The Strategic Runway Safety Plan

Report to Congress Pursuant to FAA Modernization and Reform Act of 2012 (Pub. L. No. 112-95, Section 314(a))

U.S. Department
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**Federal Aviation
Administration**

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Forward

Risk has been present in aviation since that day in December 1903 when two bicycle mechanics named Orville and Wilbur Wright had the audacity to attempt powered flight. That first take-off from a North Carolina sand dune ushered in one of the most astounding periods of technological advancement in the history of mankind. The development and integration of aerospace exploration, scientific space research, and air transport into the societal, economic, and geopolitical fabric over the last 100 years of human history is nothing less than astounding.

Today, aviation is the lynchpin of an increasingly interconnected and globalized world. In the United States, civil aviation supports over 10 million jobs, contributes $1.3 trillion in total economic activity, and accounts for 5.2 percent of total U.S. Gross Domestic Product (GDP)[1]. At $54 billion, civilian aerospace products and parts contribute more to the U.S. balance of trade than any other industrial sector.[2] The very foundation of this multifaceted system hinges upon recognition that humans are required to safely perform thousands of highly complex, technological challenging, and critically interdependent tasks. Understanding and measuring this nexus of technological complexity and human psychology is critical to maintaining safety performance within the National Airspace System (NAS) today. The challenge for the Federal Aviation Administration (FAA) is to design comprehensive data analysis systems that monitor the performance of interconnected networks, identify and prioritize the hazards associated with the human operation of those networks, and take appropriate measures to remove risk from the system.

> *A primary goal for the FAA is to create an integrated National Air Space System that monitors everyday risk and creates the ability to forecast conditions of increased risk.*

Maintaining the safety of the nation's runways is critical to ensuring safe operations in the NAS. The FAA is using this data-based approach to examine and redefine the safety parameters of the runway and airport surface environment.

The science of understanding risk was relatively easy for the Wright Brothers. Today, it's a different story. The demands and sheer size of the aerospace system, including the need for increased efficiency and environmental performance by the Next Generation Air Transportation System (NextGen), will continually challenge the FAA to evolve its capability to identify, investigate, measure, rate, and ultimately reduce the risks associated with the operation and expansion of an extremely dynamic and complex technical system.

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[1] Information from the FAA report, "The Economic Impact of Civil Aviation on the U.S. Economy," page 3, August 2011. Figures are for 2009.

[2] *U.S. Trade in Goods*, Bureau of Economic Analysis and U.S. Census Bureau, accessed April 3, 2013. Figures are for 2012.

1. Executive Summary

Congressional Runway Safety Report Requirement

The safe and expeditious flow of air traffic at an airport is the product of a complex, disciplined interaction of people, aircraft, and vehicles, all supported by increasingly sophisticated processes, communications and control technologies, and regulatory oversight. Maintaining this safe flow of airport traffic defines the runway safety mission of the FAA. This report responds to the Congressional direction in the FAA Modernization and Reform Act of 2012 (Pub. L. No. 112-95), Section 314, for the FAA Administrator to develop and submit a report on the Agency's Strategic Runway Safety Plan. As requested, this report addresses the contents of the strategic plan.[3] To fully convey the FAA's continuous growth in runway safety capability, the report describes accomplishments made since 2007, the current state of runway safety management, and the challenges in meeting the demands of NextGen.

Overview of Current Runway Safety Management Initiatives

The Strategic Runway Safety Plan (the "Strategic Plan") in this report builds upon on the accomplishments of the FAA in improving runway safety with a special emphasis on the actions taken since the FAA Administrator's 2007 Runway Safety Call to Action.[4] The Strategic Plan encompasses the direction set forth in 2012 - 2014 National Runway Safety Plan (NRSP), Appendix D of this document, and it incorporates the goals, initiatives, and objectives set forth by operational FAA LOBs, FAA Destination 2025 and Department of Transportation's 2012 High Priority Performance Goals (HPPG).[5]

The FAA has implemented most of the near- and mid-term action items from the Call to Action. These include:

- The Air Traffic Safety Action Program (ATSAP) and the Technical Operations Safety Action Program (T-SAP) – voluntary self-reporting systems for ATO personnel

- Initial and periodic safety reviews of airports where wrong runway departures and runway incursions are of greatest concern

- Implementing enhanced taxiway centerline markings at all certificated airports

- Reviewing and revising recurrent training of airport vehicular operations and air carrier surface procedures and employee recurrent training

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[3] See page 7 in this report for detailed strategic runway safety plan requirements as stated in Pub. L. No. 112-95, Section 314 (Runway Safety).
[4] August, 2007, FAA Administrator Marion Blakey issued a "Call to Action" to the U.S. aviation industry. The Call to Action resulted in several short- and longer-term actions to improve the safety of nation's airports. The actions focused on solutions in cockpit procedures, airport signage and markings, air traffic procedures and implementation of technology.
[5] http://www.whitehouse.gov/sites/default/files/omb/performance/high-priority-performance-goals.pdf, page 15.

- Accelerating deployment of surveillance, detection and warning systems such as Airport Surface Detection Equipment – Model X (ASDE-X) and Runway Status Lighting (RWSL) systems at designated Core 30 Airports [6]

- Adoption of International Civil Aviation Organization (ICAO) standardized air traffic controller/pilot runway clearance phraseology ('Line Up and Wait', and Runway Crossing Clearances)

Other mid-term and long-term initiatives identified in the Call to Action Plan,[7] including cockpit moving map technology, Low Cost Ground Surveillance (LCGS) Systems, and digital Notices to Airmen (NOTAM) are being prototyped and developed inside the NAS Enterprise Architecture. Surface Safety Operational Initiatives are contained in the 2012 NextGen Implementation Plan.

Addressing Future Runway Safety Challenges

In addition to implementing the Call to Action runway safety measures, the FAA is advancing the development and implementation of new technologies to address system safety deficiencies. Information technology and innovation are transforming the industry and creating opportunities which were not envisioned even a few years ago. In 2007, smartphones were not widely used. Today, the FAA is starting to use such devices to help General Aviation pilots determine their positions on the airport surface and to file reports concerning wildlife hazards. Electronic tablets are replacing paper charts and offer enhanced situational awareness for pilots. Replacing analog voice and paper reports with digital communication and electronic reporting systems is revolutionizing the Agency's ability to capture and store information. Highly capable multilateration systems are augmenting radar and satellite infrastructure and are providing an array of choices for airports with diverse requirements.

The FAA is taking advantage of advancements in technology to improve safety in the NAS. Examples include:

- Accelerating and standardization of air traffic facility electronic reporting capabilities through the Comprehensive Electronic Data Analysis Reporting (CEDAR) system

- Creating the ability to baseline, assess, and manage risk in the terminal area utilizing Traffic Analysis Review Program (TARP) and centralized Quality Assurance protocols

- Continuing to strengthen the Aviation Safety Information and Analysis Sharing (ASIAS) program, which is fusing subjective and objective information contributed by the airlines with FAA and other publically available data to produce comprehensive, graphical depictions of not only "what happened," but "why it happened"

- Developing innovative tools to identify and assess risk, such as making available Quick Response codes to file immediate, real time wildlife reports, which are used to formulate wildlife mitigation plans on the nation's airports

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[6] Core 30 airports are those with significant activity serving major metropolitan areas and also generally serve as hubs for airlines.
[7] FAA Runway Safety Call to Action, Mid-Term and Long-Term Initiatives Action Plan, June 28, 2010.

- Installing Runway Status Lighting (RWSL) at 23 large airports by 2016
- Installing Engineering Material Arresting Systems (EMAS) at certain certificated airports that do not have standard runway safety areas.

Risk-Based Approach to Runway Safety

Since the FAA created programs dedicated to reducing runway incursions, a fundamental shift in the global approach to safety has occurred. Building on the success of traditional forensic analysis of accidents and serious events, a more proactive, risk-based approach to current and emerging safety issues is being implemented. The tools described above reflect this shift. With them, the FAA is creating a portfolio-based approach to addressing runway safety, that is, an approach embracing perspectives from various stakeholders and input from diverse processes and technologies.

The combination of the FAA's longstanding focus on improving runway safety and bringing enhanced capabilities online has two advantages. It enables the FAA to:

1. **Identify and more accurately assess the risk posed inside the NAS and**
2. **Prioritize the resource requirements necessary to eliminate or mitigate those risks, including those associated with runway and surface operations.**

Runway Safety and Increased Air Traffic Volume

Several aviation studies[8] suggest that minor increases in traffic or vehicular volume can cause an exponential increase in runway safety risk.

To meet this challenge, the FAA is developing a hierarchy of control measures to ensure acceptable levels of risk are maintained on the runway during periodic or sustained increased levels of air traffic volume. These control measures include infrastructure design (such as end-around taxiways and runway safety areas); installation of physical guards; indication and alerting signals (such as Runway Status Lights, ASDE, and Final Approach Runway Occupancy Signals); procedures (such as cockpit checklists); and training of operational personnel to ensure acceptably low levels of risk are maintained on the runway during periodic or sustained increased levels of air traffic volume.

In addition to control measures, the FAA is building integrated risk models and developing common dataset taxonomies[9] to ensure risk remains at acceptably low levels regardless of traffic. The new tools and capabilities enable the FAA to forecast the risk and utilize additional control measures at specific airports based on traffic volumes, complexity, and environmental factors.

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[8] Two notable studies include: "Final Report - Sub-Committee on Runway Incursions (TP 13795," Transport Canada, National Civil Aviation Safety Committee, Subcommittee on Runway Incursions, September 14, 2000 and "Runway Incursions: 1997 to 2003," Australian Transportation Safety Bureau, June 2004.

[9] Alphanumerical codes that assist in the analysis of complicated events.

Runway Safety and Future Challenges

In addition to meeting the increasing volume of air traffic, future airport and runway surface operations must accommodate autonomous aircraft that are manned or unmanned, equipped with legacy or next generation avionics, as well as all types of rotorcraft. The FAA's strategies for runway safety under this expanding scope and traffic volume include:

- Cohesive official guidance
- Industry outreach and collaboration
- User education, checking and training standards
- Advanced risk and mitigation measures
- Infrastructure requirements
- Implementation of surface safety technology

These initiatives fuse together the high and low technological control measures that provide individual and systemic approaches to maintaining and improving runway safety.

Runway Safety and Performance Measures

As a performance-based organization, the FAA strives to improve safety performance by identifying and addressing safety risks. Current performance metrics for runway safety include severity, number, and rate of runway incursions. The FAA has succeeded in achieving its runway incursion reduction performance targets and will strive to continue to improve in this area. Building on this success, however, the FAA seeks to address broader safety issues as a fundamental goal.

Embracing Change

This Strategic Plan provides direction to incorporate the broader scope of surface safety, including runway excursions and other occurrences related to runway safety, by continuing to understand and prioritize the risk posed by high consequence and technically complex surface operations. Increased volume of air traffic and the accommodation of new aerospace vehicles will demand a different approach and direction for runway safety goals.

As the world's economies and commerce continue to globalize, so too does the aviation industry. In fact, the data demonstrates that the largest segment of increasing air traffic is across borders. More U.S. flight crews are exposed and subjected to rules and regulations of an increasing span of sovereignties, and pilots from other countries are increasingly flying into the U.S. The airborne and ground-based operating systems and procedures need to look more similar than different in order to reduce any confusion which introduces risk. The FAA continues to shape and harmonize all runway safety activities within the global aviation community to ensure global interoperability. Engagement with the International Civil Aviation Organization, the Civil Air Navigation Services Organization, the International Air Transport Association and foreign regulators is of vital importance to the FAA's overall safety mission.

Maintaining safety on the airport surface requires the active insight, management, and participation of government and industry stakeholders who are acting in accord with national goals and objectives. The Strategic Runway Safety Plan reflects the commitment by the FAA and key stakeholders to achieve an ever safer aviation system. This report is intended to

provide Congress with the necessary insight into the FAA's approach, both near- and long-term, to continually improve the safety of the nation's airports.

2. Elements of the Strategic Plan

Congress has asked that the Strategic Plan contain the FAA's:

- *Goals to improve runway safety*
- *Near- and long-term actions designed to reduce the severity, number, and rate of runway incursions, losses of standard separation, and operational incidents*
- *Time frames and resources needed for the actions described above*
- *Continuous evaluative process to track performance toward the goals*
- *Review with respect to runway safety of every commercial service airport (as defined in section 47102 of title 49, United States Code) in the United States and proposed action to improve airport lighting, provide better signs, and improve runway and taxiway markings at those airports[10]*

Congress has also asked that the FAA Strategic Plan address:

- *The increased runway safety risk associated with the expected increased volume of air traffic*

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[10] The FAA is assembling a survey of the current status of airport lighting, signage and markings. This report will also be provided to Congress.

3. Goals to Improve Runway Safety

The Strategic Plan outlines the FAA's evolving multidisciplinary approach to system safety that incorporates its dual roles as the oversight authority and the air navigation service provider, with an emphasis on preventing and mitigating the effects of runway excursions, runway incursions and other occurrences related to runway safety. This evolution is encompassed by the FAA's Safety Management System (SMS). SMS is a powerful, risk-based approach to managing safety that has been adopted by the FAA and is being serially implemented by key stakeholder groups including the airlines, airports, Office of Aviation Safety and the Air Traffic Organization. The following agency-wide goals will provide the FAA with the ability to identify runway hazards or concentrations of risk early in their life cycle, using a broad range of detection, notification and reporting methods, and address them effectively.

Goal 1 - Continue the efforts to reduce the severity, number and rate of runway incursions, Losses of Standard Separation (LoSS), and operational incidents by updating the NRSP initiatives, assigning activities to the responsible FAA Line of Business, identifying ongoing resources, and defining timeframes and success metrics.

Goal 2 - Evolve runway safety[11] event risk analysis through a surface Risk Analysis Program (RAP) and adopt target measures compatible with the System Risk Event Rate (SRER) process.

Goal 3 – Provide integrated risk modeling and surface RAP safety data analysis to the Airport Obstructions Standards Committee (AOSC) in support of the development of airport surface standards for legacy and future generation aerospace vehicles and ground service equipment.

Goal 4 - Improve runway safety during periods of airport construction by incorporating Airport Construction Advisory Council (ACAC) activities and data into safety risk management and SMS reporting structures.

Goal 5 - Consolidate and create accountability for Local and Regional Runway Safety Action Team efforts at the facility/terminal/airport stakeholder group level through the strengthening of the Regional Runway Safety Program.

Goal 6 - Create and adopt an FAA-wide common taxonomy and classification system to support proactive risk management, global data integration, and advanced surface safety analytical studies within the FAA's SMS.

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[11] Establish a broad definition of 'runway safety' to include runway incursions, runway excursions, and other safety occurrences on or near the runway surface.

Goal 7 - Continue to develop the components of the FAA's operational SMS to identify and manage those hazards and risks which transcend individual regulated entities and overlap multiple sectors.

Goal 8 - Finalize rulemaking to require certain certificated airports to implement SMS.

Goal 9 - Implement program for federally obligated airports to conduct wildlife hazard assessments.

Goal 10 - Further investigate the development of multilateration as a stand-alone airport surface surveillance technology to provide near-term surveillance and identification of all transponder equipped aircraft and vehicle movement on the runway environment.

4. Near- and Long-Term Actions to Improve Runway Safety

4.1 Runway Safety Program Development

By any measure, the U.S. airspace system is the safest in the world, and continuous improvement to the safety of surface operations at the nation's airports is one of the FAA's highest priorities. The FAA published its first Runway Incursion Plan in 1991 and has devoted considerable resources to reducing incursions ever since. The 1991 Plan was amended in 1993, 1995, and again in 1998. In October of 1998, the Commercial Aviation Safety Team (CAST) chartered the Runway Incursion Joint Safety Analysis Team (RI JSAT) to address this issue. The work of the RI JSAT helped inform the first *Runway Safety Blueprint*, published in 2000. The RI JSAT released a *Results and Analysis* report in 2002 that outlined 115 strategies to mitigate the risk posed by runway incursions. Most of these strategies and recommendations were incorporated in the *Runway Safety Blueprint, 2002 – 2004* (Blueprint).

Overall responsibility and authority for executing the Blueprint was delegated to the Office of Runway Safety in 2002 through FAA Order (FAAO) 7050.1. The Order required the Office to work with other FAA organizations and the aviation community to identify and implement activities and technologies designed "to improve runway safety by decreasing the number and severity of runway incursions and other surface incidents." The activities, goals, and objectives of the Blueprint have been assimilated into the NRSP. FAAO 7050.1 was cancelled and replaced by FAAO 7050.1A on September 16, 2010, which updated policy, assigned responsibility, and delegated authority for the Runway Safety program to three main operational units:

- Office of Airports (ARP) - Airport Safety and Standards (AAS) is accountable for leadership and oversight to the aviation and airport community, including vehicular driver certification, compliance with airport surface markings, and lighting standards

- Office of Aviation Safety (AVS) - Flight Standards Service (AFS) provides certification standards for pilots, mechanics, and others in safety-related positions and oversight of domestic and international air carriers with operations in the NAS

- The ATO has two relevant organizations:

  o ATO Safety and Technical Training (AJI) is responsible for integrating safety standards into the provision of air traffic services, leading organizational efforts to manage risk, assuring quality standards, and policy development and processes for improving operational safety within the ATO including the area of runway safety

- ATO Terminal Services (AJT) is accountable for safe and secure air traffic management across the NAS through FAA airport towers, FAA contract towers, and Terminal Radar Approach Control facilities (TRACON)

Many other agencies, organizations, and industry initiatives have studied the issue of runway safety and have contributed ideas and mitigation strategies. Some of these include the National Transportation Safety Board (NTSB), Department of Transportation Office of the Inspector General (OIG), U.S. Government Accountability Office, General Aviation Joint Steering Committee, MITRE Corporation, and the Research, Engineering and Development Advisory Committee. Several nations and ICAO have also conducted studies and made recommendations to improve aviation surface safety. The conclusions and recommendations share a significant degree of commonality, leveraging the safety strategies and technologies of the day. Today the ATO Vice President of Safety and Technical Training is charged with coordinating and implementing the NRSP as it continues to evolve.

4.2 Runway Safety Accomplishments Since the Call to Action

The Call to Action served to consolidate and focus FAA and aviation industry efforts towards reducing the severity, number, and rate of runway incursions. Remarkable progress has been made toward reducing the risk of collisions on the runway through the development of new technologies, new air traffic control and flight crew procedures, and improvements to airport signage, lighting, and markings. The FAA's plan to support this continuous improvement strategy is outlined in the *National Runway Safety Plan 2012 - 2014*.

The NRSP details a coordinated and comprehensive approach developed by several internal FAA organizations, airport operators, airlines, labor unions, and other airspace system stakeholders. The NRSP seeks to continually improve runway safety through integrated measures and initiatives and to incorporate the development of new airborne and surface technologies.

The NRSP leverages activity surrounding seven key initiatives and assigns activities within each initiative to the applicable FAA Lines of Business. The initiatives are:

- Guidance
- Outreach and Collaboration
- Education and Checking
- Risk and Mitigation
- Training
- Infrastructure
- Technology

The following timelines depict the safety approaches and milestones achieved by multiple FAA LOBs in each of the seven initiative areas outlined in the NRSP. The initiative achievements demonstrate the actions that have been taken through a layered and integrated effort to improve all aspects of safety in the runway environment. The current NRSP initiatives continue to build a stronger and more integrated safety net upon this foundation.

4.2.1 Guidance

The following timeline and accompanying outline describe runway safety guidance documents and collaboration efforts the FAA has developed and undertaken to ensure information has been aligned across all LOBs. It incorporates techniques and procedures to prevent runway incursions and excursions:

Figure 4-1. Guidance

- August 2007 – *Call to Action* defines near-, mid-, and long-term runway incursion goals. Focus is on surface markings, signs and lights, and reducing runway incursions

- October 2007 – Adoption of ICAO runway incursion definition. This adoption standardizes the classification of runway incursions internationally

- October 2008 – The Runway Safety Council (RSC) and Root Cause Analysis Team (RCAT) are established. These groups are intended to move toward a more proactive safety management strategy

- September 2010 – FAAO 7050.1A - *Runway Safety Program* Order, updates policy, assigns and delegates responsibility to service offices within each LOB for ensuring compliance with the order

- May 2011 – The Office of Airports initiated rulemaking process to amend Title 14, Code of Federal Regulations, Part 139 (Part 139) to require certificated airports to implement SMS. This effort will increase safety at airports by requiring risk-based SMS procedures when airports are planning to change procedures or infrastructure

- September 2011 – Advisory Circular (AC) 150-5370-10F - *Standards For Specifying Construction of Airports* establishes the ACAC as an integral part of the airport construction notification process

- February 2012 – FAAJO *Air Traffic Control* 7110.65 semi-annual update was released with the new requirement to notify pilots when the available runway length had been shortened due to construction

4.2.2 Outreach and Collaboration

The following timeline and accompanying outline describes the activities the FAA has undertaken in collaboration with industry partners to communicate best practices for surface safety:

Figure 4-2. Outreach and Collaboration

- October 2007 – 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, which states: "*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*" [12]

- April through July 2008 – Regional Runway Safety Summits. Three Annual Regional Safety summits were completed. The goal of these meetings was to identify and address existing and potential runway safety problems

- February 2009 – Runway Safety Meeting with ICAO, Transport Canada Civil Aviation (TCCA), and European Aviation Safety Agency (EASA) to discuss the need for SMS and State Safety Program cooperation. The Safety Management International Collaboration Group is created

- December 2009 – International Runway Safety Summit. Co-sponsored by the American Association of Airport Executives (AAAE) and The MITRE Corporation, this three-day event focused on runway safety, various analyses and reviews of critical issues such as human factors, airport geometry, technology, the cockpit, Air Traffic Control (ATC) procedures, SMS systems, and global harmonization

- April 2010 – O'Hare International Airport (ORD) Construction Safety Summit discussed safe surface operations at ORD

- October 2011 – The FAA, in conjunction with the ICAO, hosted a regional runway safety seminar in Miami for North America and Latin America

- May 2012 – Annual FAA Safety Summit. *"We're all in this together."* A discussion about safety across the FAA

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[12] *FAA Runway Safety Plan 2008,* page 37

Outreach

The FAA has made concerted efforts at outreach and coordination by cooperating and communicating with aviation industry stakeholders at all levels - local, national, and international - to enhance surface safety improvements. Some examples of those efforts are:

- Working through the Regional Runway Safety Program Managers (RRSPM) in the regional Runway Safety Offices to conduct the activities of guidance, outreach, awareness and training at all levels

- Personnel from the three FAA ATO Service Areas (SA) participate in meetings across the country to conduct runway safety awareness outreach meetings and provide training to aviation stakeholders

- Regional Certified Flight Instructor (CFI) and Designated Pilot Examiner refresher courses and FAA Pilot Proficiency Award Programs are a few examples of where the regional Runway Safety Action Teams (RSAT) meet with the local target audiences

- RSATs at the local and regional level are critical tools where outreach, training, and awareness are promoting greater runway safety for all levels of airport users

FAA supports the Department of Transportation National Safety Week Conference and several other conferences and conventions. Outreach activities include:

- The Experimental Aircraft Association "AirVenture" in Oshkosh, Wisconsin
- Sun 'n Fun International Fly-in and Expo in Lakeland, Florida
- National Business Aircraft Association (NBAA) Annual Meeting and Convention
- Women in Aviation Annual Conference
- Air Traffic Control Association (ATCA) Annual Meeting
- Aircraft Owners and Pilot Association (AOPA) Aviation Summit
- AAAE Annual Conference and Exposition
- Regional Airline Association (RAA) Annual Convention

The Runway Safety Group created a FAA Runway Safety website which provides toolkits, information, videos, and training material that can be easily accessed or downloaded. This website is located at: http://www.faa.gov/go/runwaysafety

The FAA participated in international outreach activities that included the following regulatory agencies:

- European Aviation Safety Agency (EASA)
- International Civil Aviation Organization (ICAO)
- Transport Canada Civil Aviation (TCCA)
- National Civil Aviation Agency (ANAC) of Brazil
- Civil Aviation Authority of the Netherlands
- Civil Aviation Authority of New Zealand
- Civil Aviation Safety Authority (CASA) of Australia
- Direction Générale de l'Aviation Civile (DGAC) of France

- European Aviation Safety Agency (EASA)
- Federal Office of Civil Aviation (FOCA) of Switzerland
- Japan Civil Aviation Bureau (JCAB)
- Civil Aviation Authority of United Kingdom (UK CAA)

4.2.3 Education and Checking

The following timeline and accompanying outline describes the activities revolving around air traffic controller and pilot education. Checking is often done through testing or inspection.

Figure 4-3. Education and Checking

- April 2007 – DVDs on Runway Safety are released for Air Traffic Controllers. They included:

  - *Back to Basics for Tower Air Traffic Controllers*

  - *Runway Safety Collection* on surface safety

- April 2009 – Training DVDs reached over 485,000 pilots and flight instructors. The Safety Series DVDs for pilots included;

  - *Heads Up, Hold Short, Fly Right* - focuses on maintaining situational awareness by advocating recall of basic principles such as reviewing diagrams of departure and arrival airports, knowing the meaning of industry-standard color-coded runway signage, and asking for help from air traffic control if you are lost

  - *Was That For Us?* - examines safe taxi operations

  - *Listen Up, Read Back, Fly Right* - focuses on mission planning, preparation, and pre-flight communication

  - *Face to Face, Eye to Eye* - talks about how pilots and air traffic control can work together more efficiently and examines the real-world consequences of breakdowns and lapses in communication

- Sept 2010 – *Best Practices for Runway Incursion Prevention Report* - this report summarizes best practices gathered through field visits, interviews with RSAT and Local Runway Safety Action Teams (LRSAT) members, ATC, pilots, and airport vehicle operators

- Jan 2012 – The FAA's *Airplane Flying Handbook* - is currently being revised to include detailed runway safety information, to include; runway incursion avoidance material, runway status lights, and Engineered Materials Arresting System (EMAS) technology

- April 2012 – Revision to *Pilot's Handbook of Aeronautical Knowledge* - reflects renewed emphasis on runway safety, airport markings, and signage
    - o The FAA is developing a new Runway Incursion Remedial Training process that will focus on General Aviation pilots that cause a Category A, B, or C runway incursion. The process employs a standard runway incursion syllabus that, when combined with the new Runway Incursion Avoidance chapter in the Pilot's Handbook of Aeronautical Knowledge and updated Practical Test Standards that now include a required Runway Incursion Avoidance task, will underscore the FAA's dedication to mitigating runway incursions through knowledge of airport signage, lighting, markings, and pilot operating procedures.

4.2.4 Risk Identification and Mitigation

The following timeline and accompanying outline describes the activities undertaken to develop data collection and reporting mechanisms to identity and analyze runway safety risk.

Figure 4-4. Risk Identification and Mitigation

The FAA works across all SUs to collect and analyze safety incidents in order to track, identify, and assign appropriate levels of severity. Different offices within the FAA are responsible for investigating different types of individual incidents. There are several tools used in collecting safety related data, including:

- September 1975 – Aviation Safety Reporting System (ASRS) is established between the FAA and NASA

- October 1998 – Runway Incursion Analysis Team (RIAT) is introduced by the FAA. The RIAT is composed of members from AAS, AFS, and AJT. Each of the team members provides subject matter expertise to the group to identify causal factors and rate severity, risk, and category of the incursions

- September 2002 -- Runway Safety Action Teams are created to address existing runway safety problems at individual airports. The RSAT is comprised of personnel from the regions and Runway Safety Group. The LRSAT includes personnel from the Air Traffic Control Tower (ATCT), local airport authority, and users of the airport. Information is logged in the Runway Safety Tracking System (RSTS)

- March 2007 –The ATO establishes an SMS Program per FAAJO 1000.37. Other FAA LOBs establish internal SMS programs and develop regulatory guidance for external entities, including airlines and airport

- October 2007 –The ASIAS system connects multiple proprietary and publicly available safety databases including accident, incident, and voluntary reporting across the industry and is integrated into the CAST process

- October 2008 – Air Traffic Safety Action Program (ATSAP) begins collecting reports

- October 2010 – Comprehensive Electronic Data Analysis and Reporting (CEDAR) is implemented. This system provides local ATC facilities with an electronic means of managing resources and capturing safety-related information and metrics

- October 2011 – Technical Operations Safety Action Program (T-SAP) begins collecting reports

- January 2012 – Voluntary Safety Reporting Program (VSRP) replaces ATSAP as the method from which controllers can file safety-related incidents voluntarily

4.2.5 Training

The following timeline and accompanying outline describes the activities for safe airport operation to pilots, air traffic controllers, and airport vehicular drivers:
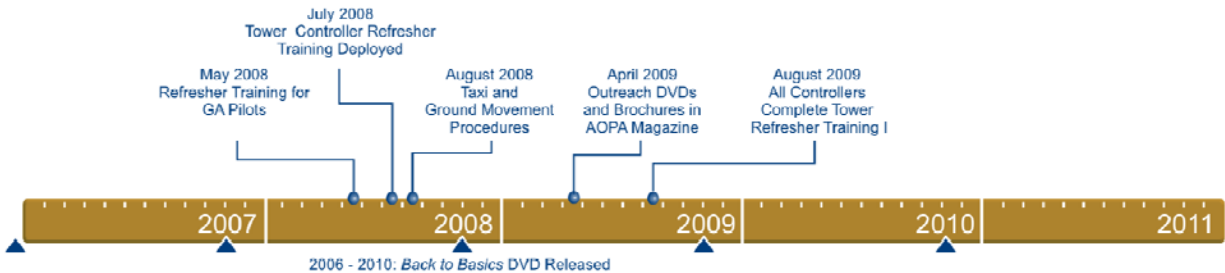

Figure 4-5. Training

The FAA has updated the *Pilot Handbook of Aeronautical Knowledge* for new pilot candidates and Practical Test Standards for all GA pilots to include increased emphasis on airport surface safety. This includes runway and taxiway markings, signs and lights, and methods and techniques for avoiding runway incursions.

- May 2008 – Refresher Training for GA Pilots:

    o Requires a minimum of one hour of ground instruction and one hour of flight instruction covering the revised standards and methods for avoiding runway incursions

    o Evaluates Part 141 flight schools to ensure the revised runway safety standards and training requirements are included in the curricula

    o Recommends implementation of a runway incursion remedial training program

    o Recommends runway incursion events (Categories A, B, C, and possibly D) involving GA be investigated by an aviation safety inspector and remedial training applied if needed

    o In response to serious incidents involving the towing of aircraft, the FAA Runway Safety Group produced a DVD presentation entitled *Safe Tug and Tow Operations*

- July 2008 – Refresher Training for Tower Controllers:

    o Refresher Training mandates runway incursion prevention be included in quarterly refresher training at every control tower

- August 2008 – Taxi and Ground Movement Procedures:

    o All air traffic controllers are trained on two changes to air traffic procedures that have been implemented:

        1. Multiple runway crossing procedures and explicit runway crossing instructions

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2. Line Up and Wait phraseology change that substitutes "line up and wait" for "taxi into position and hold"

- From 2006–2010, two series of *Back to Basics* training DVDs were deployed, and subsequent training was completed. Subjects of the DVDs included:

  o Be Sure the Runway is Open
  o Aircraft Position is Verified
  o Scan the Runway
  o Issue Clearance Using Correct Phraseology
  o Close the Loop by Getting an Accurate Readback
  o Clear Communications

- April 2009 – Pilots receive brochures and training DVDs on runway safety via mailings to AOPA and National Association of Flight Instructors (NAFI) membership

- August 2009 – Controllers complete Tower Refresher Training Level I

4.2.6 Infrastructure

The following timeline and accompanying outline describes the activities associated with improving airport infrastructure:

Figure 4-6. Infrastructure

- October 1999 –Runway Safety Area (RSA) Program. The FAA will upgrade RSAs at certificated airports to meet standards or to the extent practicable.

- May 2009 – Guidance issued or implemented for improved Enhanced Taxiway Centerline and Runway Hold Short Position signs at all Part 139 airports, through AC 150/5340-1K - *Standards for Airport Markings.*

- June 2005 – 2012 – RWSL are tested at DFW, LAX, BOS, and SAN. The FAA is developing RWSL technology to increase situational awareness for pilots and airport vehicle drivers operating on and around runways.

- September 2011 – AC 150/5370-2F *Operational Safety on Airports During Construction* issued. Principal changes to safety during airport construction include:

    o Construction activities are prohibited in RSAs while the associated runway or taxiway is open to aircraft operations

    o Performing Safety Risk Management during periods of construction

    o Recommended checklists are provided for writing Construction Safety and Phasing Plans and for daily inspections

4.2.7   Technology

The following timeline and accompanying outline describes the activities associated with development and implementation of technologies designed to enhance runway situational awareness:
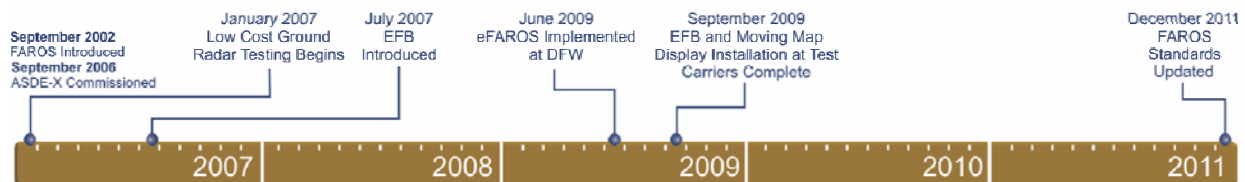

Figure 4-7 Technology

The FAA continues to evaluate emerging technologies for improving runway safety. The following is a list of technologies that have been implemented or are in development to reduce runway incursions and mitigate severe damage and loss of life in the unlikely event of a runway excursion:

- September 2002 – Final Approach Runway Occupancy Signal (FAROS) was first deployed at Long Beach Airport. FAROS was designed to provide a visual alert of runway occupancy status to pilots on final approach to a runway by flashing the Precision Approach Path Indicator (PAPI).

- September 2006 – ASDE-X, has been commissioned and is operational at 8 airports. Today, ASDE-X has been installed at the nation's core 35 airports.

- January 2007 – Low Cost Ground Surveillance System (LCGS). A long-term Call to Action item, LCGS systems are being tested at five small or medium airports: Long Beach Airport, Manchester-Boston Regional Airport, Reno-Tahoe International Airport, San Jose International Airport, and Spokane International Airport.

- July 2007 –The FAA introduces AC 120-76B, *Guidance for the Certification, Airworthiness, and Operational Use of Electronic Flight Bags (EFB),* which details a process for removal of paper aeronautical charts and other documentation from the cockpit through the use of either electronic portable or installed cockpit displays. Installation of EFB at the test air carrier is completed by September 2009.

- June 2009 – Enhanced Final Approach Runway Occupancy Signal (eFAROS) completes operational evaluation at DFW.   Like FAROS, eFAROS is designed to provide an independent visual alert of runway status to pilots intending to land on occupied runways at high density airports.

- April 2012 – Engineered Materials Arrestor System (EMAS) – In April of 2012, standards for the planning, design, installation, and maintenance of EMAS were upgraded. Installed EMASs have already stopped eight overrunning aircraft.

4.3 National Runway Safety Plan (NRSP) 2012 – 2014 Initiatives – Goal 1

The initiatives outlined in the NRSP provide the FAA's coordinated vision to achieve desired reductions in runway safety risk. Activities, timelines, resources, accountable FAA LOBs, and indicators of success have been allocated and resourced. Goal 1 of the Strategic Plan incorporates the approach outlined in NRSP by reference. Goals 2 – 10 build upon the foundation created by the specific initiatives called for in the NRSP.

Goal 1 - Continue the efforts to reduce the severity, number, and rate of runway incursions, LoSS, and operational incidents by updating the NRSP initiatives, assigning activities to the responsible Lines of Business, identifying ongoing resources, and defining timeframes and success metrics.

4.3.1 Timeframe and Resources

The resources for timeframe and budget allocations required to achieve the Goal 1 initiatives have been determined by the responsible FAA LOBs. These requirements are detailed starting on page 4 of the NRSP (see Appendix D of this document). Goal 1 incorporates the activities, timelines, and resource requirements of the NRSP by reference.

4.4 Continuous Evaluative Process to Track Runway Safety Performance – Goal 2

Goal 2 - Evolve runway safety event risk analysis through a surface Risk Analysis Process (RAP) and adopt target measures compatible with the System Risk Event Rate (SRER) process.

In concert with risk analysis for airborne events, the FAA is developing a Risk Assessment Process (RAP) for runway safety incidents, including runway excursions and other runway related safety events. The surface incident RAP is modeled on the process currently used to evaluate airborne LoSS events. RAP utilizes a new safety metric called the System Risk Event Rate (SRER). SRER tracks the incidents where the risk is the highest and measures the rate at which those events occur. This differentiates the raw number of low risk events from events that represent high risk and require some type of corrective action. SRER tracks and trends the performance data while RAP, utilizing aviation risk specialists, pilots, and controllers, determines causal and contributory factors with a high degree of likelihood and repeatability.

The RAP panels can pull data from applicable databases for use in developing comprehensive understanding of the risk picture and aid in the determination of causal and contributing factors. Surface RAP will track, evaluate, categorize, and assess each serious surface event utilizing a standardized process which should facilitate the reporting process and evaluative capabilities.

Currently, the RSTS is used to manage, track, and store action items and recommendations from the RSAT and the RSC. As the surface RAP matures, the RSTS will be absorbed into RAP and SRER, providing continuity from the event-based system of the past to the risk-based system inherent in the SMS.

4.5 Airport Obstructions Standards Committee (AOSC) – Goal 3

Goal 3 – Provide integrated risk modeling and surface RAP safety data analysis to the Airport Obstructions Standards Committee (AOSC) in support of the development of airport surface standards for legacy and future generation aerospace vehicles and ground service equipment.

The AOSC is committed to harmonizing FAA airport obstruction policy. The AOSC is charged with developing a transition strategy to guide the application of obstruction standards for airports and operations where standards previously were not applied consistently or operations were approved under older standards. The AOSC serves as the vehicle for transforming outdated, inconsistent obstruction standards practices to future policy. The evolution of surface safety on the nation's airports in the gate-to-gate approach of the NextGen and the mixture of legacy aircraft with next generational aerospace vehicles will be supported by the design criteria developed through the AOSC. Utilization of risk-based models will support improvements in airport operations design.   Incident data from the RSTS and surface RAP can help inform the evolution of design improvements.

4.6 Airport Construction Advisory Council – Goal 4

Goal 4 - Improve runway safety during periods of airport construction by incorporating ACAC activities and data into safety risk management and SMS reporting structures.

The Airport Construction Advisory Council was established in May 2010 to address surface safety issues associated with disruptions caused by runway and taxiway construction. Through the use of Safety Risk Management (SRM) processes, ACAC identified weaknesses in the control measures undertaken by the Agency during periods of prolonged construction and has developed a layered suite of mitigations to proactively prevent similar occurrences from happening in the future. These enhancements include training for controllers, amendments to clearance terminology contained in the Controller's Handbook, and Airport Terminal Information Service broadcasts during periods of shortened runways. Identified safety risks and best practices have been cataloged and incorporated into a Runway-Taxiway Construction checklist. The ACAC designed and structured digital NOTAMs to provide real-time situation awareness for pilots and controllers.

Information collected in the ACAC database is another source of hazard and risk data that when fused with other data streams will provide additional protections to runway safety during periods of runway and taxiway construction.

4.7 Strengthening Runway Safety at the Local and Regional Level – Goal 5

Goal 5 - Consolidate and create accountability for Local and Regional Runway Safety Action Team efforts at the facility/terminal/airport stakeholder group level through the strengthening of the Local and Regional Runway Safety Program.

Runway safety starts at the local airport. Airport operators, tenants, airlines, maintenance organizations, and the activities and standards of several FAA LOBs (AFS, ARP, and ATO) converge on the airport surface. The Regional Runway Safety Program Managers (RRSPM) serves as the focal point to ensure harmonization and coordination is achieved between of Local Runway Safety Action Plans (LRSAP) and National goals and objectives. Strengthening accountability at the regional level will aid in elimination of duplicated efforts through Regional Runway Safety Program synchronization. This type of broad based effort can significantly lessen the resource burden while achieving better results.

4.7.1 Regional Runway Safety Governance

The FAA is establishing Regional Runway Safety Governance structure to aid the development of local accountability. The Regional Administrators are conducting Quarterly Runway Safety Program Reviews with the Vice President of ATO Safety and Technical Training to facilitate the exchange of runway safety data and trends and promote understanding of the integrated safety picture across the ATO, AFS, and ARP. Each Regional Administrator is establishing a local governance council whose members include the Local Runway Safety Program Manager, an Airports Division Manager, and a Flight Standards Division Manager. The intent of the local council is to ensure regional initiatives and actions are being accomplished in the appropriate manner and timeframe.

Additionally, the Local Runway Safety Governance Council could function as an auditing and oversight mechanism of the SMS. The local council has specific knowledge and understanding of issues affecting runway safety. As hazards and actionable items at specific airports are identified by Local Runway Safety Action Teams (LRSAT), recorded in the Local Runway Safety Action Plan (LRSAP), and logged in the RSTS, the local council provides informed guidance for safety prioritization and resource allocation. Coordinated at the regional level, the Regional Runway Safety Governance Council could ensure that the open items are prioritized and addressed, completing one of the feedback loops of the SMS.

Runway safety begins and ends at the airports. A delicate balance exists between sound strategic planning and expert tactical execution, along with the ability to understand how the two interact. A strong local, regional, and national partnership ensures that this balance is maintained and supported.

5. The Future of Runway Safety

5.1 Common Taxonomies – Goal 6

Goal 6 - Create and adopt an FAA-wide common taxonomy and classification system to support proactive risk management, global data integration, and advanced surface safety analytical studies within the FAA's SMS.

Before different streams of data from various perspectives can be used in the analysis of risk, a common classification system must be established for aviation accident and incident reporting systems.   Common taxonomies and definitions establish a standard industry language thereby improving the quality of information and communication. Creating a universal language greatly enhances the aviation community to jointly address risk.   A common classification system ensures risk analysts compare apples to apples.   The FAA collects data from many sources: digital, analog, narrative, statistical, voluntary, and mandatory.   The classification system within each of these databases is unique to the developer of program manager who collected and used the data.   Creating a common language between unique data sets is critical to finding data driven solutions to safety issues.

As part of a global safety effort, the Data and Performance Analysis group within the ATO Safety and Technical Training is currently working to harmonize and map the multiple safety databases within the ATO and has two goals:

1. Building an internal detailed taxonomic mapping/bridging system called the Air Traffic Management Common Taxonomy Version 2 (ACTv.2).   This effort takes each of the basic elements of the major datasets including RAP, ATSAP, Air Traffic Quality Assurance (ATQA), and soon, the NTSB, and maps them to ACT v.2, creating a common language between the datasets.

2. The International effort coordinates FAA's work with Civil Air Navigation Service Organization, Eurocontrol, the European Aviation Safety Agency (EASA), and CAST/ICAO Common Taxonomy Team (CICTT).   The draft document is complete and will be presented to CICTT in September 2012.   Once approved, this document will become the international Air Traffic Management common taxonomy digest.

Once an FAA-wide common taxonomy and classification system is fully mature, the ability to standardize data analysis will crosscut through LOBs and geographic regions with a high degree of repeatability.   This will support national runway safety trend analysis, and calibrated investigation methodologies for safety risk assessments as required by NextGen programmatic implementation.   The ability to track, trend, and evaluate specific concerns and systemic issues will be accurate, available, and timely.

5.2 Evolving Runway Safety Risk Management – Goal 7, Goal 8, and Goal 9

Goal 7 - Continue to develop the components of the FAA's operational Safety Management System to identify and manage those hazards and risks which transcend LOB area of responsibility and overlap multiple sectors.

Goal 8 - Finalize rulemaking to require certain certificated airports to implement SMS.

Goal 9 - Implement program for federally obligated airports to conduct wildlife hazard assessments.

The purpose of any SMS is two-fold: to create a clear view of day-to-day operation, and to utilize information to forecast future risk. The success of the SMS depends upon the ability to gather the appropriate data and utilize standardized processes that produce repeatable, uniform results. As a global industry, and to ensure worldwide interoperability, the aviation industry has an imperative to adopt and align safe operating standards.

In alignment with ICAO safety management Standards and Recommended Practices (SARP), the FAA is moving to a more systemic view of determining safety within the NAS through the establishment of risk assessment-based metrics and common taxonomies. This allows for identification and analysis on upstream data and creates the ability to merge critical safety data with other established SMS networks. Previous error reporting systems, including those operating at the facility level, created very real incentives to under-report events. The shifting emphasis places more value on using adverse safety incidents to determine where and how risk is introduced into the NAS rather than who is at fault. A fully functional SMS establishes the framework to identify and address emergent and complex safety issues inside a performance-based organization.

Since the 2007 Call to Action, the FAA has been implementing fundamental SMS applications that collect information from a multitude of objective and subjective data streams. Parsing information gleaned from various front-line employees, radar tracks, weather information, and aircraft operational data will allow the FAA's safety analysts to actively model current operations and build redundant and resilient safety systems. The impact of human error can be significantly reduced through new designs, training processes, and decision-making technologies derived from integrated SMS and safety assurance modeling.

Safety information derived from an airport SMS is critical to the integrity of comprehensive systemic and runway safety solutions. An airport SMS fills in the 'white areas' of regulatory overlap on the airport surface and enables safety mechanisms to address the mixture of man and machines. Understanding and integrating the perspective of all the airport stakeholders creates the ability to build more proactive safety systems on local, national, and international levels. Identifying and addressing wildlife hazards at specific airports increases safety margins and manages risk locally and season-to-season.

The current demands of the NAS and the transition to NextGen will continue to challenge the FAA to evolve the capability to identify, investigate, measure, rate, and facilitate the reduction of risk posed by aviation activities. The integration of organizational SMS will align safety goals,

sustain quality functions, and improve measured operational performance across this technically complex system.

5.2.1 NextGen and SMS

Safety in NextGen will require integrated risk models, utilizing sources of information gleaned through dedicated and interfaced SMS processes. Risk models must allow for differing levels and type of aircraft traffic, varying degrees of airborne and stationary technologies and capabilities, ranges of pilot and air traffic controller proficiencies and performance, changing weather, environmental and market-driven scenarios, and global interoperability. These factors will ultimately define aviation in the mid-term of NextGen implementation. In a highly technical, complex system, no one person or group of persons has the ability to see or understand the effect of small changes. Safety depends on the ability of safety management to identify anomalies in terabytes of data, upstream of events. Data-driven solutions depend on the ability of data systems to assimilate the data and communicate actionable information to every segment of the broader community.

Full utilization of the comprehensive suite of safety technologies, programs, and tools will allow the FAA to fully transition from occurrence-based metrics to more sophisticated risk-determination. The NextGen safety suite will provide:

- An understanding of interactions among safety sub-systems
- A capability to identify contributory, causal and contextual factors, and estimate the volatility of each factor
- The ability to forecast on segment and overall risk of any new sub-system or procedure
- Risk ranking ability
- A better understanding of control measures and their impact on the system

This transition is underway and will enable the FAA to redefine the metrics of accounting for runway and surface safety. When fully developed, the SMS will provide the FAA a systematic means to identify and address real time and future risks in the NAS. Key to the success of this Strategic Plan is the continued development and amalgamation of the Agency's SMS into a single safety assurance system.

5.2.2 Sources of Data

The work undertaken by the FAA, CAST, the NTSB, and industry reduced the fatality rate in U.S. aviation by 83% between 1998 and 2008. CAST utilized a forensic approach derived through an exhaustive analysis of accident and serious incident data. This served to make the U.S. air traffic system the safest transportation system in the world. However, due to a dramatically reduced accident rate, the amount of accident data available to safety investigators also decreased. This has resulted in the need to obtain as much data from as many upstream sources as possible. Proactive safety is derived from the analysis of multiple data streams providing multiple perspectives into millions of aviation operations.
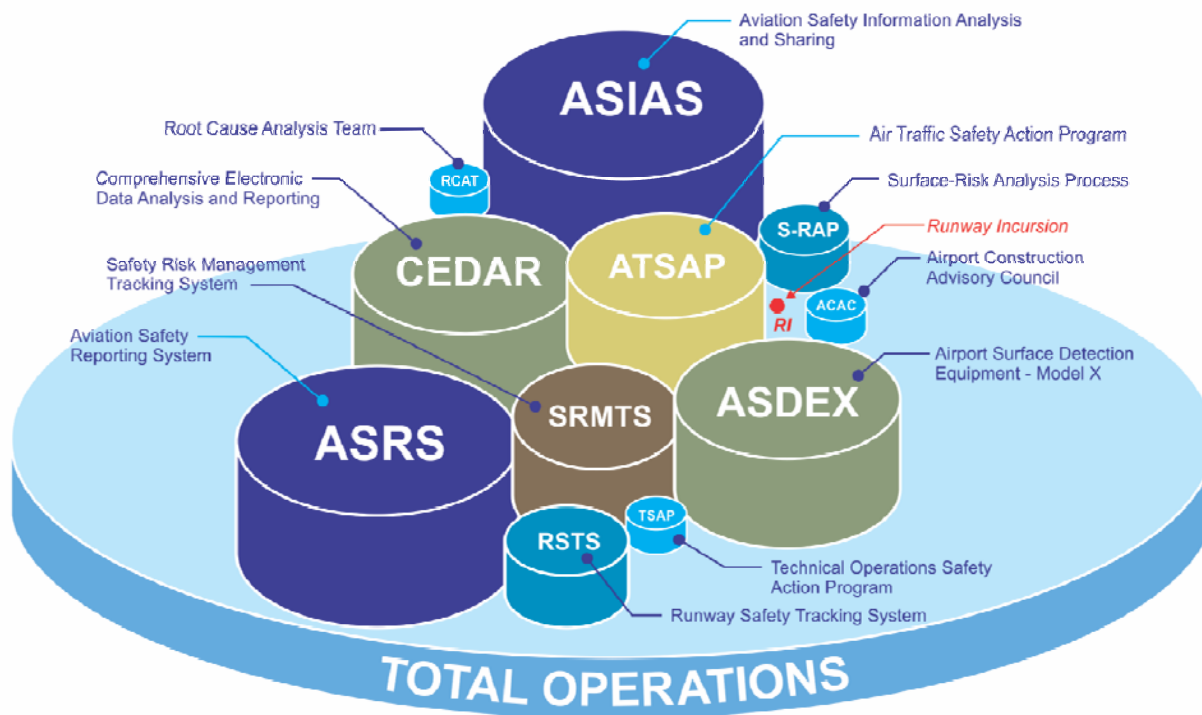
Figure 5-1 SMS Data Sources

Data is at the heart of FAA's integrated internal SMS. Creating the ability to integrate data from multiple data streams will help the FAA effectively address current and future risk through tailor-made solutions sufficient to mitigate the risk to an acceptable degree in a resource-efficient manner.

5.3 Bridging the Surface Safety Technology Gap – Goal 10

Goal 10 - Further investigate the use of a multilateration system and other surface surveillance technologies to provide near-term surveillance and identification of all transponder-equipped aircraft and vehicles on the runways, taxiways, and non-movement areas of the airport.

As part of the transition to NextGen, it is the FAA's intent to leverage, to the greatest extent possible, solutions and logistics from infrastructure that are currently deployed in the NAS.

Multilateration technology is currently deployed in multiple roles in the NAS. One of those roles is to function as a supplemental surveillance source at airports equipped with radar systems such as Airport Surveillance Radar and ASDE-X. Future plans are for these systems to be replaced with multilateration and ADS-B.

6. Runway Safety and Increased Air Traffic Volume

Several aviation studies[13] suggest that minor increases in traffic or vehicular volume can cause an exponential increase in runway safety risk. The number of incursion scenarios can be mathematically calculated based on the number of aircraft operating in the movement area at any one time. In 2002, the CAST Runway Incursion Joint Safety Action Team (RI JSAT) *Results and Analysis Report[14]* determined that factors such as airport layout, runway and taxiway geography, and runway and taxiway complexity combine to increase the risk of unintended conflicts on the runways. The need to address this issue is critical, given the projected increases in traffic volume and complexity over the next two decades.

As the commerce of air travel evolves, so must the safety systems designed to preserve and improve safety. To meet this challenge, the FAA is building a hierarchy of control measures.

These control measures include:

- Infrastructure design (such as end-around taxiways and runway safety areas)
- Testing and development of indication and alerting systems (such as RWSL, and Final Approach Runway Occupancy Signals)
- Airport surface surveillance systems (such as ASDE-X, MultiLateration, Terminal RADAR)
- Operational procedures for pilots, controllers, and vehicle operators
- Training of operational personnel

These interconnected control measures follow many of the CAST procedural, training, regulatory, and infrastructure recommendations and are designed to ensure acceptably low levels of risk are maintained on the runway during periodic or sustained increased levels of air traffic volume. Increasing facilitation of air traffic and greater situational awareness for pilots, controllers and vehicular operators combine to strengthen the safety net.

6.1 Runway Safety and Integrated Risk Modeling

The FAA is innovating internal and external processes using new tools and data sources to baseline current surface safety performance. Currently in development by the FAA, this work not only serves to track runway safety goals, but also informs ongoing efforts to model surface safety and measure the effectiveness of the solutions. This research is critical to providing the bridge from today's operations to the Next Generation surface traffic management systems. The FAA has formed the Integrated Safety Risk Assessment Advisory Committee to research and

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[13] Two notable studies include: Transport Canada, National Civil Aviation Safety Committee, Subcommittee on Runway Incursions, September 14, 2000 and Australian Transportation Safety Bureau, "Runway Incursions: 1997 to 2003," June 2004

[14] *Results and Analysis,* August 11, 2000, Runway Incursion Joint Safety Analysis Team (JSAT), chartered by the Commercial Aviation Safety Team (CAST) and General Aviation Joint Steering Committee (GAJSC), 142 pages

develop a suite of evaluative tools designed to embed safety risk methodologies upstream in the FAA's Acquisition Management System. The new tools provide visibility into where and how risk occurs and accountability for the design and operation of the NAS.

Capabilities derived from integrated datasets and risk models provide the FAA with the ability to constantly assess risk and ensure risk remains at acceptably levels regardless of traffic density. Additional activity is underway to determine operations in the NextGen mid-term *in the absence of satellite signal.*[15]

Risk models that forecast risk levels at specific airports based on traffic volumes, complexity, availability of systems, and environmental factors will ultimately enable the industry to employ appropriate control measures.

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[15] In accordance with U.S. National Policy, the FAA needs to ensure a sufficient backup Position, Navigation and Timing (PNT) capability is present to mitigate risks to aviation users if the PNT services provided by satellite become unavailable. The FAA's NextGen Alternative PNT (APNT) research initiative ensures that backup PNT services will be available to support flight operations to maintain safety and security while minimizing economic impacts of satellite outages.

7. Proactive Safety Analysis

The future of air commerce depends upon the ability of the FAA to design safety systems to accommodate a range of technology. The methodical application of risk tools and safety programs can help improve organizational performance by creating a cohesive framework that integrates safety and risk awareness. This can be accomplished through an in-depth understanding of the interrelated interests of competing stakeholders, coupled with leadership oversight. The achievement of the goals outlined in this Strategic Runway Safety Plan will enable the FAA to evolve its management of runway safety risk from a forensic-based system to a more comprehensive approach to maintaining and improving safety. The goals promote an open exchange of pertinent safety information, real-time risk evaluation, enhanced knowledge of the effectiveness of current standards and levels of compliance, and tactical management and strategic input to risk management.

The ability of air transport to overcome physical barriers of time and space has helped shape a dramatic century of human development. The economic, societal, and political contributions of aviation continue to fuel an interconnected globalized world in the 21st century. Powered by an integrated safety system, the FAA will ensure the fidelity and soundness of the runway environment for the next century of air travel.

Appendix A – Glossary

Advisory Circular (AC) — This is 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 Movement Area Safety System (AMASS) — This is a radar-based surface detection system that provides automated alerts and warnings of potential runway incursions and other hazards. The system prompts air traffic controllers both visually and aurally to respond to events on the airfield that potentially compromise safety.

Aviation Safety Information Analysis and Sharing (ASIAS) — An FAA-sponsored program that connects multiple safety databases across the industry, including airline proprietary data sources and the FAA's Air Traffic Safety Action Program database. ASIAS enables better safety information management and data sharing as it proactively extracts from public and non-public data sources, including accidents, incidents, and voluntary reporting.

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 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 to openly report safety of flight concerns. ATSAP is based upon the principles and mechanisms employed by Aviation Safety Action Program (ASAP).

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 an alleged violation of Title 14 of the Code of Federal Regulations (14 CFR), enforcement-related incentives have been designed into the program. Under ASAP, safety issues are resolved through corrective action rather than through punishment or discipline. An ASAP is based on a safety partnership that includes the FAA and the certificate holder, and usually includes a third party, such as the employee's labor organization.

Category A (Beginning FY08) — A serious incident in which a collision was narrowly avoided.

Category B (Beginning FY08) — 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 (Beginning FY08) — An incident characterized by ample time and/or distance to avoid a collision.

Category D (Beginning FY08) — 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.

Commercial Aviation Operations — Scheduled or charter-for-hire aircraft used to carry passengers or cargo. Airlines, air cargo, and charter services typically operate these aircraft. This group of aircraft operations includes jet transports and commuter aircraft.

Commercial Aviation Safety Team (CAST) -- Formed in 1998, CAST is a partnership between government and industry including the DOT, FAA, National Air & Space Administration (NASA), Transport Canada, European Aviation Safety Agency (EASA), Department of Defense (DOD), Flight Safety Foundation, National Air Traffic Controllers Association (NATCA), Airline Pilots Association (ALPA), regional, national, and international airline associations, and manufacturers. CAST utilizes a data-driven, risk-centric, consensus approach to identifying and resolving significant commercial aviation safety issues. CAST achieved its goal of reducing commercial aviation fatality rate by 80% in 2008 and was awarded the prestigious National Aeronautical Association's Collier Trophy in 2008 for "achieving an unprecedented level of safety in U.S. commercial airline 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.

General Aviation (GA) — 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.) The small GA aircraft tend to be single piloted aircraft, such as a Cessna 152 or Piper Cherokee. Corporate or executive aircraft with a two-person flight crew, for example a Cessna Citation C550 or a Gulfstream V, represent the large GA aircraft.

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.

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 operational capabilities, new airport infrastructure, and improvements to safety, security, and environmental performance. The plan's management process ensures these will be delivered by a specific near-term dates. The FAA and its partners are also undertaking research, policy and requirements development, and other activities to assess the feasibility and benefits of additional proposed system changes that could be delivered in the midterm (2012–2018). The goal of this plan is to turn these proposals into commitments and to guide them into use. The NextGen Implementation Plan was formerly called the Operational Evolution Partnership. Its name has changed to clarify its purpose.

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.

Operational Deviation (OD) — An occurrence attributable to an element of the air traffic system in which applicable separation minima were maintained, but an aircraft, vehicle, equipment, or personnel encroached upon a landing area that was delegated to another position of operation without prior coordination and approval.

Operational Evolution Partnership (OEP) — This partnership is led by the FAA and requires collaboration, commitment, monitoring, and accountability among internal and external stakeholders to transition the National Airspace System to NextGen. In particular, the OEP serves as the integration and implementation mechanism for NextGen. See NextGen Implementation Plan.

Operational Incident (OI) — An occurrence attributable to the provision of air traffic services in which less than required separation is maintained: between two or more aircraft; between an aircraft and terrain or obstacles; between an aircraft and a vehicle, equipment, pedestrian, or closed runway.

Office of the Inspector General (OIG) — The OIG has a 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 comprised 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.

RTCA, Inc. — A private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance CNS, and ATM system issues. RTCA functions as a Federal Advisory Committee.

Runway Entrance Lights (REL) — A lighting 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) (Beginning FY08) — 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 Incursion Error Type — This can be operational error/deviation, pilot deviation, or vehicle/pedestrian deviation. These error types are not necessarily an indication of the cause of the runway incursion. They typically refer to the last event in a chain of pilot, air traffic controller, and/or vehicle operator actions that led to the runway incursion.

Runway Intersection Lights (RIL) — A lighting 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) — An RSAT is established at either the regional or local level to develop a Runway Safety Action Plan for a specific airport. The RSAT's primary purpose is to address existing runway safety problems and issues. A secondary purpose is to identify and address potential runway safety issues. RSATs operate in accordance with standard operating procedures issued by the Office of Runway Safety.

Runway Safety Area (RSA) — The FAA requires that commercial airports, regulated under Part 139 safety rules, have a standard 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) — A situational awareness indication system located on the runway that provides an alert to pilots and ground vehicle operators not to enter or cross a runway when there is conflicting traffic. Alerts are provided by 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.

Takeoff Hold Lights (THL) — Lights that provide an indication to pilots when the runway is unsafe for takeoff due to traffic on the runway.

Taxi Into Position and Hold (TIPH) — An air traffic control instruction to a pilot of an aircraft to taxi onto the active departure runway, to hold in that position, and not take off until specifically cleared to do so.

Vehicle/Pedestrian Deviation (V/PD) — Vehicles or pedestrians entering or moving on the runway movement area without authorization from air traffic control that interferes with aircraft operations.

Appendix B – Acronyms

AAAE	American Association of Airport Executives
AAS	Office of Airports Safety and Standards
AC	Advisory Circular
ACAC	Airport Construction Advisory Council
ADS-B	Automatic Dependent Surveillance - Broadcast
AFS	FAA Aviation Safety - Flight Standards Service
AJI	FAA Air Traffic Organization Office of Safety and Technical Training
AJT	FAA Air Traffic Organization- Terminal Services
ALPA	Air Line Pilots Association
AMASS	Airport Movement Area Safety System
AMS	Acquisition Management System
ANAC	National Civil Aviation Agency of Brazil
AOPA	Aircraft Owners & Pilots Association
AOSC	Airport Obstructions Standards Committee
AOV	FAA AVS - Air Traffic Safety Oversight Service
ARP	FAA Office of Airports
ASAP	Aviation Safety Action Program
ASDE	Airport Surface Detection Equipment
ASDE-X	Airport Surface Detection Equipment- Model X
ASIAS	Aviation Safety Information Analysis and Sharing
ASRS	NASA Aviation Safety Reporting System
ATC	Air Traffic Control
ATCA	Air Traffic Control Association
ATCT	Air Traffic Control Tower
ATM	Air Traffic Management
ATO	Air Traffic Organization
ATSAP	Air Traffic Safety Action Program
AVS	FAA Office of Aviation Safety
BOS	Boston-Logan International Airport
CASA	Civil Aviation Safety Authority
CAST	Commercial Aviation Safety Team
CDTI	Cockpit Display of Traffic Information
CEDAR	Comprehensive Electronic Data Analysis and Reporting
CFI	Certified Flight Instructor
CICTT	CAST/ICAO Common Taxonomy Team

CNS	Communication/Navigation/Surveillance
CRM	Crew Resource Management
DFW	Dallas/Fort Worth International Airport
DGAC	Dirección General de Aviación Civil (various countries)
DGCA	Directorate General of Civil Aviation (India)
DOD	Department Of Defense
DOT	Department of Transportation
DTW	Detroit Metro International Airport
DVD	Digital Video Disc
EASA	European Aviation Safety Agency
eFAROS	Enhanced Final Approach Runway 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
FAAJO	FAA Joint Order
FAAO	FAA Order
FAROS	Final Approach Runway Occupancy Signal
FOCA	Federal Office of Civil Aviation of Switzerland
GA	General Aviation
GDP	Gross Domestic Product
HPPG	High Priority Performance Goals
IAH	Houston Intercontinental Airport
ICAO	International Civil Aviation Organization
ISRAAC	Integrated Safety Risk Assessment Advisory Committee
JCAB	Japan Civil Aviation Bureau
JSAT	Joint Safety Analysis Team
JSC	Joint Steering Committee
LAX	Los Angeles International Airport
LCGS	Low Cost Ground Surveillance System
LOB	FAA Lines of Business
LRSAP	Local Runway Safety Action Plan
LRSAT	Local Runway Safety Action Team
MITRE	MITRE Corporation
NAFI	National Association of Flight Instructors
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NATCA	National Air Traffic Controllers Association
NAVTAC	Navigation Technical Assistance Contract
NBAA	National Business Aviation Association

NGIP	NextGen Implementation Plan
NOTAM	Notice to Airmen
NRSP	National Runway Safety Plan
NTSB	National Transportation Safety Board
OIG	Department of Transportation Office of Inspector General
ORD	Chicago-O'Hare International Airport
PAPI	Precision Approach Path Indicator
PTS	Practical Test Standards
RAA	Regional Airline Association
RADAR	RAdio Detection and RAnging
RAP	Risk Assessment Process
RCAT	Root Cause Analysis Team
RIAT	Runway Incursion Assessment Team
RIRP	Runway Incursion Reduction Program
RRSPM	Regional Runway Safety Program Manager
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
SAN	San Diego International Airport
SARP	Standards and Recommended Practices
SMS	Safety Management System
SRER	System Risk Event Rate
SRM	Safety Risk Management
TCCA	Transport Canada Civil Aviation
TRACON	Terminal Radar Approach Control
VSRP	Voluntary Safety Reporting System

Appendix C – List of Reference Documents

1. Airport Safety and Standards, May 2012, briefing - provided by James White
2. ATO National Runway Safety Plan, Sept 22, 2011, introduction by Joseph Teixeira
3. Runway Incursion Reduction Plan, Jan 1, 2012, provided by Herb King
4. Runway Incursion – GA remedial training email, June 7, 2012, provided by Patrick Doyle
5. Best Practices Report for Runway Incursion Prevention, Sept 30, 2010, by AOV Oversight Service
6. Runway Safety Tracking System Report, June 26, 2012, provided by Fred Stein
7. FY2010-11 Runway Safety Annual Report, downloaded from FAA
8. Runway Safety Program Order 7050.1A, Sept 16, 2010, downloaded from FAA
9. FAA Runway Safety Call to Action, Mid-Term and Long-Term Initiatives, June 28, 2010, via FAA website
10. National Runway Safety Program Order 7210.58, dated June 30, 1999, via FAA website
11. Runway Safety Program , Order 7050.1, dated July 24, 2002, via FAA website
12. FAA OIG Audit Report, Runway Incursion Program FAA, #AV-1998-075
13. FAA OIG Audit Report, FAA's Runway Incursion Program, #AV-1998-015
14. FAA OIG Audit Report, Follow-up Review of FAA's Runway Safety Program, #AV-1999-114
15. CEDAR MOR Validation for Surface Events, no date, provided by Fred Stein
16. 2009-2013 FAA Flight Plan, via FAA website
17. Study of Runway Incursion Reporting at Federal Contract Towers, October 29, 2010,ATO Safety
18. Kinston Tower Runway Safety Program, Order 7 May 1, 2010, provider unknown
19. RSAT Mid Ohio Valley Regional Airport (PKB) Williamstown, WV, Sept 21, 2009, provided by Fred Stein
20. FY2010-2011 Runway Safety Annual Report, via FAA website
21. 2011 Runway Incursion Reduction Quarterly Analysis and Plan, September 2011, authored by The Airport Safety and Operations Division, Office of Airport Safety and Standards
22. FY2012 Runway Incursion Reduction Second Quarter Analysis, March 2012, authored by The Airport Safety and Operations Division, Office of Airport Safety and Standards
23. Fact Sheet – Aviation Industry Responds to FAA's Runway Safety Call to Action, March 25, 2008, Contact: Alison Duquette
24. National Runway Safety Plan 2009 – 2011, via FAA website
25. Runway Safety Report, June 2008, via FAA website
26. Runway Safety Blueprint 2002 – 2004, July 2002, via FAA website
27. National Blueprint for Runway Safety, October 2000, via FAA website
28. Fiscal Year Comparison Report for AJS-0 Office of Safety, undated, unknown source

29. Runway Safety: Surface Operations Risk Factors, January 30 – 31, 2012, 3rd RASGPA Aviation Safety Workshop, Mexico
30. NextGen Fiscal Year 2012 Business Plan, November 28, 2011, via FAA website
31. Air Traffic Organization Fiscal Year 2012 Business Plan, November 18, 2011, via FAA website
32. NAVTAC Task Order 24, Develop Draft Runway Safety Strategic Plan for Congress, May 30, 2012, authored by Donald Porter & Mary McMillan
33. FAA Air Traffic Organization Order N 1100.332, April 5,2012, via FAA website
34. NextGen Implementation Plan, March 2012, via FAA website
35. Office of Safety, Safety Blueprint, April 2009, via FAA website
36. ALPA White Paper on Runway Incursions, undated, via ALPA website
37. FAA Office of Airports Safety Management System (SMS) Desk Reference, June 1 2012, from James White
38. Runway Incursion – GA remedial training – FYI, June 7, 2012, from Al Gorthy
39. RIRP Weekly, Runway Incursion Reduction Program, June 1, 2012, from Patrick Doyle
40. FAA Runway Safety Program, Improving Airport Surface Safety and Preventing Surface Accidents, September 6, 2010, Authored by Chris Pokorski
41. 15th Runway Safety Council (RSC) Meeting Minutes, ALPA, Washington, DC, April 4, 2012, via ALPA website
42. Key Safety Indicators, Current Safety Indicators, undated, source unknown
43. Runway Safety and Risk Mitigation, undated, source unknown
44. ATO Safety – Everything You Need to Know About ATO Safety, June 11, 2012, via FAA website
45. Recent Advances in Airport Research, paper provided by Fred Stein
46. AC 150-5210-20 Ground Vehicle Operations On Airports Date: June 21, 2002
47. AC 120-57A Surface Movement Guidance and Control System Date: December 19, 1996
48. SAFO #11004 Runway Incursion Prevention Actions
49. SAFO #11009 Runway Status Lights (RWSL)
50. SAFO #11011/ runway Excursions at Jackson Hole Airport
51. AC 120-74 Flightcrew Procedures During Taxi Operations
52. Low Cost Ground Surveillance - briefing by Rob Higginbotham, FAA NextGen Solution Group
53. FAA JO 7210.632 ATO Occurrence Reporting – January 30, 2012
54. FAA JO 7210.633 ATO Quality Assurance Program (QAP) – January 30, 2012
55. FAA JO 7210.634 ATO Quality Control – January 30, 2012
56. HR 658 - FAA Remodernization and Reform Act of 2012, Section 314. Runway Safety
57. FAA NextGen Plan (NGIP) – 2012
58. FAA NextGen Segment Plan (NSIP) 2010 - 2015Section 4: Improved Surface Operations
59. NTSB Safety Recommendations A-00-66 through -71 July 7, 2000 Internet Google search
60. N JO 7050.3 Change to Runway Incursion Definition and Classification – Canceled notice

61. Improvements to the Runway Safety – paper provided by Fred Stein
62. Runway Status Lights: What Are They and How Do They Work? – paper provided by Fred Stein
63. White Paper on Risk-Based Modeling for NextGen Concepts - Eric Harkleroad, James Kuchar, and Adan Vela, MIT Lincoln Laboratory – May 10, 2012

Appendix D – 2012 - 2014 National Runway Safety Plan

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 meets the FAA Destination 2025 goal for runway safety.

Please follow the below link to access the document:
http://www.faa.gov/airports/runway_safety/news/publications/media/2011_ATO_Safety_National_Runway_Safety_Plan.pdf