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WORKING PAPER

SECOND HIGH-LEVEL SAFETY CONFERENCE 2015 (HLSC 2015)
PLANNING FOR GLOBAL AVIATION SAFETY IMPROVEMENT

Montréal, 2 to 5 February 2015

Theme 1: Reviewing the current situation
Topic 1.1 Achievements and remaining work

RUNWAY SAFETY UPDATE

(Presented by the United States)

SUMMARY

In fiscal year 2000, the Federal Aviation Administration (FAA) began an ambitious plan to accelerate safety improvements on runways available for commercial service that did not meet FAA design standards. Since then, 603 runway safety areas (RSAs) of the 642 identified as needing improvements have been completed. The remaining ones are scheduled for completion by the end of 2015 mandated by the United States Congress. Having completed the RSA Improvement Program, the FAA is starting a new long-term initiative to address non-standard taxiway geometry issues identified as causal factors for runway incursions.

Action: The conference is invited to
a) note contents of this paper; and
b) consider adoption or implementation of the technologies and/or processes discussed to address the on-going safety challenges faced by airports.

1. INTRODUCTION

1.1 A runway safety area (RSA) is a defined surface surrounding the runway that is prepared or suitable for reducing the risk of damage to aircraft in the event of undershoot, overrun or excursion from the runway. The term RSA is equal to the ICAO term runway end safety area (RESA).

1.2 Following a 1999 MD-82 runway excursion in Little Rock, Arkansas which resulted in eleven fatalities, the Federal Aviation Administration (FAA) took its first survey of RSAs and implemented a policy for proactively improving RSAs. Under this policy, the FAA developed plans and a schedule to improve RSAs at all commercial service airports by December 2015. This date enables the FAA to accomplish its RSA improvement plan seven years faster than the FAA's original approach, which improved RSAs in conjunction with major runway improvement projects.

1.3 In 2005, a Boeing 737 which was landing at Midway Airport in Chicago, Illinois overran the runway, ran through the airfield security wall and onto a public road, killing a vehicle passenger. Around this time, the United States Congress passed Public Law 109-115, which adopted the FAA's RSA improvement schedule and required all commercial service airports to improve their RSAs to the extent practicable by 31 December 2005.

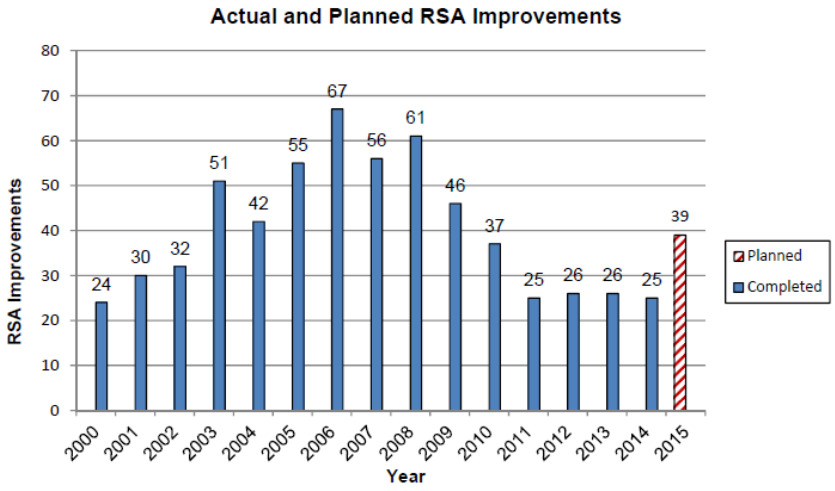
2. DISCUSSION

2.1 **Runway Safety Area Improvement Options:** It is not always practicable to improve RSAs to meet full dimensional standards. Construction costs can be extremely high when nearby natural features or urban development constrains the airport. Environmental constraints can also hamper RSA expansion proposals. Unlike other standards, local conditions alone cannot be used to justify a modification of RSA dimensions. Instead, the FAA makes a practicability determination of the best alternative for improving any RSA that does not meet standards. The practicability determination identifies how the RSA can be improved and to what extent. Airports can improve RSAs by:

a) constructing or expanding the RSA;
b) modifying or relocating the runway;
c) restricting the runway's use for smaller and slower aircraft;
d) installing an engineered materials arresting system (EMAS);
e) implementing declared distances to reduce the useful length of the runway;
f) relocating the FAA-owned equipment within the RSA to the outside of the RSA;
g) installing frangible structures on FAA-owned equipment that cannot be relocated outside of the RSA; or
h) any combination of the above.

2.1.1 For example, on a 10 000 foot (3 000 meter) long runway having only 200 feet of runway safety area at one end, the airport can shorten this runway for take-off and landing by an additional 800 feet through declared distances in order to meet the RSA length standard of 1 000 feet. If there is additional safety area available on the other end, beyond 1 000 feet, the runway could be shifted in that direction in order to maintain the runway length and minimize the declared distances.

2.2 **RSA Improvement Program Progress:** Prior to 2000, the pavement inventory showed that at least 619 out of 1 012 runways required improvements. The number of runways with RSAs that were improved to the extent practicable increased from approximately 400 in 2000 to 603 at the end of 2014. The FAA plans to complete all practicable improvements for the remaining thirty-nine runways that do not include mitigation of navigational aids by the end of 2015. The following table shows the progress made by the FAA's Office of Airports with RSA projects funded under the Airport Improvement Program (AIP):



2.3 Moreover, the FAA completed all practicable improvements for its mitigation of navigational aids for the FAA's Air Traffic Organization's facilities and equipment (F&E) program, which amounted to 316 out of 524 RSAs at the end of FY 2014.

2.4 **Engineered Materials Arresting Systems (EMAS):** The FAA began conducting research in the 1990s to determine how to improve runway safety at airports where the full RSA standard cannot be obtained. Working in concert with the University of Dayton, the Port Authority of New York and New Jersey, and the Engineered Arresting Systems Corporation (ESCO) of Logan Township, New Jersey, a new technology emerged to provide a safer arrest for overrunning aircraft. EMAS uses crushable concrete placed at the end of a runway to stop an aircraft that overruns the runway. The tires of the aircraft sink into the lightweight concrete and the aircraft decelerates as it rolls through the material. The EMAS technology improves safety where land is not available or it is not possible to meet the standard 1 000 foot overrun. A standard EMAS installation usually extends 600 feet from the end of the runway. A customized EMAS arrestor bed can help slow or stop an aircraft that overruns the runway, even when less than a standard RSA length is available.

2.5 To date, there have been nine incidents where EMAS has safely stopped overrunning aircraft, affecting a total of 243 crew and passengers aboard those flights.

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

2.6 **RSA Improvement Impact:** To date with over $3 billion in AIP funding spent on RSA improvements, the FAA has made significant strides towards improving airfield safety at over 500 airports by reducing the risk of injury or property damage in the event of an aircraft excursion or overrun. While many of the critical improvements involved the installation of EMAS, numerous other RSA improvements saved hundreds of lives and did not involve EMAS. For example, in 2013 a Boeing 777 undershot the runway at San Francisco International Airport. Several hundred lives were saved because the approach RSA, under the FAA's RSA Improvement Program specifically increased the RSA to account for undershoots to the standard distance by lengthening the distance between the end of the runway and the San Francisco Bay. Without this improvement, the aircraft likely would have crashed into the water.

2.7 **New Airport Safety Initiative:** As the RSA Improvement Program concludes, the FAA Office of Airports will continue with its effort to enhance airport safety by initiating another program to improve taxiway geometry in problematic areas at airports throughout the United States. A safety data mining study conducted by the FAA's William J. Hughes Technical Center in Atlantic City, New Jersey confirmed that along with runway excursions, the other top two safety risks at airports are runway incursions and wildlife hazards. The data mining study also revealed that airport geometry was the primary contributing factor that leads to runway incursions and operations on the wrong runway or taxiway.

2.8 Similar to the RSA Program, one of the next big safety efforts at the FAA is a fifteen-year initiative to improve problematic taxiway geometry and to reduce the potential for runway incursions and operations on the wrong runway or taxiway. This program involves determining the number of incidents resulting from problematic geometry type and use of this information to help develop criteria for risk-based prioritization. Other criteria for determining prioritization are locations with more than three runway incursions in a year: total number of runway incursions at a location; and total number of operations.

2.9 The goal is to reduce the risk of runway incursions resulting from errors by pilots, air traffic controllers, pedestrians, vehicle operators, tug operators and individuals conducting aircraft taxi operations by working in collaboration with aviation stakeholders to identify and mitigate risk. This goal is broken down into two targets. The first target is to develop a priority list of taxiways with problematic geometry by 1 March 2015. The second target is to coordinate with regional offices and FAA lines of business to develop a schedule and associated cost estimates in fiscal year 2016.

2.10 Currently, a geospatial database inventory of runway incursion and hot spot locations is under development to manage progress of the program. By the end of fiscal year 2015, runway and airport locations will be evaluated to determine options and recommended improvements as well as long term schedules for development. The taxiway improvements will occur from fiscal year 2016 through fiscal year 2031.

2.11 A recent Engineered Materials Arresting Systems (EMAS) bed replacement has been completed at Midway Airport by a new vendor named Runway Safe LLC. This installation was the first done by this company. This EMAS consists of foamed aggregate, which is made from recycled glass as the core material. Unlike the current EMAS product by Engineered Arresting Systems Corporation (ESCO), whose blocks are prefabricated, this material is poured on site into lanes bounded by geo-grid fabric. It is then levelled and compacted to its required height to arrest any applicable aircraft operating at the airport. The aggregate, referred to as foamed silica, is covered with a thin layer of cement to protect the bed from jet blast. The cement is then topped with a coating to protect it from the weather.

2.11.1 The presence of a second EMAS vendor is expected to create a competitive market for EMAS throughout the world, lowering cost and offering a variety of designs for airports throughout the world.

First EMAS installation by Runway Safe LLC, at Midway Airport.

3. CONCLUSIONS

3.1 The FAA Office of Airports continues to proactively identify risk and use available resources to enhance runway and taxiway safety to the best extent practicable.

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