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**Agenda Item 2:            Safety Oversight**  
**2.5       Safety – Related Topics**

**RUNWAY SAFETY AREA IMPROVEMENTS**

(Presented by the United States of America)

**SUMMARY**

The Federal Aviation Administration (FAA) wants to improve all Runway Safety Areas (RSA) for commercial service runways that do not meet standards. This effort began in 2000 to meet long-term safety improvement goals for the FAA. The FAA is now evaluating more than 1000 runways for compliance with current standards. Standards and policies are guiding the development of a completion and financial plan for all practical improvements for the remaining RSAs that do not meet standards. This program will result in a runway system with a significantly improved margin of safety for the aircraft they serve.

**1.            Introduction**

1.1            A runway safety area is a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway. RSA standard dimensions have increased over time. The predecessor to today's standard extended only 200 feet from the ends of the runway. Today, a standard RSA can be as large as 500 feet wide and extend 1,000 feet beyond each runway end. The standard dimensions have increased historically to accommodate larger and faster aircraft, and to address higher safety expectations of aviation users.

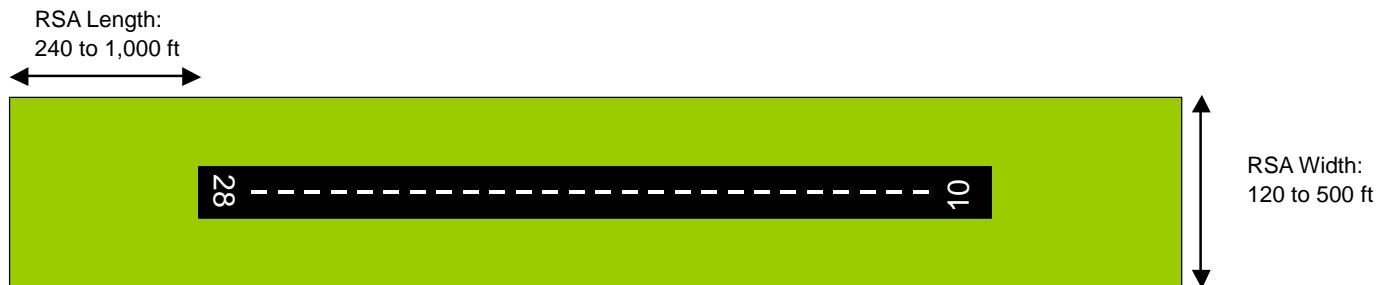
1.2            Applying new standards to existing airports can create problems. Many runways do not meet current standards because they were constructed to an earlier standard. The fact that airports are increasingly constrained by nearby land development and other natural features compounds the problem. By the late 1980s, the FAA had recognized a growing gap with respect to RSA standards. Although the 1990s saw progress in closing the gap, there was little oversight or specific federal goals for making RSA improvements. In 2000, the FAA established a RSA improvement program with the goal of making all significant and practicable improvements at runways used by commercial service aircraft.

1.3 There are approximately 550 airports and 1,000 runways that are used by commercial service aircraft. Runways with a standard RSA increased from approximately 46% in 1990 to 65% in 2005. Just as important, the potential for RSA improvements has also increased dramatically. In 1996, 36% were non-standard runways that were determined to be not practicable to improve. According to FAA findings in 2005, only 3% or approximately thirty non-standard runways will not undergo improvements because it is not practicable.

2. **Discussion**

2.1. The FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, proscribes RSA design standards. The document guides the basic layout for all airports in the United States that are certificated under 14 CFR Part 139, or are subject to assurances from Airport Improvement Program (AIP) grant funding. The standard dimensions of the RSA depend upon the aircraft and the approach procedure visibility minimums associated with the runway. Generally, smaller and slower aircraft require smaller RSA dimensions. RSA dimensions range 120 feet wide by 240 feet beyond the end of the runway to 500 feet wide by 1,000 feet beyond the end of the runway. Except under special conditions, the RSA standard dimensions for runways used by aircraft with approach speeds of 121 knots or more (approach category C) are 500 feet wide and 1,000 feet long. This is the RSA standard dimension for most, but not all, runways used by commercial service carriers. See Figure 1.

**Figure 1.** Runway Safety Area Dimensions



2.2 Runway safety area standards cannot be modified like other dimensional standards contained in AC 150/5300-13. Instead, the regional airport division manager is required to make a practicability determination of the best alternative for improving any RSA that does not meet standards. The practicability determination then becomes the requirement for compliance with 14 CFR Part 139. FAA Order 5100.8, *Runway Safety Area Program*, contains procedures for making RSA practicability determinations. This order encourages incremental improvements, even when full RSA standards are not possible. The objective is to make continual improvements as they become practicable and to never lose focus on the overall goal of having each RSA meet standards.

2.3 It is not always possible to improve RSAs to meet full dimensional standards. When constrained by nearby natural features or urban development, airport construction costs can be exceedingly high. Environmental constraints can also hamper RSA expansion proposals. Order 5200.8 identifies acceptable alternatives to constructing or expanding the RSA. These alternative include:

- a. Shortening or relocating the runway,
- b. Use of declared distances,
- c. Use of Engineered Materials Arresting System (EMAS) when a standard RSA is not possible.

2.4 Projects that result in shorter runways or use declared distances could have a negative impact on airport operations. Aircraft might be required to operate at a reduced weight on a shorter runway. FAA policy does not allow the reduction of runway length or the use of declared distances if there would be any operational impact on the aircraft currently using the airport.

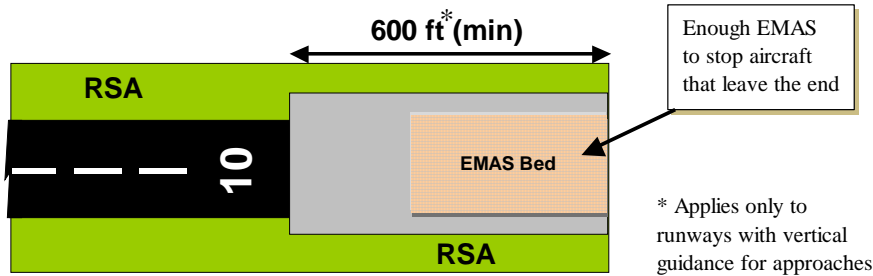
2.5 The FAA issued Order 5100.9, *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems*, in 2004 to provide additional guidance for making practicability determinations. This order establishes a maximum feasible RSA improvement cost above which improvements may not be practicable. It also encourages the use of EMAS as an acceptable and desirable alternative when the full RSA is not practicable. In fact, it establishes EMAS as an equivalent alternative to a standard RSA in terms of safety enhancement. It also requires a life cycle cost comparison with any alternative that results in a standard-sized RSA. The maximum feasible cost of Order 5100.9 is based on the cost of adding EMAS beds on either end of an existing, sub-standard RSA. In other words, an EMAS installation on both ends of an existing RSA is financially feasible by definition, regardless of the actual cost to install the EMAS at any particular location.

2.6 Change 8 to AC 150/5300-13 allows the use of EMAS as an alternative for meeting RSA standards. An RSA can meet current FAA design standards if:

- a. An EMAS bed conforming to the requirements of AC 150/5220-22, *Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns*, is capable of stopping the design or critical aircraft that leaves the end of the runway traveling at 70 knots,
- b. The RSA extends at least 600 feet beyond the end of the runway, and
- c. The approach end of the runway provides vertical guidance (visual or electronic) for landing aircraft. See Figure 2.

2.7 Order 5100.9 has profoundly affected RSA improvement plans and the overall FAA goal. Preliminary planning was re-scoped for many improvement projects to comply with the new requirements. RSAs previously considered "not possible to improve" are now considered otherwise. Finally, projected costs for completing all practicable improvements has continued to climb because of the maximum feasible cost policy.

**Figure 2.** Standard EMAS: An alternative means of providing a standard runway safety area



### 3. Conclusion

3.1. The FAA’s RSA improvement goal is to complete all practicable improvements in order to enhance the safety of the runway. This means that not all runways will have a standard runway safety area upon completion of the improvements. For example, in FY-2005, five of the 41 runway improvements will not meet standards when all practicable improvements are complete. RSA improvements can involve:

- a. Constructing or expanding the RSA,
- b. Modifying or relocating the runway,
- c. Installing EMAS,
- d. Implementing declared distances, or
- e. Any combination of the above.

3.2 Another way an RSA can be “improved” to meet standards is when the design aircraft or approach visibilities change and the resulting standard dimensions decrease. For example, if the design aircraft for a runway with lower than 3/4-mile visibility changes from C-II to B-II, then the corresponding RSA length off the end of the runway decreases from 1,000 feet to 600 feet. In FY-2005, five of 41 RSA improvements are reported to have reduced the standard RSA dimensions.

3.3 The FAA has designated about 250 runways as being a priority for completing all practicable improvements. Accordingly, a long-term completion and financial plan is being developed to complete the improvements for these runways as expeditiously as possible. The current plan is to complete these improvements by 2015. Airport Improvement Program (AIP) grant investments to support these improvements are estimated to be \$1.67 billion.

3.4 Not all runways can be improved to meet current RSA standards because of costs and other constraints. In fact, thirty runways nationally will not be improved at all because it is not practicable. The reasons for this determination include:

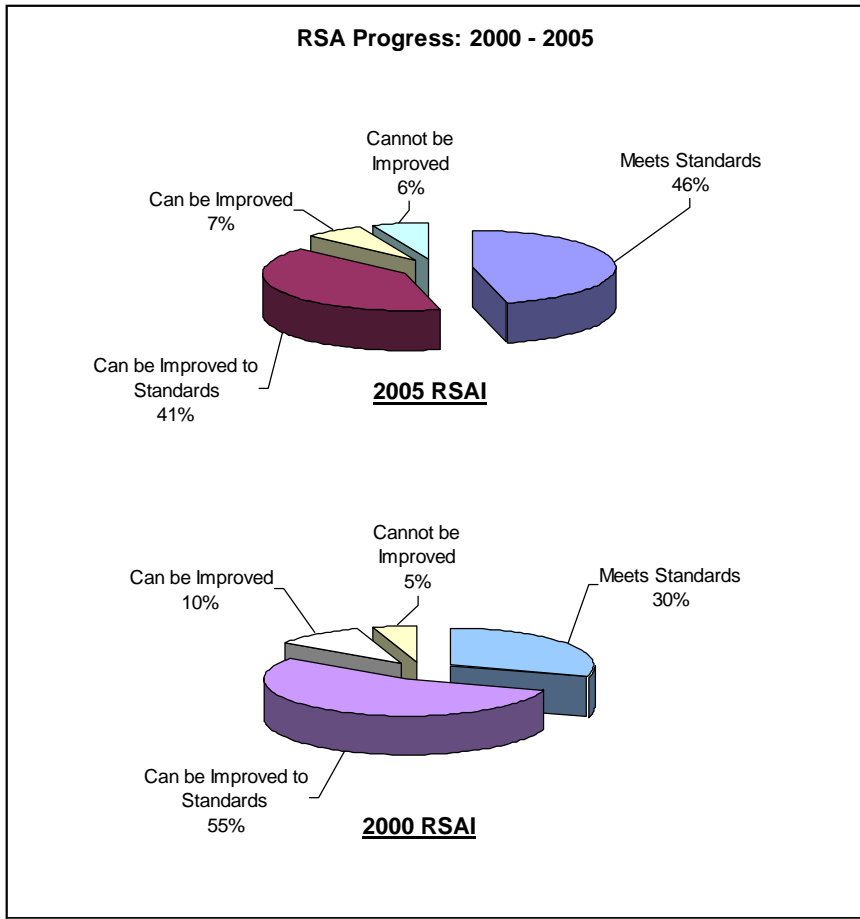
- a. The private airport sponsor is not eligible for AIP grants and does not support RSA improvements.
- b. The airport is scheduled to close in the near future.
- c. The RSA is already within 90% of the standard dimensions and the region has determined that further improvements are not warranted.
- d. Environmental constraints
- e. The maximum feasible cost to improve the RSA has already been applied to improvements although more improvements might be possible with more funding.

3.5 The FAA, in cooperation with airport sponsors, has completed all practicable RSA improvements for 207 commercial service runways since 2000 (including projects expected to be completed in FY-2005). Figure 3 presents the progress from 2000 to 2005. The number of runways with an RSA complying with 100% of the standard increased from 30% in 2000 to 46% in 2005. Logically, as more runways are improved, the number remaining to improve decreases. Thus, the number of runways that could be improved to standards declined from 55% in 2000 to 41% in 2005.

3.6 The plan also reveals that 39 RSA improvements will not be completed until after 2010. The FAA was hoping that all improvements would be complete by 2010. However, RSA improvements are often large and complex projects that may take several years to complete because of multiple critical factors:

- a. **Funding:** The level of AIP funding to support the improvements at some airports and in some regions is much higher than normal and the schedule has been extended out to spread the costs over several years.
- b. **Alternatives Analysis and Environmental Review:** Many improvement projects are complicated and require a careful review of various alternatives for their impact on airport operations and the surrounding community. Environmental review and in some cases an Environmental Impact Statement (EIS) is anticipated before final approval. This process can take several years depending upon how far along the airport sponsor is in the project planning and formulation process.
- c. **Project Management Resources:** For some airports, planned RSA improvements involve several runways, each with major improvement needs. It is impossible for them to manage several RSA improvement projects while simultaneously working other needed capital improvements at the airport.

**Figure 3. RSA Improvements Since 2000**



3.7 FAA is undertaking an ambitious program for RSA improvements for priority runways at all commercial service airports. The program requires clear standards, goals, and policies to define the problem and to provide guidance for implementing solutions. This program will require long-term diligence but will result in a runway system with a significantly improved margin of safety for the aircraft they serve.

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