International Civil Aviation Organization
ICAO South American Regional Office
Eleventh Meeting of the Civil Aviation Authorities of the SAM Region (RAAC/11)
(Santiago, Chile, 6 – 8 May 2009)

Agenda Item 4: **Review of the level of safety oversight attained in the Region**

c) Status of implementation of safety management systems in the States of the Region

AIRFIELD SAFETY IN THE UNITED STATES

(Presented by the United States of America)

SUMMARY

The biggest safety challenge to aviation is not in the air but on the ground. Improvements in procedures and the introduction of new technology can improve runway safety. This paper discusses how the United States Federal Aviation Administration (FAA) places a high priority on improving airfield safety and how, in partnership with industry, airport operators, and air traffic controllers, it has implemented many changes to reduce the risk of runway incursions.

1. Introduction

1.1 The FAA regards safety as its first priority. The biggest safety challenge is not in the air, but on the ground at hundreds of commercial service airports. Both runway incursions and runway overruns pose a threat to passengers, crews, and airport workers that can cause significant damage to aircraft and infrastructure.

1.2 An aggressive and effective runway safety program has reduced the number of serious runway incursions in the United States by 63 percent from fiscal year (FY) 2000 through FY2008. In the first quarter of FY2009, there were no serious runway incursions, which is an all-time low for a three month period. All categories of runway incursions were down slightly for the first quarter of FY2009 versus the same period in FY2008 – 224 in FY 2009 compared to 226 in 2008. Although these are encouraging numbers, there is still much work to be done.

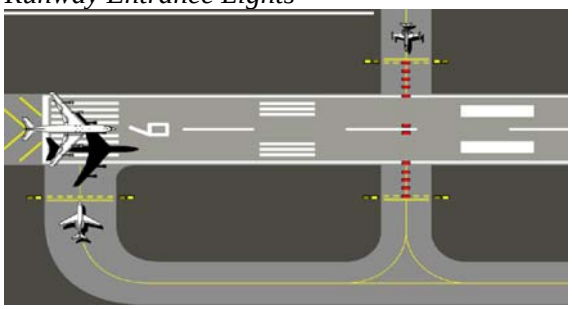
1.3 For many years, the United States has actively invested in programs and technology to address airfield safety. We continue to deploy the Airport Surface Detection Equipment, Model X (ASDE-X) while pursuing newer technologies such as Runway Status Lights, Final Approach Runway Occupancy Signal (FAROS), low-cost ground surveillance systems, and Airport Moving Maps. Changes to airport infrastructure and procedures have also been implemented, such as enhanced taxiway markings, improvements to runway safety areas (RSA), and increased training. In the human factors arena, changes have been made in policies for issuing taxi instructions and takeoff clearances, a voluntary reporting system for air traffic controllers has been developed, and a Fatigue Symposium was conducted.

2. Discussion

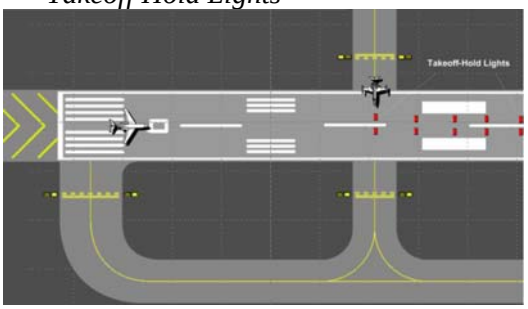
2.1 To improve controller situational awareness on the airport movement area at the busiest U.S. airports, the FAA has installed ASDE-X ground surveillance systems at 14 towers. ASDE-X screens show controllers aircraft on a continuously updated color display map, where they are able to spot potential collisions. An additional 21 systems are scheduled to be installed by the end of 2010.

2.2 Runway Status Lights are a fully automated system that integrates airport lighting equipment with surveillance systems to provide a visual signal to pilots and vehicle operators when it is unsafe to enter or cross a runway (Runway Entrance Lights) or begin takeoff roll on a runway (Takeoff Hold Lights). Airport surveillance sensor inputs are processed through light control logic that command in-pavement lights to illuminate red when there is traffic on or approaching the runway. Runway status lights have been successfully demonstrated at Dallas-Fort Worth and San Diego airports. Another demonstration system has been installed at Los Angeles World Airport as a cooperative effort between the airport and the FAA. The developmental systems have proven successful and the FAA is moving ahead with installing FAA runway Status Lights production systems. The following 22 airports will have Runway Status Lights by the end of 2011: Atlanta; Baltimore Washington International; Boston; Charlotte, NC; Chicago O'Hare; Dallas-Fort Worth; Denver; Detroit; Washington Dulles; Fort Lauderdale; Houston Intercontinental; John F. Kennedy; LaGuardia; Las Vegas; Los Angeles; Minneapolis; Newark, N.J.; Orlando, Fla.; Philadelphia; Phoenix; San Diego; and Seattle.

Runway Entrance Lights



Takeoff Hold Lights



2.3 The FAA is also testing the FAROS system, which provides immediate information to pilots on approach that the runway is occupied or otherwise unsafe for landing. The FAROS system determines occupancy of the runway by detecting aircraft or vehicles on the runway surface. If a monitored area on the runway is occupied, FAROS flashes the Precision Approach Path Indicator Lights (an existing system) to alert the pilot that it is potentially unsafe to land. The system is being tested at both Dallas-Fort Worth Airport and Long Beach/Daugherty Field Airport.

2.4 The FAA is also evaluating the use of low-cost, commercially available radar surveillance systems that would reduce the risk of runway incursions at certain small and medium-sized airports that are currently not programmed to receive ASDE-X. The first contract to install and test a low-cost ground surveillance system was awarded in January 2009. The contractor will deliver, install and test a ground surveillance system at airports chosen by the FAA. The agency will select multiple companies for these tests in order to evaluate the different alternatives. Testing is expected to last from several months to a year.

2.5 Industry has developed avionic products that may further enhance aircrew situational awareness. To facilitate operational assessment of these options, the FAA reached agreement with four US airlines to fund in-cockpit runway safety systems in exchange for critical operational data. The selected airlines will equip their aircraft with surface moving maps with own-ship position on an Electronic Flight Bag for flights to or from 21 test bed airports. The technology will be installed in 20 aircraft at each airline by Spring 2009. The data gathered will help the FAA evaluate the safety impact of this technology and is expected to accelerate key safety capabilities necessary for the transition to our Next Generation Air Transportation System. The FAA expects initial results from the data analysis by September 2009.

2.6 Twenty of the busiest airports in the United States were visited by Runway Safety Action Teams to conduct surface analysis meetings with air traffic control, FAA safety inspectors, and airport operators. These groups developed action plans to mitigate detected risks, identifying over 100 short term fixes, including new or improved signage, improved marking, driver training, and other actions. A second set of 22 airports were identified and went through the review process.

2.7 FAA has continued to make progress in improving Runway Safety Areas (RSAs), which enhance safety in the event of an undershoot, overrun, or excursion from the side of the runway. Since a program was started in FY00 to accelerate RSA improvements for commercial service runways, 72 percent of those improvements have been completed. Twenty-four airports accomplished their improvements by installing Engineered Materials Arresting Systems (EMAS), a bed of crushable concrete placed at the end of a runway to absorb the forward momentum of an aircraft. The EMAS technology provides safety benefits in cases where land is not available or where it would be very expensive for the airport sponsor to buy the land off the end of the runway. This technology is now in place at 41 runway ends at 28 airports with plans to install 15 additional EMAS systems at nine additional airports. EMAS has also been installed internationally at Sichuan Province, People's Republic of China and Madrid, Spain. To date, there have been four incidents where the technology has worked successfully to keep aircraft from overrunning the runway and in several cases has prevented injury to passengers and damage to the aircraft.

Saab 340 overrun at JFK, May 1999

Falcon 900 overrun, Greenville, SC, July 2006

2.8 All US airports with enplanements of 1.5 million or more (75 airports) were required to install enhanced airport markings by June 30, 2008. All 75 airports completed the marking upgrades in advance of the deadline. Medium-sized airports must install the markings by December 2009 and small airports by December 2010. To date, 82 percent and 54 percent of those airports, respectively, have

completed their installations. In addition, roughly 95 percent of all commercial service airports currently have or plan to provide recurrent training for all who have access to the aircraft movement area.

Previous Taxiway Centerline Markings

Enhanced Taxiway Centerline Markings

2.9 Re-examining air traffic communications offers potential to improve surface safety. After conducting a risk analysis, the FAA implemented a requirement for controllers to issue explicit taxi instructions in May 2008. In August 2008, the requirement for an aircraft to cross all intervening runways prior to receiving a takeoff clearance was implemented. Three other changes are under consideration – adoption of the ICAO phraseology "line up and wait" instead of the currently used "position and hold"; the requirement for a pilot to receive a clearance to cross every runway; and the requirement to clear an aircraft to land only after the preceding aircraft has crossed the landing threshold.

2.10 The FAA, working with our Air Traffic Controller's union, has begun phased implementation of a voluntary reporting system for air traffic controllers. The program is currently implemented at 32 facilities, giving 3,200 controllers access. This system offers individual controllers an opportunity to provide valuable information that can be used to target safety risks that may not have been identified through existing audits, inspections, and automated tools.

2.11 In June of 2008, the FAA conducted its first Fatigue Symposium, which brought together leading fatigue scientists, representatives of the airline industry and its employee groups, representatives of the NTSB, and representatives of the FAA and its employee groups. At the symposium, experts presented the most current fatigue information covering topics such flight operations and shift-work operations, including air traffic control, maintenance, ramp operations, and aircraft dispatch. The intent of the conference was to present information that would lead to improved understanding of fatigue in aviation and increased awareness of fatigue mitigation strategies, which the aviation industry can voluntarily adopt. We have already applied some of the information, ideas and strategies from the symposium – we will be working with industry to define Fatigue Risk Management Systems to assist aviation operations in effective application of fatigue countermeasures. We are taking advantage of developments in fatigue science to model and mitigate fatigue aspects of Ultra Long Range (ULR) flying, and will observe the effectiveness of the strategies employed for any lessons leaned that may be applied to airfield operations.

2.12 The FAA formed a joint FAA-industry Runway Safety Council in October 2008 to explore the root causes of runway incursions. The Council is comprised of representatives from various parts of the aviation industry. A working group integrates investigations of severe runway incursions,

conducts a root cause analysis, and then presents its root cause analysis to the council. The working group also makes recommendations on ways to improve runway safety, which the council considers. If accepted, these recommendations are assigned to the part of the FAA and/or the industry that is best able to control the root cause and prevent further runway incursions. The Council tracks recommendations to make sure appropriate action is taken

3. Conclusion

3.1 The biggest safety challenge to aviation is not in the air but on the ground. Improvements in procedures and the introduction of new technology can improve runway safety.

4. Suggested Action

4.1 The Meeting is invited to:

a) note the contents of this paper, and

b) consider implementing some or all of the technologies and processes above to reduce the risk of runway incursions on their airfields.

Executive summary for consideration for inclusion in the Conference Report

AIRFIELD SAFETY IN THE UNITED STATES

The United States Federal Aviation Administration (FAA) places a high priority on improving airfield safety. FAA, in partnership with industry, airport operators, and air traffic controllers, has implemented many changes to reduce the risk of runway incursions.

Efforts focused on technology include deployment and testing of several systems. The Airport Surface Detection Equipment – Model X system to improve controller situational awareness has been installed at 14 towers, and will be in a total of 35 towers by the end of 2011. A contract was just awarded to install Runway Status Lights at 22 airports – these lights provide a visual signal to pilots and drivers when it unsafe to enter or cross a runway or begin takeoff roll on a runway. The Final Approach Runway Occupancy Signal system, which provides information to pilots on approach that the runway is occupied or unsafe for landing is currently being tested at both Dallas-Fort Worth and Long Beach airports. An evaluation of commercial Low-Cost Surveillance Systems, which would reduce the risk of runway incursions at certain small and medium-sized airports, is underway; the first contract has been awarded, and additional companies will be selected. The FAA recently offered incentives to airlines for installing Cockpit Avionics Information/Warning Systems which can display approved airport moving maps or provide aural situational awareness runway information to pilots – to date, four airlines have been have been provided funding to install these systems in exchange for critical operational data. The selected airlines will equip 20 of their aircraft for flights to or from 21 test bed airports. To enhance Runway Safety Areas, Engineered Materials Arresting Systems, a bed of crushable concrete placed at the end of a runway to absorb the forward momentum of an aircraft, is now in place at 41 runway ends at 28 airports in the United States and at airports in China and Spain. To increase awareness of pilots that they are approaching a runway, 75 of the busiest U.S. airports installed Enhanced Taxiway Markings. These markings are now being installed at smaller U.S. airports.

The FAA has also addressed human factors in many of its initiatives. Air traffic communications were analyzed and requirements were added for controllers to issue explicit taxi instructions and for controllers to wait until an aircraft has crossed all intervening runways before being issuing a takeoff clearance. Three other changes are under consideration. To identify safety risks that might not have been identified through existing audits and inspections, a voluntary reporting system is being implemented for air traffic controllers. The agency has been studying fatigue issues, and conducted its first Fatigue Symposium. The FAA has established a joint FAA-industry Runway Safety Council to review runway incursion data, conduct root cause analysis, and develop safety recommendations, and adopt strategies to implement the recommendations and/or request further studies of issues.