffic management tools will help manage surface flow of aircraft at high-density airports through automated decision support. These tools will provide surface sequencing and staging lists for departures.

Critical communications between pilots and controllers will be accomplished by data communications. These communication types will include automated airport information, clearances, instructions and even hold-short instructions. Data communications will reduce frequency congestion and ensure successful transmissions with correct comprehension of clearances and instructions to provide an increased, safe runway environment.

8.0 CONCLUSION

ATO Safety has experienced successes in improving runway safety. The immediate tools – training, awareness, education and procedures – have been effective, but to reduce the number of runway incursions further a change to the approach is required. While technology solutions are being planned, evaluated and implemented, they represent, in some cases, a strategy for the mid and long-term. The NRSP is an overview of the FAA's strategy to address the changes necessary to improve runway safety during FY2012-14 and beyond. Improving runway safety requires collaboration across the FAA Lines of Business, and partnering with domestic stakeholders and the global aviation community.

ATO Safety is the focal point for all runway safety initiatives in the NAS. Planned runway safety initiatives for the FY2012-14 time frame presented in this document reflect goals and objectives in collaboration with other FAA and national and international runway safety partners.

APPENDIX A: ICAO RUNWAY INCURSION DEFINITION AND SEVERITY CLASSIFICATION

As part of its Flight Plan goal for International Leadership, the FAA supported the efforts of ICAO to establish standard definitions for runway incursion and runway incursion severity. The FAA adopted the ICAO definition beginning in FY 2008 (October 1, 2007):

> Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and takeoff of aircraft.

Figure A1 shows a comparison between the FAA definition used prior to October 1, 2007, and the current definition for runway incursion severity classifications.

Figure A1: Comparison of Previous and Current FAA Definitions for Runway Incursion Severity Classifications

FAA Definition Prior to FY 2008		**Current FAA Definition**	
Class	Description	Class	Description
A	Separation decreases and participants take extreme action to narrowly avoid a collision, or the event results in a collision.	Accident	Refer to NTSB 49 CFR 830.
		A	A serious incident in which a collision was narrowly avoided.
B	Separation decreases and there is a significant potential for a collision.	B	An incident in which separation decreases and there is a significant potential for collision, which may result in a time critical corrective/evasive response to avoid a collision.
C	Separation decreases, but there is ample time and distance to avoid a potential collision.	C	An incident characterized by ample time and/or distance to avoid a collision.
D	Little or no chance of a collision but meets the definition of a runway incursion		
Other Surface Incidents	An event during which unauthorized or unapproved movement occurs within the movement area or an occurrence in the movement area associated with the operation of an aircraft that affects or could affect the safety of flight. (This subset includes only non-conflict events.)	D	Incident that meets the definition of runway incursion such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and takeoff of aircraft but with no immediate safety consequences.
		Not Defined	(FAA non-conflict surface incidents include more than just ICAO Class "D" events.)
ID	Insufficient Data: inconclusive or conflicting evidence	E	Insufficient information, inconclusive or conflicting evidence precludes

	precludes severity assessment.		severity assessment.

APPENDIX B: ACRONYMS

A/FD	FAA Airport/Field Directory
AAAE	American Association of Airport Executives
AC	Advisory Circular
ACI	Airports Council International
ACI-NA	Airports Council International – North America
ACRP	Airport Cooperative Research Program
ADS-B	Automatic Dependent Surveillance – Broadcast
AFS	FAA Aviation Safety – Flight Standards Service
AIS	Automated Information System
AJP	FAA Air Traffic Organization NextGen & Operations Planning Office
AJS	FAA Air Traffic Organization - Safety
AJT	FAA Air Traffic Organization – Terminal Services
ALPA	Air Line Pilots Association
AMBI	Automated Mandatory Briefing Items
AOA	Airport Operations Area
AOPA	Aircraft Owners & Pilots Association
AOV	FAA Air Traffic Safety Oversight Service
ARP	FAA Office of Airports – Airports Safety and Standards
ASAP	Aviation Safety Action Program
ASDE-X	Airport Surface Detection Equipment- Model X
ASRS	NASA Aviation Safety Reporting System
ATA	Air Transport Association
ATC	Air Traffic Control
ATCA	Air Traffic Control Association
ATCT	Air Traffic Control Tower
ATO	Air Traffic Organization
ATSAPO	Air Traffic Safety Action Program
ATXA	Air Taxi Association
AVP	FAA Office of Accident Investigation and Prevention
CANSO	Civil Aviation Navigation Services Organization
CDTI	Cockpit Display of Traffic Information
CFI	Certified Flight Instructor
CFR	Code of Federal Regulations
CMO	Certificate Management Office
CRM	Crew Resource Management
DPE	Designated Pilot Examiners
EASA	European Aviation Safety Agency
eFAROS	Enhanced Final Approach Occupancy Signal
EFB	Electronic Flight Bag
EFVS	Enhanced Flight Vision System
EMAS	Engineered Materials Arresting System
EUROCONTROL	The European Organization for the Safety of Air Navigation

EVS	Enhanced Vision System
FAA	Federal Aviation Administration
FAASTeam	FAA Safety Team
FAROS	Final Approach Runway Occupancy System
FCT	FAA Contract Tower
FY	Fiscal Year
ICAO	International Civil Aviation Organization
IRRSS	International Regional Runway Safety Seminar
IRSS	International Runway Safety Summit
LC	Tower Local Controller
LCE	Charlotte/Douglas International Airport Local Tower Control East
LCGS	Low Cost Ground Surveillance System
LED	Light-emitting diode
LOB	Lines of Business
LRSAT	Local Runway Safety Action Team
NAFI	National Association of Flight Instructors
NAS	National Airspace System
NATCA	National Air Traffic Controllers Association
NBAA	National Business Aviation Association
NNEW	NextGen Network Enabled Weather
NOTAM	Notice to Airmen
NRSP	National Runway Safety Plan
OIG	Department of Transportation Office of Inspector General
PAPI	Precision Approach Path Indicator
PASS	Professional Aviation Safety Specialists
POI	Principle Operations Inspector
PTS	Practical Test Standards
RAA	Regional Airline Association
RAP	Risk Assessment Program
RCAT	Root Cause Analysis Team
REL	Runway Entrance Lights
RIAT	Runway Incursion Assessment Team
RID	Runway Incursion Devices
RIL	Runway Intersection Lights
RSA	Runway Safety Area
RSAP	Runway Safety Action Plan
RSAT	Runway Safety Action Team
RSC	Runway Safety Council
RSO	Runway Safety Office
RSPM	Runway Safety Program Manager
RSTS	Runway Safety Tracking System
RWSL	Runway Status Lights
SAFO	Safety Alert For Operators
SBP	FAA Air Traffic Organization – Safety Business Plan
SMGCS	Surface Movement Guidance Control System

SMS	Safety Management System
SURF-IA	Enhanced Traffic Situation Awareness with Indications and Alerts
SVS	Synthetic Vision System
SWIM	System Wide Information Management
THL	Takeoff Hold Lights
TIS-B	Traffic Information System – Broadcast
TPP	FAA Terminal Procedure Publications
TRACON	Terminal Radar Approach Control
VMC	Visual Meteorological Conditions

APPENDIX C: GLOSSARY

Advisory Circular (AC) – A document that provides guidance, such as methods, procedures and practices, acceptable to the Administrator for complying with regulations and grant requirements. ACs may also contain explanations of regulations, other guidance material, best practices, or information useful to the aviation community. They do not create or change a regulatory requirement.

Airport Surface Detection Equipment, Model X (ASDE-X) – Surface detection technology that integrates data from various sources, including radars and aircraft transponders to provide controllers with a more robust view of airport operations and enable them to detect potential runway conflicts by providing detailed coverage of movement on runways and taxiways. By collecting data from a variety of sources, ASDE-X is able to track vehicles and aircraft on the airport movement area and obtain identification information from aircraft transponders.

Air Traffic Safety Action Program (ATSAP) – A voluntary, non-punitive reporting program for employees of the FAA Air Traffic Organization to openly report safety of flight concerns.

Aviation Safety Action Program (ASAP) – A voluntary reporting system designed to encourage voluntary reporting of safety issues and events that come to the attention of employees of certain certificate holders. To encourage an employee to voluntarily report safety issues even though they may involve alleged violation of Title 14 of the Code of Federal Regulation (14 CFR), enforcement-related incentives have been designed into the program. An ASAP is based on a safety partnership that includes the FAA and the certificate holder, and may include any third party such as the employee's labor organization.

Category A – A serious incident in which a collision was narrowly avoided.

Category B – An incident in which separation decreases and there is a significant potential for collision, which may result in a time critical corrective/evasive response to avoid a collision.

Category C – An incident characterized by ample time and/or distance to avoid a collision.

Category D – Incident that meets the definition of runway incursion such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and takeoff of aircraft but with no immediate safety consequences.

Core Airports – Thirty of the nation's largest airports used to measure air transportation performance data. These airports handle 63 percent of the country's passengers and 68 percent of the country's air freight operations.

Crew Resource Management (CRM) – The optimal use of all available resources, information, equipment and people to achieve safe and efficient flight operations.

Engineered Materials Arresting System (EMAS) – An EMAS uses materials of closely controlled strength and density placed at the end of a runway to stop or greatly slow an aircraft

that overruns the runway. The best material found to date is a lightweight, crushable concrete. When an aircraft rolls into an EMAS arrestor bed the tires of the aircraft sink into the lightweight concrete and the aircraft is decelerated by having to roll through the material.

European Aviation Safety Agency (EASA) – An agency of the European Union (EU) which has been given regulatory and executive tasks in the field of civilian aviation safety. The Agency's responsibilities include: giving advice to the EU for drafting legislation; implementing and monitoring safety rules, including inspections in the Member States; type-certification of aircraft and components, as well as the approval of organizations involved in the design, manufacture and maintenance of aeronautical products; authorization of third-country (non-EU) operators; and safety analysis and research.

General Aviation (GA) – Aviation that is neither government/military nor commercial. GA operations encompass the full range of activity from student pilots to multi-hour, multi-rated pilots flying sophisticated aircraft for business or pleasure. This group of aircraft operations includes small GA aircraft (less than 12,500 lbs maximum takeoff weight) and large general aviation aircraft (maximum takeoff weight greater than or equal to 12,500 lbs).

Hold Short – An air traffic control instruction to the pilot or an aircraft or a vehicle driver not to proceed beyond a specified point.

Hot Spot – A location on an aerodrome movement area with a history or potential risk of collision or runway incursion where pilot/vehicle operator heightened attention is necessary.

Line Up and Wait (LUAW) – Line Up and Wait is the ICAO harmonized phraseology used by tower controllers to instruct pilots to taxi onto the runway and await takeoff clearance when an immediate takeoff clearance cannot be issued due to other traffic.

Movement Area – The runways, taxiways and other areas of an airport/heliport which are utilized in taxiing/hover taxiing, air taxiing, takeoff and landing of aircraft, exclusive of loading ramps and parking areas. At those airports/heliports with a tower, specific approval for entry onto the movement area must be obtained from ATC.

National Transportation Safety Board (NTSB) – An independent U.S. federal agency that investigates every civil aviation accident in the United States and significant accidents in the other modes of transportation, conducts special investigations and safety studies, and issues safety recommendations to prevent future accidents.

NextGen Implementation Plan – This plan defines the FAA's path to the Next Generation Air Transportation System. The NextGen Implementation Plan contains firm, fully-funded commitments to new satellite-based operational capabilities, new airport infrastructure and improvements to safety, security and environmental performance.

Non-Movement Area – Taxiways and apron (ramp) areas not under the control of air traffic.

Notice to Airmen (NOTAM) – Information on unanticipated or temporary changes to components of or hazards in the NAS provided to aircraft operators until the FAA amends the associated charts and related publications.

Office of the Inspector General (OIG) – The OIG has responsibility to report, both to the Secretary of Transportation and to the Congress, program and management problems and recommendations to correct them. The OIG carries out these duties through a nationwide network of audits, investigations, inspections and other mission-related functions performed by OIG components.

Pilot Deviation (PD) – An action of a pilot that violates any Federal Aviation Regulation.

Precision Approach Path Indicator (PAPI) – A lighting system that primarily assists pilots by providing visual glide slope guidance in precision approach environments. The glide path is composed of a maximum of four lights (red and white) that illuminate in combinations (e.g., two white and two red when the pilot is on the correct glide slope or one red and three white when the pilot is slightly above the glide slope) to assist the pilot in adjusting the approach accordingly.

Runway Entrance Lights (REL) – A component of the Runway Status Lights system located at runway-taxiway intersections that illuminates a string of red lights and serves as an indicator for pilots and vehicle operators when it is unsafe to enter or cross the runway.

Runway Incursion (RI) – Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and takeoff of aircraft.

Runway Intersection Lights (RIL) – A component of the Runway Status Lights system located at runway-runway intersections that illuminates a string of red lights and serves as an indicator for pilots and vehicle operators when it is unsafe to enter or cross the runway.

Runway Safety Action Team (RSAT) – A Runway Safety Action Team (RSAT) convenes to discuss surface movement issues and concerns at a particular airport and formulate a Runway Safety Action Plan (RSAP) to address those concerns. The team must include personnel from the ATCT and airport operator and may include personnel from various FAA Lines of Business (including Runway Safety) and interested users of the airport.

Runway Safety Area (RSA) – The FAA requires that commercial airports, regulated under Part 139 safety rules, have a standard Runway Safety Area (RSA) where possible. At most commercial airports the RSA is 500 feet wide and extends 1,000 feet beyond each end of the runway. The FAA has this requirement in the event that an aircraft overruns, undershoots or veers off the side of the runway.

Runway Status Lights (RWSL) – Warning system located on the runway that provides a visual indication to pilots and ground vehicle operators not to enter or cross a runway on which there is

approaching traffic. Types include Runway Entrance Lights, Runway Intersection Lights and Takeoff Hold Lights.

Safety Management System (SMS) – A quality management approach to controlling risk. It also provides the organizational framework to support a sound safety culture. For general aviation operators, an SMS can form the core of the company's safety efforts. For certificated operators, such as airlines, air taxi operators and aviation training organizations, the SMS can also serve as an efficient means of interfacing with FAA certificate oversight offices. The SMS provides the organization's management with a detailed roadmap for monitoring safety-related processes.

Surface Incident (SI) – Any event where unauthorized or unapproved movement occurs within the airport movement area, or an occurrence in the movement area associated with the operation of an aircraft that affects or could affect the safety of flight. A surface incident can occur anywhere on the airport's surface including the runway. The FAA further classifies a surface incident as either a runway incursion or a non-runway incursion. This report generically refers to non-runway incursions as surface incidents.

Surface Movement Guidance and Control System (SMGCS) – A system used during low visibility conditions providing guidance to, and control or regulation of, all aircraft, ground vehicles and personnel on the movement area of an aerodrome. Guidance relates to facilities, information and advice necessary to enable the pilots of aircraft or the drivers of ground vehicles to find their way on the aerodrome and to keep the aircraft or vehicles on the surfaces or within the areas intended for their use. Control or regulation means the measures necessary to prevent collisions and to ensure that the traffic flows smooth and freely.

Takeoff Hold Lights (THL) – A component of the Runway Status Lights system that illuminates a string of red lights and serves as an indicator for pilots when the runway is unsafe for takeoff due to traffic on the runway.

APPENDIX D: TECHNOLOGY AND INFRASTRUCTURE

D-1 Airport Surface Detection Equipment – Model X (ASDE-X)
Airport Surface Detection Equipment-Model X (ASDE-X) has been installed at 35 airports. Thirty of these installations are the "Core Airports" which handle 63 percent of the country's passengers and 68 percent of the country's operations.

ASDE-X is a significant technological and infrastructure investment in the National Airspace System. ASDE-X bears great significance for runway safety for several reasons. First, ASDE-X provides much better situational awareness for controllers. Multiple sensors located around each airport's surface allow multi-lateration to precisely determine aircraft and/or ground vehicle positions on an airport.

Secondly, ASDE-X is essential to increased runway safety in the future. ASDE-X will be the enabling technology for other runway safety infrastructure systems being tested and programmed for operational deployment. These new technologies include Runway Status Lights (RWSL), the Final Approach Runway Occupancy System (FAROS) and as we progress, the Next Generation Air Transportation System's (NextGen) Automatic Dependent Surveillance-Broadcast (ADS-B).

D-2 Electronic Flight Bag (EFB)
The Electronic Flight Bag, another system that should significantly increase runway safety, is in its initial test phase. The EFB, although not technically a NextGen technology, is a NextGen enabled system that will support initial NextGen ADS-IN operations.

It is critical that pilots know what runway or taxiway they are on. That knowledge is especially important at night, in poor weather or when the crew is unfamiliar with the airport layout. After thoroughly reviewing safety data, including human factors research on the safety benefits of own ship position versus the potential safety risks, the FAA is now conducting operational and safety evaluation of Electronic Flight Bags with own ship position on an airport moving map. With help from FAA grants, four U.S. air carriers have aircraft that are equipped and crews conducting the evaluations.

D-3 Engineered Materials Arresting System (EMAS)
The FAA has a requirement that airports certified under FAR Part 139 maintain a runway safety area, where possible. The runway safety areas at most commercial airports are usually 500 feet wide and equidistant on either side of the runway centerline, and 1,000 feet beyond the ends of the runway. RSA physical requirements are listed in Section 7.3.1 Infrastructure. The areas lessen possible damage to aircraft should they veer off or overshoot the runway on take off or landing roll. Runway Safety Areas have been a priority with the FAA, but the locations and geometries of some airports do not allow the 1,000 feet safety areas at the ends.

To address the impracticality of RSAs at some airports, the FAA, in the 1990s, collaborated with the University of Dayton, airport operators such as, Port Authority of New York and New Jersey, and industry to develop a technological solution to the limited overrun space at certain airports. An Engineered Material Arresting System (EMAS), using crushable concrete with a closely

controlled strength and density, was developed to be placed at the end of runways to stop or slow aircraft during an overrun situation. When an aircraft rolls into an EMAS arrestor bed, the tires of the aircraft sink into the concrete surface and the aircraft is decelerated by the bed resistance as the aircraft rolls through the material.

The first EMAS bed was installed at John F. Kennedy International Airport (JFK) in 1996. The Airport Cooperative Research Program (ACRP) published a report in January 2010 that provides an industry update and resource information. The report is available at: http://www.trb.org/ACRP/. 51 EMAS beds have been installed at 35 airports across the NAS. During FY2012 – 14, 21 EMAS beds will be installed at NAS airports.

The following are examples of EMAS installations stopping aircraft during runway overruns:

- May 1999: A Saab 340 commuter aircraft overran the runway at JFK.
- May 2003: A Gemini Cargo MD-11 overran the runway at JFK.
- January 2005: A Boeing 747 overran the runway at JFK.
- July 2006: A Dassault Falcon 900 overran the runway at Greenville Downtown Airport (GMU), South Carolina.
- July 2008: An Airbus A320 overran the runway at Chicago O'Hare Airport (ORD), Illinois.
- January 2010: A Bombardier CRJ-200 regional jet overran the runway at Yeager Airport (CRW), Charleston, West Virginia.
- October 2010: A Gulfstream G-IV overran the runway at Teterboro Airport (TEB), Teterboro, New Jersey.

D-4 Final Approach Runway Occupancy Signal (FAROS)

The Final Approach Runway Occupancy Signal system warns landing pilots of an unsafe condition. FAROS provides direct notification to pilots that a runway is occupied, potentially unsafe for landing and the pilots should increase vigilance. The system – advisory only – operates automatically and independently of air traffic control. Enhanced FAROS (eFAROS), using safety and light control logic processed from ASDE-X, "flashes" the Precision Approach Path Indicator (PAPI) when the runway is occupied. PAPI is an existing light system pilots use to maintain glide path in visual meteorological conditions (VMC). At most airports around the world, the PAPI is normally located next to the touchdown zone of the runway. In today's NAS, there is no automated system to alert pilots that their landing runway is occupied by another aircraft or vehicle.

The FAROS system has several advantages. It is a direct and immediate notification of potential danger to the pilots, and it uses existing controller procedures and requires no additional aircraft equipage.

A developmental system proved successful in tests at Dallas/Ft Worth Airport (DFW) from October 2008 to May 2009. The test indicated that eFAROS worked well both technically and operationally. The DFW system will be reactivated in the 4th quarter of FY2011. Another developmental system is being tested at Long Beach Airport using magnetic loops and not driven

by ASDE-X surveillance information.

D-5 Low Cost Ground Surveillance System (LCGS)
Efforts are also underway to develop low-cost ground surveillance systems (LCGS) that can be deployed at small to medium sized airports. These commercially available radar systems are much less expensive than the ASDE-X system being used at 35 airports. The LCGS is a response to the FAA's 2007 "Call to Action." The LCGS provides an added layer of safety by giving air traffic controllers basic ground surveillance for aircraft and vehicles operating on runways and adjacent taxiways. Several of the LCGS systems being evaluated have the capability to integrate ADS-B, when that technology is ready for deployment in the NAS.

The first pilot site was installed at Spokane International Airport (GEG), and is demonstrating the potential for a low cost surface movement system to enhance safety at smaller airports within the NAS. LCGS user evaluations are being completed, and in several documented cases the system assisted controllers in identifying potential unsafe situations. The GEG system will remain in use until the LCGS pilot program has been completed. Other pilot sites are being installed at San Jose, California (SJC), Manchester, New Hampshire (MHT), Reno, Nevada (RNO), and Long Beach, California (LBG).

D-7 Runway Status Lights (RWSL)
Runway Status Lights are designed to improve flight crew and vehicle operator situational awareness by direct, accurate and timely indications of a runway's status. RWSL is a fully automatic, advisory system to reduce runway incursions without interfering with normal air traffic and airport operations. The system is compatible with existing air traffic and flight crew procedures.

Since 2005, systems at Dallas/Fort Worth International Airport (DFW), Los Angeles International Airport (LAX), San Diego International Airport (SAN) and Boston Logan International Airport (BOS) have been operationally evaluated. The system at BOS is the first to use Runway Intersection Lights, necessitated by Boston's intersecting runway geometry. A production RWSL system will undergo operational testing at the Orlando International Airport (MCO). The production system, unlike the four test systems, will have light-emitting diodes, which will improve the reliability of in pavement light fixtures. The production system will also have full monitoring capability with fault detection and built-in testing.

The RWSL is an in-pavement system of Runway Entrance Lights (RELs), Takeoff Hold Lights (THLs), and a new edition, Runway Intersection Lights (RILs). The RWSL operates independently of air traffic control. It contains advanced safety light control logic that processes surveillance data derived from the ASDE-X system. All of the RWSL lights are imbedded in the runway and taxiway pavement.

Runway Entrance Lights (REL) are placed in the pavement at the intersections of taxiways and runways. They will be visible to pilots and vehicle drivers approaching a runway at those taxiway/runway intersections. When illuminated, pilots and vehicle operators should remain clear of the runway. Illumination of the lights is an indication that the runway is, or soon will be, occupied by a high speed aircraft, possibly landing or taking off.

Figure 4: Runway Entrance Lights

Takeoff Hold Lights (THL) are placed in the runway pavement and are visible to pilots in takeoff position. When illuminated, THLs indicate it is not safe to takeoff because the runway ahead is occupied, or soon will be occupied, by another aircraft or vehicle. When lined up ready for takeoff or cleared for takeoff and the THLs are illuminated, the pilot/crew will remain in position, notify the tower control of the discrepancy and not begin takeoff roll.

Figure 5: Takeoff Hold Lights

Runway Intersection Lights are placed in the pavement at intersecting runways. The RILs will illuminate when the runway ahead is unsafe because there is a potential conflict at the runway intersection. Where RILs are deployed, illumination is an indication to pilots or vehicle operators that another aircraft or vehicle is approaching the intersection from the crossing runway. Upon seeing illuminated RILs, pilots or vehicle operators should stop or exit the runway prior to the runway intersection ahead.

Figure 6: Runway Intersection Lights

The FAA will install the RWSL Systems at 23 major airports.

Table 15: Waterfall Installation Schedule as of July 8, 2011

Airport	Operational Readiness Date (ORD)
Orlando International Airport (MCO)	May-2012
Phoenix Sky Harbor International Airport (PHX)	May-20121
George Bush Intercontinental Airport (IAH)	May-2012
Minneapolis-St. Paul International Airport (MSP)	May-2012
Seattle-Tacoma International Airport (SEA)	May-2012
Las Vegas McCarran International Airport (LAS)	May-2012
Washington Dulles International Airport (IAD)	May-2012
Ft/Lauderdale/Hollywood International Airport (FLL)	May-2012
Charlotte Douglas International Airport (CLT)	May-2012
Chicago O'Hare International Airport (ORD)	May-2012
LaGuardia Airport (LGA)	Jan-2014
John F. Kennedy International Airport (JFK)	Jan-2014
Detroit Metro Wayne County Airport (DTW)	Jan-2014
Newark Liberty International Airport (EWR)	Apr-2014
Philadelphia International Airport	Apr-2015
San Francisco International Airport (SFO)	May-2015
Dallas/Ft. Worth International Airport (DFW)	Sep-2015
Hartsfield-Jackson Atlanta International Airport (ATL)	Apr-2016
Boston Logan International Airport (BOS)	Apr-2016
San Diego International Airport (SAN)	Apr-2016
Los Angeles International Airport (LAX)	Apr-2016
Baltimore/Washington International Thurgood Marshall Airport	May -2016
Denver International Airport (DEN)	Jun-2016

For more information please see: http://www.faa.gov/air_traffic/technology/rwsl/.

D-8 Surface Movement Guidance and Control System (SMGCS)

Aircraft using today's state-of-the-art navigation equipment can land and takeoff in minimum visibility. When airports are operating under obscured visibility conditions, the ability to observe the surface surroundings for pilots, air traffic controllers and vehicle drivers is a critical issue. The FAA, in collaboration with airport and aviation operators, developed a system to increase safety for ground operations during low visibility conditions. A SMGCS plan facilitates the safe movement of aircraft and vehicles on the airport by establishing rigorous control procedures and requiring enhanced visual aids.

Surface Movement Guidance and Control System is a system of lighting, signs and markings to allow aircraft to operate from ramp-to-runway and runway-to-ramp in very low visibilities in a controlled and safe manner. SMGCS provides guidance and control to pilots and vehicle drivers on the airport's movement area. Guidance relates to facilities, information and advice necessary to enable the pilots of aircraft or the drivers of ground vehicles to find their way on the aerodrome and to keep the aircraft or vehicles on the surfaces or within the areas intended for their use. Control or regulation means the measures necessary to prevent collisions and to ensure

that the traffic flows smoothly and freely.

SMGCS is in transition from AFS advisory guidance (AC 120 – 57) to regulatory compliance under a new 14 CFR Part 139 Regulation. The AC provided guidance and standards for developing SMGCS for U.S. airports where scheduled air carriers conduct operations at visibilities below 1,200 feet. The new regulation makes the Office of Airports the lead for SMGCS. As of March 2009, there were 126 airports conducting SMGCS operations. The regulation will ensure:

- Internal standardization and cooperation between Airports, ATO and Flight Standards
- Clear responsibilities between LOBs
- Charting used by pilots is standardized
- FAA alignment with the European Aviation Safety Agency (EASA)