INTERNATIONAL CIVIL AVIATION ORGANIZATION

THE THIRD MEETING OF THE AERODROMES OPERATIONS AND PLANNING – WORKING GROUP (AOP/WG/3)

Putrajaya, Malaysia, 2 – 4 June 2015

Agenda Item 4: Provision of AOP in the Asia/Pacific Region

RUNWAY SAFETY UPDATE

(Presented by the United States of America)

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, 610 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, as mandated by 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 casual factors for runway incursions.

Action: The Meeting is invited to:

a) Note the contents of this paper; and

b) Consider adaptation or implementation of the technologies and/or processes discussed to address the on-going safety challenges faced by airports.

This paper relates to –

Strategic Objectives:

*A: **Safety** – Enhance global civil aviation safety*

*E: **Environmental Protection** – Minimize the adverse environmental effects of civil aviation activities*

1. INTRODUCTION

1.1 An 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 an undershoot, overrun, or excursion from the runway. It is comparable to the ICAO term of a runway end safety area (RESA Following an MD-82 runway excursion e in Little Rock, Arkansas, in 1999 that resulted in 11 fatalities, the FAA undertook a survey of RSAs and implemented a policy to proactively improve RSAs. FAA developed plans and a schedule for improving RSAs at commercial service airports by December 2015. This was 7 years sooner than the RSAs would have been approved if we had continued the approach of improving RSAs in conjunction with major runway improvement projects. In 2005, a landing Boeing 737 at Midway Airport in Chicago, IL overran the runway, ran through the airfield security wall and onto a public road, killing a vehicle passenger. By this time, U.S. Congress passed Public Law 109-115, which adopted the FAA RSA improvement schedule and requires all commercial service airports to improve their RSAs to the extent practicable by December 31, 2005.

2. DISCUSSION

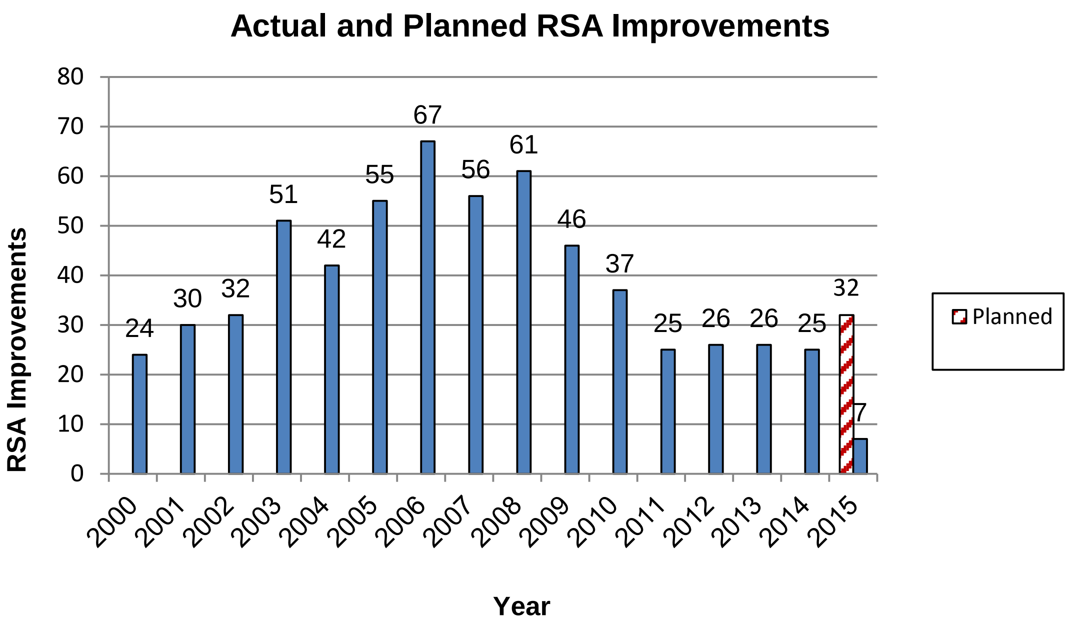
2.1 *Runway Safety Area Improvement Options:* It is not always practicable to improve RSAs to meet full dimensional standards. Construction costs can be extremely high when the airport is constrained by nearby natural features or urban development. Environmental constraints can also hamper RSA expansion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

Airports can improve RSAs by:

(1) Constructing or expanding the RSA;
(2) Modifying or relocating the runway;
(3) Restricting the runway's use for smaller and slower aircraft;
(4) Installing an Engineered Materials Arresting System (EMAS);
(5) Implementing declared distances to reduce the useful length of the runway;
(6) Relocating the FAA-owned equipment within the RSA to the outside of the RSA;
(7) Installing frangible structures on FAA-owned equipment that cannot be relocated outside of the RSA; or
(8) Any combination of the above.

2.1.1 For example, a 10,000' (3,000 meter) long runway with only 200' of safety area on one end can shorten the runway by an additional 800', through declared distances, to meet an RSA length standard of 1000'. Or, if there is additional safety area available on the other end, beyond 1000', the runway can be shifted in that direction, to maintain the runway length or minimize reducing it.

2.2 *RSA Improvement Program Progress:* Prior to 2000, the inventory showed that at least 619 out of 1012 runways required improvements. The number of runways with RSAs meeting being improved to the extent practicable increased from approximately 400 in 2000 to over 970 at the end of 2014. The FAA plans to complete all practicable improvements for the remaining 39 runways that do not include mitigation of navigational aids by the end of 2015. The following table shows the progress that that FAA's Office of Airports has made with RSA projects funded under the Airport Improvement Program (AIP):



2.2.1 Additionally, the FAA has completed all practicable improvements, for the mitigation of navigational aids under the Air Traffic Organization's Facilities and Equipment (F&E) program, for 316 out of the 524 RSAs at the end of FY 2014.

2.3 *Engineered Materials Arresting Systems:* The FAA began conducting research in the 1990s to determine how to improve safety at airports where the full RSA 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, NJ, a new technology emerged to safely arrest 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 is decelerated as it rolls through the material.

2.3.1 The EMAS technology improves safety benefits in cases where land is not available, or not possible to have the standard 1,000-foot overrun. A standard EMAS installation extends 600 feet from the end of the runway. An EMAS arrestor bed can be installed to help slow or stop an aircraft that overruns the runway, even if less than a standard RSA length is available.

2.3.2 To date, there have been nine incidents where EMAS has safely stopped nine overrunning aircraft with 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

2.3.3 For many years, there has only been one EMAS vendor, Zodiac Arresting Systems America (ZASA), on the market, both in the U.S. and internationally. Recently a new EMAS vendor, Runway Safe, has become the second FAA-accepted manufacturer of an EMAS product, based on technical standards. Its product consists of a core material known as "foamed silica', which is produced from recycled glass. Runway Safe is a company owned by a group of investors in Sweden and managed by Protection Engineering Consultants (PEC), which is based in Dripping Springs, TX. A Foamed Silica EMAS bed involves a high-strength plastic mesh system anchored to the pavement at the end of the runway. It is then poured into the mesh and is covered with a poured cement top to form the bed. The plastic mesh and the cement top hold the Foamed Silica pieces together. A new Runway Safe EMAS bed has been installed at Chicago Midway Airport, on the north end of Runway 4R-22L, which was previously experiencing problems with its previous bed due to harsh jet blast causing damage to it. The Runway Safe EMAS product is designed to withstand harsh jet blast.

2.3.4 Foamed Silica for EMAS was originally developed by Norsk Glass Gjenvinning (NGG), a Norwegian waste collection and recycling company.

The FAA's Office of Airports notified NGG , via letter on April 2, 2012, that its Engineering Materials Arresting System (EMAS) Foamed Silica, formerly called Glasopor, designed to stop aircraft overruns, meets the FAA's design and performance standards outlined in advisory circular 150/5220-22, *Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns.* In March 2014, NGG sold its patent to Runway Safe. Therefore, NGG is no longer the prime vendor for Foamed Silica EMAS but still currently provides the core product to Runway Safe. The product named changed from Glasopor to Foamed Silica.

2.3.5 NGG initially developed a test bed in Norway and has done overrun and model testing at the Texas Transportation Institute with the FAA in attendance. In addition, the FAA conducted burn testing of Foamed Silica in June 2011 at its Technical Center in NJ. NGG developed a partnership with PEC, which has managed efforts for research and development of the Foamed Silica EMAS product. The FAA entered into a Cooperative Research Development Agreement with NGG to study the feasibility of the product in October 2010. In May and June 2011 NGG conducted product testing and submitted a design and performance report to the FAA. Upon completion of review of the design and performance report, along with the subsequent addenda, the FAA determined that NGG's EMAS design is compliant with its design standards.

2.3.6 NGG has patented the Foamed Silica EMAS system in the United Kingdom, and has submitted patent applications world-wide. Runway Safe and the FAA will continue their research and development efforts to further improve the design of the Foamed Silica EMAS.

2.3.7 EMAS, when practical, is often used when a standard runway safety area is not possible. The EMAS technology emerged in the 1990s as a way to safely stop an aircraft from overrunning the runway safety area. ZASA was one of the research partners and is the first approved EMAS vendor.

2.4 *RSA Improvement Impact:* 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. While many of the critical improvements involved the installation of EMAS, there also RSA improvements that saved hundreds of lives and did not involve EMAS. For example, during the Boeing 777 undershoot accident at San Francisco International Airport; several hundred lives were saved because the approach RSA was increased to the standard distance, lengthening the distance between the end of the runway and the San Francisco Bay, to account for undershoot. A lack of this improvement may have resulted in the aircraft crashing into the water.

2.5 *CAST Runway Excursion Team:* A team consisting of both government and industry stakeholders, known as the Commercial Airport Safety Team (CAST) was formed to charter a runway excursion study in 2012 to review existing reports, summarize findings and recommendations and develop cost-beneficial CAST Safety Enhancements that encompass the most effective mitigations. Recommendations for mitigations include continued enforcement of regulatory actions, air traffic control procedure changes, landing training, better friction measurement and reporting, runway overrun awareness and alerting systems, signage for better awareness (distance remaining signs), RSA improvement and EMAS.

2.6 *New Airport Safety Initiative:* As the RSA Improvement Program concludes, the FAA Office of Airports will continue with its effort to enhance airport safety be initiating a program to improve taxiway geometry in problematic areas at airports throughout the United States. A safety data mining study at the FAA William J. Hughes Technical Center in Atlantic City, NJ confirmed that along with runway excursions, the other top two safety risks at airports and 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.

2.6.1 Similar to the RSA Program, one of the next big safety efforts is the 15 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 based the problematic geometry type and used this information to help develop criteria for prioritization. Other criteria for determining prioritization are locations with more than 3 runway incursions in a year, total number of runway incursions at a location and number of operations.

2.6.2 The FAA has included this effort as part of their business plan. 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 draft priority list of taxiways with problematic geometry by March 1, 2015. The second target is to coordinate with regional offices and FAA lines of businesses to develop a draft schedule and associated cost estimates for fiscal year 2016, in order to complete the top priority taxiway geometry improvements by September 30, 2015.

2.6.3 Currently, a geospatial database inventory of runway incursion and hot spot locations is being develop to manage progress of the program. By the end of fiscal year 2015, locations will be evaluated to determine options and recommended improvements and long term schedules will be developed. The taxiway improvements will be executed from fiscal year 2016 through fiscal year 2013.

3 CONCLUSION

3.1 The FAA Office of Airports will continually and proactively use any available resources to enhance runway and taxiway safety to the best extent practicable.

4 ACTION BY THE MEETING

4.1 The Meeting is invited to:

a) Note the contents and conclusions of this paper.

   a. Consider adoption or implementation of the technologies and/or processes discussed to address the on-going safety challenges faced by airports.

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