Airport Safety Management Systems and New Technologies

Presented to: Aircraft Builders Council Conference
By: Eduardo Angeles, FAA Associate Administrator for Airports
Date: September 22, 2015
Overview

• Safety Management Systems (SMS)
• Runway Incursions and Excursion Data
• Runway Safety Areas (RSAs)
  • Engineered Material Arresting System (EMAS)
• Wildlife Hazard Mitigation
• FAA Airport Safety Technology - Research and Development
Identifying the Problem to Help Make Risk-Based Decisions

- FAA conducted a Safety Data Mining effort of surface events (2003-2013).
- Analysis identified the top airport risks to be:
  - Runway Excursions;
  - Runway Incursions; and
  - Wildlife Strikes.
What is SMS?

• **A TOOLBOX for managers**
  – Decision making tools
  – Data collection with methods for analysis
  – Means of continuous improvement

• **A MANAGEMENT system**

• **Focus on OPERATIONAL safety**

• **Facilitates a PROACTIVE approach to safety**
SMS Basics Defined

“…a system to **assure** the safe operation of aircraft through effective management of safety risk. This system is designed to **continuously improve** safety by identifying hazards, collecting and analyzing data and continuously assessing safety risks.” – *ICAO SMM Doc9859, 2013*

“ The **formal, top-down, organization-wide** approach to managing safety risk and assuring the effectiveness of safety risk controls. It includes **systematic** procedures, practices, and policies for the management of safety risk.” – *FAA Order 8000.369A,*

“…an **integrated** collection of processes and procedures that ensures a **formalized and proactive** approach to system safety through **risk management.**” – *Notice of Proposed Rulemaking, Safety Management System for Certificated Airports, 2010*
SMS Defined

The Four SMS Components

**Safety Policy**
Establishes senior management's commitment to continually improve safety; defines the methods, processes, and organizational structure needed to meet safety goals.

**Safety Assurance**
Evaluates the continued effectiveness of implemented risk control strategies; supports the identification of new hazards.

**Safety Risk Management**
Determines the need for, and adequacy of, new or revised risk controls based on the assessment of acceptable risk.

**Safety Promotion**
Includes training, communication, and other actions to create a positive safety culture within all levels of the workforce.
What SMS is and is not...

What it is:

- Compliance is integral to safety management
- An effective interface for safety management
- SMS completes the systems approach
- A set of decision making processes for senior and line management

What it is not:

- A substitute for compliance
- A substitute for oversight
- A replacement for system safety
- A requirement for a new department
What is the FAA Office of Airports (ARP) required to do?

- FAA Order 8000.369A requires ARP to:
  - Integrate SMS concepts into organization (part of the ‘State Safety Program’ and FAA SMS effort)
  - Develop SMS requirement for regulated parties (Part 139 certificated airports)

- FAA’s efforts will also harmonize with International standards and recommended Practices
  - ICAO Annex 19, Safety Management
  - ICAO Annex 14, Aerodromes
How are we dealing with these requirements?

• Dual approach

  – **Internal SMS** – Also known as ARP SMS; integrating SMS components into ARP organization, processes and programs that impact safety (Implemented through internal FAA Orders and Guidance)

  – **External SMS** – Part 139 SMS requirement (Implementing through Rulemaking)
ARP SMS - Safety Risk Management

• SRM is required when an FAA Office of Airports decision could impact aviation safety:
  – Airport planning, environmental, engineering, construction, operations, and maintenance standards in Advisory Circulars
  – Approval of new or updated Airport Layout Plans (ALPs)
  – FAA airspace determinations for construction safety plans
  – FAA airspace determinations of airport sponsor requests for non-construction changes
  – Approval of Part 150 Noise Compatibility Program measures that could affect aviation safety
  – Approval of requests for project-specific Modifications of Standards

• Triggering action is NOT whether or not the project is AIP-funded; it’s based on the approval action
Part 139 SMS Proposal

• Notice of Proposed Rulemaking published in the Federal Register in October 2010
  – Available at www.regulations.gov
  – Regulatory Evaluation also available in docket
  – Technical Report and Responses to Clarifying Questions also available in docket

• Comment period closed July 5, 2011
  – Offered multiple extensions of time to comment based on industry requests
Runway Safety Areas

• Most fatalities around the world from airport accidents are caused by runway excursions. One of the best ways to prevent a runway excursion from turning into a fatal accident is for the airport to have standard runway safety areas (RSA).

• Since 2000, we have been actively working with airports to improve RSAs to the extent practical. We are scheduled to complete all practical improvements to Part 139 certificated runway RSAs by December 31, 2015.

• The Engineered Materials Arresting Systems (EMAS) installed at the ends of many runways has already successfully stopped nine (9) overrunning aircraft without fatalities or any significant injuries.
Runway Safety Area (RSA) Program

- 96% of all U.S. runways have been improved to the extent practicable

- U.S. airports are on track to complete remaining RSAs by end of 2015.
RSA Program – Engineered Materials Arresting System (EMAS)

A new EMAS manufacturer!

EMASMAX®

* Applies only to runways with vertical guidance for approaches

Enough EMAS to stop aircraft that leave the end of the runway traveling at 70 kts
## RSA Program - EMAS Captures

<table>
<thead>
<tr>
<th>Date</th>
<th>Crew and Passengers</th>
<th>Incident</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 1999</td>
<td>30</td>
<td>A Saab 340 commuter aircraft overran the runway at JFK</td>
</tr>
<tr>
<td>May 2003</td>
<td>3</td>
<td>A Gemini Cargo MD-11 overran the runway at JFK</td>
</tr>
<tr>
<td>January 2005</td>
<td>3</td>
<td>A Boeing 747 overran the runway at JFK</td>
</tr>
<tr>
<td>July 2006</td>
<td>5</td>
<td>A Falcon 900 overran the runway at Greenville Downtown Airport in South Carolina</td>
</tr>
<tr>
<td>July 2008</td>
<td>145</td>
<td>An Airbus A320 overran the runway at ORD</td>
</tr>
<tr>
<td>January 2010</td>
<td>34</td>
<td>A Bombardier CRJ-200 regional jet overran the runway at Yeager Airport in Charleston, WVA</td>
</tr>
<tr>
<td>October 2010</td>
<td>10</td>
<td>A G-4 Gulfstream overran the runway at Teterboro Airport in New Jersey</td>
</tr>
<tr>
<td>November 2011</td>
<td>5</td>
<td>A Cessna Citation II overran the runway at Key West International Airport in Key West, FL</td>
</tr>
<tr>
<td>October 2013</td>
<td>8</td>
<td>A Cessna 680 Citation overran the runway at Palm Beach International in West Palm Beach, FL</td>
</tr>
</tbody>
</table>
RSA Program - EMAS Captures

EMAS capture of a Bombardier CRJ-200 Regional Jet at Yeager Airport, Charleston, WV, January 2010
RSA Program - EMAS Captures

EMAS capture of a Falcon 900 at Greenville Downtown Airport,
SC July 17, 2006
SFO RSA Expansion

Google Earth Imagery June 2013 depicts old threshold

Google Earth Imagery Feb 2014 depicts the new threshold location
Asiana Airlines Flight 214
July 6, 2013
KSFO

Ezra Shaw (Getty Images)
Visual Approach Surface, 28L

Old Threshold Location

New Threshold Location
Runway Incursion Mitigation

• Through data analysis, airfield geometry has been identified as a primary contributing factor for runway incursions.

• The FAA is developing a new, comprehensive, multi-year program to identify, prioritize, and implement projects to address the risk at these locations to reduce runway incursions.

• The FAA will be in contact with airport operators to develop preliminary, voluntary, mitigation alternatives for specific runway locations. These alternatives may range from geometric corrections of the taxiway, improved marking and lighting, operational solutions, or a combination of those solutions.

• The FAA will develop high-level, order-of-magnitude cost estimates for each of those alternatives, which the agency will then develop into national and regional programs.
Wildlife Hazard Mitigation (WHM)

http://www.faa.gov/airports/airport_safety/wildlife/
Wildlife Strike Mitigation

• FAA currently working on four NTSB Recommendations
• FAA continuing to analyze strike data
  – Strike reporting continues to increase at both Part 139 and GA airports, with an overall strike reporting rate of 47 percent
  – Damaging strikes within the airport environment (<500 feet AGL) continue to decrease, showing that airport mitigation efforts are effective.
Wildlife Hazards

Goal: Minimize collisions between hazardous wildlife and aircraft on and near airports

COST OF WILDLIFE STRIKES:
$937 million/year in U.S
$1.3 billion/year Worldwide
255 fatalities worldwide since 1988
243 destroyed aircraft worldwide since 1988
Bird Radar

Bird radars can provide timely information about hazardous bird activity to airport wildlife biologists, airport operations, ATC, and potentially pilots.

FAA R&D BSTAR Bird Radar at DFW
Wildlife Surveillance Concept (WiSC)

A concept that enables the introduction of precise avian threat information to the ATCT environment

- Commercially available radar systems identified in FAA guidance documents

Objectives

Increase safety by reducing damaging strikes

- Improved avian threat detection
- Improved avian threat information quality passed to the aircraft
- Improved ATC procedures for disseminating avian threat information
Pharovision Interceptor

An electro-optical (i.e. camera) sensor for detecting and tracking birds without radar.
Airport GIS

• Biggest change - Aligning Airports GIS as the airport data authoritative source for the entire FAA thereby improving data quality and timeliness.

• Major milestones include developing user tools for airports and their consultants, FAA Airport, and other FAA Lines of business.

• Surface Analysis and Visualization tool (20:1 evaluations)

• Submit data validation, compliance plans, and mitigation plans automatically to the Flight Procedures Team.

• Modifications of Standards (MOS) tool

• Airport Layout Plan tool
Proposed Research:
- “Green” technologies such as Warm Mix Asphalt
- New asphalt materials
- Effect of New Generation Aircraft on Asphalt Pavement Performance

National Airport Pavement and Materials Research Center (NAPMRC)
- Six test lanes - four outdoors and two indoors.
- Sensors installed in pavements
Heavy Vehicle Simulator (HVS-A) at FAA's National Airport Pavement & Materials Research Center (NAPMRC)
Heavy Vehicle Simulator – A Few Key Specifications

- Largest Heavy Vehicle Simulator in the world
- Length – 129’5”  Width – 16’  Height – 13’9”
- Weight – 240,000 lbs
- Test pavement temperature control
- Pavement temperatures up to 150°F
- Wheel loads - up to 100,000 lbs.
- Test speeds - 0.17 to 5 mph
- B-777 Tire and B-737 Landing Gear
- FAA Acceptance – November 1, 2013
Future Research

EVALUATION OF NEW ASPHALT TECHNOLOGIES FOR AIRFIELD PAVEMENTS

- Warm Mix Asphalt
- Stone Matrix Asphalt
- Polymer Modified Binders
- Recycled Asphalt Pavement
- Full-Depth Rehabilitation
AeroMACS is a Broadband wireless communication service that will provide licensed and protected wireless services to aviation users, for specific uses:

- FAA ATC
- Airlines
- Airport Operators
AeroMACS Architecture (Airport)
Aviation Rumble Strips

**Objective:**
Identify safety enhancements that will reduce runway incursions by alerting pilots to potential hot spots.

**Approach:**
Research the feasibility and effectiveness of using rumble strips to alert general aviation pilots to high risk runway-taxiway intersections.
Temporary Rumble Strips

- Non-intrusive
- Portable
- Cost-effective
- Easy to Deploy
- Scalable
Saw Cut Rumble Strips

• Intrusive
• Permanent
• Constructability issues
• Degradation issues
• Winter operations issues (i.e. plowing)

Trapezoidal Shape Desired
Thermoplastic Rumble Strips

- Easy to construct
- Semi-intrusive
- Permanent
- Proven to withstand winter ops in roadway environment
**Aircraft Braking**

**Long Term Goal:**
Use aircraft onboard systems to collect braking performance data during landing and then send that data to the next plane in line to land

1. Airplane lands
2. Braking action data is collected
3. Data translated to meaningful information
4. Information sent to follow-on airplane
Aircraft Braking

FAA Fire Truck (Crash 5) Applying Water to Test Section on Runway 4-22

FAA Global 5000 (N47) Conducting a Braking Run through the Wetted Test Section on Runway 4-22
New Firefighting Systems ARFF Vehicles

Research new firefighting systems using dedicated test ARFF vehicles
Research on thermal imaging and Forward Looking Infrared (FLIR) cameras for enhancing ARFF response during conditions of low visibility.
Thermal Imaging and FLIR

There are tradeoffs among the different cameras and the type of information a user can get from the images.

Good display of hot spots but very limited context

Good context
Thank You! Questions?