II. Purpose and Need

2.1 Background

The Metropolitan Washington Airports Authority is preparing an Environmental Assessment of potential environmental impacts associated with proposed enhancements to the Runway 4-22 and Runway 15-33 Runway Safety Areas and related improvements at Ronald Reagan Washington National Airport. The EA is being prepared pursuant to the requirements and guidelines of FAA Order 1050.1E, FAA Order 5050.4B, and the FAA Environmental Desk Reference for Airport Actions. The objectives of this section are to:

- Define the Purpose and Need for the Proposed Action, where “Need” is defined as the problem the Authority is facing and “Purpose” is defined as the Authority’s proposed solution to the problem
- Describe the Authority’s Proposed Action
- Identify the actions requested of the FAA
- Define the estimated timeframe for FAA actions and implementation of the Proposed Action

The Authority operates the Airport, which occupies approximately 733 acres of land and 127 acres of water along the western shore of the Potomac River in the Commonwealth of Virginia. The Airport is located in Arlington County, immediately north of the City of Alexandria, Virginia, and across the Potomac River from Washington, D.C. The regional setting of the Airport is shown on Exhibit II-1. The Airport has three runways: primary Runway 1-19 and crosswind Runways 4-22 and 15-33. Runway 1-19 accommodates approximately 92 percent of the aircraft landings and take-offs at the Airport; Runways 4-22 and 15-33 accommodate approximately 2 percent and 6 percent of the Airport's landings and take-offs, respectively. The current Airport Layout Plan is shown on Exhibit II-2.

2.1.1 Runway Safety Area

2.1.1.1 Regulatory Background and Design Standards

An RSA is a defined surface surrounding a runway. The RSA is intended to “provide a measure of safety in the event of an aircraft excursion from the runway by significantly reducing the extent of personal injury and aircraft damage during overruns, undershoots, and veer-offs.”

FAA Order 5200.8 established the Runway Safety Area Program (RSAP) and the procedures that the FAA follows in implementing the RSAP. The RSAP requires that all RSAs at federally obligated airports and at airports certificated under Title 14 CFR Part 139, Certification and Operations: Land Airports Serving Certain Air Carriers, shall conform to the standards contained in FAA AC 150/5300-13, Airport Design, to the extent practicable. The Airport is a federally obligated airport certificated under 14 CFR Part 139.

---

1 Federal Aviation Administration, Order 1050.1E, Environmental Impacts: Policies and Procedures, Change 1, March 20, 2006.
2 Federal Aviation Administration, Order 5050.4B, National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions, April 28, 2006.
3 Federal Aviation Administration, Environmental Desk Reference for Airport Actions, October 2007.
FAA Order 5200.9, *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems*, is intended to assist: (a) airport sponsors, such as the Authority, in developing a sound proposed action for RSA improvements for environmental review purposes, and (b) FAA Regional Airports Division Managers in preparing an RSA practicability determination, as required by FAA Order 5200.8. FAA Order 5200.9 provides guidance for comparing RSA improvement alternatives with improvements that use an Engineered Materials Arresting System and for determining the maximum financially feasible cost for RSA improvements, whether or not they involve EMAS. EMAS “uses materials of closely controlled strength and density placed at the end of a runway to stop or greatly slow an aircraft that overruns the runway. The best material found to date is a lightweight, crushable concrete. When an aircraft rolls into an EMAS arrestor bed, the tires of the aircraft sink into the lightweight concrete and the aircraft is decelerated by having to roll through the material.”

The U.S. DOT Appropriations Act for FFY 2006 (House Resolution (HR) 3058.6) requires the operators of all airports certificated under 14 CFR Part 139 to comply with FAA regulatory requirements for RSAs by FFY 2015. The Act also requires the FAA to report annually on its progress toward achieving compliance.

FAA AC 150/5300-13 provides dimensional requirements for RSAs based on the physical and operating characteristics of the design aircraft operating at an airport. Based on the characteristics of aircraft operating on Airport Runways 4-22 and 15-33, the current standard RSA dimensions are:

- 500 feet wide and centered on the centerline of the runway
- 1,000 feet beyond the departure runway end
- 600 feet prior to the landing threshold

Prior to September 30, 2004, the standard RSA dimensions prior to and beyond the end of the runway for the type of aircraft operating on Runways 4-22 and 15-33 were 1,000 feet. FAA AC 150/5300-13, Change 8, reduced the RSA dimension prior to the landing threshold from 1,000 feet to 600 feet.

**Exhibits II-3 and II-4** depict the standard RSA overlaid onto existing Runways 4-22 and 15-33, respectively, illustrating the shift in dimensions at the runway ends depending on the direction in which the aircraft operates. For example, when aircraft land on and take off from Runway 4 (i.e., operate in a northeast flow), the dimensional requirements for the RSA would be 600 feet prior to the Runway 4 threshold and 1,000 feet beyond the end of the runway (i.e., the northeast end of the runway). Conversely, in southwest flow conditions with landings on and take-offs from the Runway 22 end, the dimensional requirements for an RSA would be 600 feet prior to the Runway 22 threshold and 1,000 feet beyond the end of the runway (i.e., the southwest end of the runway). Similarly, when aircraft land on and take off from Runway 15 (i.e., operate in a southeast flow), the dimensional requirements for the RSA would be 600 feet prior to the Runway 15 threshold and 1,000 feet beyond the end of the runway (i.e., the southeast end of the runway). Conversely, in northwest flow conditions with landings on and take-offs from the Runway 33 end, the dimensional requirements for an RSA would be 600 feet prior to the Runway 33 threshold and 1,000 feet beyond the end of the runway (i.e., the northwest end of the runway).

---


Standard RSA Design Dimensions Overlaid on Existing Runway 4-22


Exhibit II-3
Standard RSA Design Dimensions Overlaid on Existing Runway 15-33


Exhibit II-4
Within the RSA, the FAA requires surface conditions to be:

- Cleared, graded, and without potentially hazardous ruts, humps, depressions, or other surface variations;
- Drained by grading or storm sewers to prevent water accumulation;
- Capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and fire fighting equipment, and the occasional passage of an aircraft without causing structural damage to the aircraft; and
- Free of objects, except for objects that need to be located in the RSA because of their function.

2.1.1.2 Existing Conditions

In its Runway Safety Area Determination prepared in 2007, the FAA found that the Runway 4-22 and Runway 15-33 RSAs required enhancements to comply with FAA Order 5200.8 and FAA AC 150/5300-13. Table II-1 presents a comparison of the findings of the FAA’s Runway Safety Area Determination and FAA RSA design standards.

<table>
<thead>
<tr>
<th>RSA Determination</th>
<th>Design Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway 4 Departure</td>
<td>500 feet by 200 feet</td>
</tr>
<tr>
<td>Runway 22 Departure</td>
<td>500 feet by 950 feet</td>
</tr>
<tr>
<td>Runway 15 Departure</td>
<td>500 feet by 120 feet</td>
</tr>
<tr>
<td>Runway 33 Departure</td>
<td>500 feet by 170 feet</td>
</tr>
</tbody>
</table>

Notes:
- **a/** The runway meets the Potomac riverbank at an angle, and does not meet RSA standards for the entire width of the RSA. The 200-foot-long RSA was measured along the extended runway centerline.
- **b/** The runway meets the Potomac riverbank at an angle, and does not meet RSA standards for the entire width of the RSA. The 120-foot-long RSA was measured along the extended runway centerline.


2.2 Purpose and Need Statement

2.2.1 The Problem (Need)

The FAA has determined that the RSAs for departures from Runways 4, 22, 15 and 33 do not meet the 1,000-foot FAA design standard. The specific RSA deficiencies are presented in Table II-1 above. As the operator of the Airport—a federally obligated airport certificated under 14 CFR Part 139—the Authority is obligated by FAA Order 5200.8 and the U.S. DOT Appropriations Act for FFY 2006 (HR 3058.6) to comply with FAA regulatory requirements for RSAs by 2015.
2.2.2 The Authority’s Solution (Purpose)

FAA Order 5200.8 identifies the alternatives that must be analyzed when an RSA does not comply with applicable FAA AC 150/5300-13 standards. Those alternatives are to:

- Construct a standard RSA;
- Relocate, shift, and/or realign the runway;
- Reduce the length of the runway;
- Implement a combination of relocating, shifting, and/or realigning the runway and reducing runway length;
- Use declared distances; or
- Use EMAS.

The criteria and screening process used to evaluate these alternatives are discussed in Section III. The construction of standard RSAs was eliminated from detailed consideration early in the screening process because that alternative would have significant impacts on the Potomac River at the Runway 22 and 33 ends and on the George Washington Memorial Parkway at the Runway 33 end. The cost to implement this alternative would exceed the costs of implementing other alternatives and would be impracticable. The Authority believes it is important to increase the runway length available for take-offs from Runway 4 by 89 feet, to a total of 5,000 feet, and to maintain the existing length of Runway 15-33. However, the Authority also believes that the runway length available for landings on Runway 4-22 can be reduced by 91 feet, from 4,911 feet to 4,820 feet, and that the runway length available for take-offs from and landings on Runway 22 can be reduced by 491 feet, from 4,911 feet to 4,420 feet. The principal runway elements of the Proposed Action are presented in Table II-2.

<table>
<thead>
<tr>
<th>Relocate Runway End</th>
<th>Runway 4 End</th>
<th>Runway 22 End</th>
<th>Runway 15 End</th>
<th>Runway 33 End</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Displace Threshold</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Shift Runway along Axis</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Use Declared Distances</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Use EMAS</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>


Based on consultations with the FAA, the EMAS manufacturer, and the airlines, the Authority selected: a) the A-319 with an adjusted maximum take-off weight (A-MTOW) of 144,500 pounds as the critical design aircraft for overruns of Runway 4; b) the Embraer EMB-145 with an A-MTOW of 34,000 pounds as the critical design aircraft for overruns of Runway 15; and c) the A-319 with an A-MTOW of 138,000 pounds as the critical design aircraft for overruns of Runway 33. Additional

information on the rationale for the selection of the critical design aircraft is provided in Appendix D., Section D.2.1.4 and D.2.2.3.

Within the context of the requirements of FAA Order 5200.8 and FAA AC 150/5300-13, the Authority has conducted studies addressing enhancements to the Runway 4-22 and Runway 15-33 RSAs. The more recent studies continued the planning documented in the earlier studies:


Following the completion of the Phase II Study, the Authority continued its planning efforts. The Phase II Study considered the use of EMAS that would stop the critical design aircraft that overruns the runway and exits the runway at speeds up to 70 knots. The Post-Phase II alternatives introduced the use of EMAS that would stop the critical design aircraft that overruns the runway and exits the runway at speeds up to 40 knots.

Building on the analyses in these studies, the Authority has developed a proposed solution to the need for enhanced Runway 4-22 and Runway 15-33 RSAs, as follows:

**Runway 4-22**
- Relocating the Runway 4 end by 460 feet to the southwest
- Relocating the Runway 4 threshold by 260 feet to the southwest
- Increasing the available runway length for take-offs from Runway 4 from 4,911 feet to 5,000 feet
- Decreasing the available runway length for landings on Runway 4 from 4,911 feet to 4,800 feet.
- Designating declared distances of 4,400 feet for landings on and take-offs from Runway 22 (a reduction of 511 feet from the existing runway length of 4,911 feet)
- Extending Taxiway B to the relocated Runway 4 end
- Installing EMAS (170 feet wide by 336 feet long) at the existing Runway 22 end
- Relocating the Runway 22 end 371 feet to the southwest (35 feet from the edge of the EMAS bed)
- Constructing a new taxiway connector to the relocated Runway 22 end

**Runway 15-33**
- Shifting Runway 15-33 by 270 feet to the southeast
- Installing EMAS (170 feet wide by 353 feet long) at the relocated Runway 15 end
- Installing EMAS (170 feet wide by 140 feet long) at the relocated Runway 33 end
- Constructing new taxiway connectors to the relocated runway ends
- Placing fill in the Potomac River to support the Runway 33 RSA

**Approach Aids**
- Relocating three existing visual glide slope indicators used for Runways 22, 15, and 33

**Other Elements**
- Rerouting existing service roads
- Grading and stabilizing soil in the RSA
The proposed solution described in this section, and the related improvements required to implement this solution, are referred to as the Proposed Action and are described in Section 2.3.

2.2.3 Summary of Authority’s Purpose and Need

The Authority is obligated to enhance the Runway 4-22 and Runway 15-33 RSAs as needed to comply with FAA Order 5200.8 and FAA AC 150/5300-13 by FFY 2015.

Implementing the Proposed Action would enable the Authority to bring the Runway 4-22 and Runway 15-33 RSAs into compliance with FAA Order 5200.8 and FAA AC 150/5300-13 for ARC C-III aircraft.

2.3 Proposed Action

The Authority’s Proposed Action includes the key elements described below. Except for the protrusion of the RSA at the Runway 33 end into the Potomac River, all construction would take place on Airport land. Exhibits II-5 and II-6 illustrate the Proposed Action for Runway 4-22 and Runway 15-33, respectively.

2.3.1 Runway 4-22

The Proposed Action for Runway 4-22 involves:

- **Extending the Runway 4 end by 460 feet to the southwest.** The runway pavement would be extended 460 feet to the southwest at the same width as the current Runway 4-22 pavement. Runway edge lighting would be added along the extended runway pavement.

- **Relocating the Runway 4 threshold by 260 feet to the southwest.** A runway threshold should be located at the beginning of the full-strength runway pavement. A threshold located at a point on a runway other than the designated runway end is referred to as a displaced threshold. The displaced area is available for aircraft take-off or rollout, but not for landing. A displaced threshold does not mark the end of a runway. The threshold for landings on Runway 4 would be displaced 200 feet from the edge of the extended Runway 4 pavement, thereby relocating the threshold for landings 260 feet southwest of its current location. The displacement is required to provide a 600-foot-long RSA prior to the displaced threshold. The displaced threshold would include new in-pavement lights. The runway length available for landing on Runway 4 would be reduced from 4,911 feet to 4,800 feet.

- **Designating declared distances of 4,400 feet for take-offs from and landings on Runway 22.** Declared distances would allow the Authority to establish the runway length at a specific distance regardless of the length of pavement available to establish the beginning and ending of the RSA. The use of these declared distances effectively reduces the length of runway available for take-offs from and landings on Runway 22 by 511 feet.

- **Extending Taxiway B to the relocated Runway 4 end.** Taxiway B would be extended to the new Runway 4 end. New taxiway edge lights would be installed along the length of the extended pavement.

- **Installing EMAS (170 feet wide by 336 feet long) at the existing Runway 22 end.** The EMAS would begin at the existing Runway 22 end and extend southwest 336 feet. The EMAS would be capable of stopping the critical design aircraft (i.e., Airbus A-319 with an A-MTOW of 144,500 pounds) that overruns Runway 4 and exits the runway at speeds up to 70 knots.
Exhibit II-5

Proposed Action - Runway 4-22

Sources: Aerials Express, 2007 (Aerial); Airport Design Consultants, Inc., September 2010 (Proposed Action).
Proposed Action - Runway 15-33

Sources: Aerials Express, 2007 (Aerial); Airport Design Consultants, Inc., September 2010 (Proposed Action).

Exhibit II-6

Purpose and Need

III-19
• **Relocating the Runway 22 end 371 feet to the southwest.** Takeoffs from Runway 22 would begin 35 feet southwest of the EMAS bed.

• **Constructing a new taxiway connector to the relocated Runway 22 end.** A new taxiway connector would connect the relocated Runway 22 end to Taxiway M. New taxiway edge lights would be installed along the length of the new pavement.

### 2.3.2 Runway 15-33

The Proposed Action for Runway 15-33 involves:

• **Shifting Runway 15-33 270 feet to the southeast.** To avoid impacts to the George Washington Memorial Parkway and the bike path adjacent to the existing Runway 33 end, the Proposed Action includes shifting Runway 15-33 by 270 feet to the southeast along its axis. The runway pavement would be extended 245 feet to the south at the same width as the current Runway 15-33 pavement. Runway edge lighting would be added along the extended runway pavement. The runway length for landings on and take-offs from Runway 15-33 would remain the same, 5,204 feet.

• **Installing EMAS (170 feet wide by 353 feet long) at the relocated Runway 15 end.** The location of the northwest edge of the EMAS bed at the Runway 15 end is controlled by the location of the service road. At present, the service road crosses through the RSA at the Runway 15 end. The service road cannot cross through the EMAS bed because the vehicle traffic would sink into the EMAS material. Therefore, the service road must be relocated around the end of the EMAS bed and the 10-foot step-down. The Proposed Action includes a setback of 26 feet (20 feet for the service road and 3 feet for the shoulders on either side of the service road) from the 10-foot EMAS step-down at the Runway 15 end. The EMAS would be capable of stopping the critical design aircraft (A-319 with an A-MTOW of 138,000 pounds) that overruns Runway 33 and exits the runway at speeds up to 70 knots.

• **Installing EMAS (170 feet wide by 140 feet long) at the relocated Runway 33 end.** The EMAS would be capable of stopping the critical design aircraft (EMB-145 with an A-MTOW of 34,000 pounds) exiting the runway at speeds up to 40 knots.

• **Constructing new taxiway connectors to the relocated runway ends.** One new taxiway connector would connect the relocated Runway 15 end to Taxiway N and another taxiway connector would connect the relocated Runway 33 end to the Runway 33 hold apron. New taxiway edge lights would be installed along the length of the new pavement.

• **Placing fill in the Potomac River to support the Runway 33 EMAS.** Structurally unsuitable riverbed material must be compressed or removed and replaced with materials suitable for supporting the EMAS at the Runway 33 end. The riverbed area to be disturbed and filled is approximately 5.3 acres. Approximately 3.8 acres of the Potomac River, a Water of the United States, would be impacted. The area of impacts on the riverbed will be larger than the footprint of the EMAS because the new fill would slope away from the EMAS.

### 2.3.3 Approach Aids

Visual glide slope indicators help pilots establish a stabilized approach at altitudes above terrain. A pilot using VGSIs for navigation expects to land safely at the touchdown point on a runway. The VGSIs for Runway 22, 15, and 33 would be relocated as a result of the new locations of the Runway 22 threshold and the Runway 15 and 33 ends.
2.3.4 Other Elements

The Proposed Action also involves:

- **Rerouting existing service roads.** Existing service roads would be rerouted in the vicinity of the RSA enhancements at Runway ends 4, 15 and 33.

- **Grading and stabilizing soil in the RSA.** At this time, grading and soil stabilization are expected to be limited to the areas of new runway, and taxiway pavement. The Authority is awaiting further engineering design and analysis to determine whether any unpaved RSA locations would require grading or stabilizing soil. No significant impact would be anticipated with the placement and grading of clean fill as needed, and seeding would be accomplished in accordance with an approved erosion and sediment control plan.

2.4 Federal Actions

The FAA actions being requested by the Authority include:

- Approval of the updated ALP for Ronald Reagan Washington National Airport, depicting the proposed airfield pursuant to 49 USC §§ 40103(b), 44718, and 47107(a)(16); 14 CFR Part 77, *Objects Affecting Navigable Airspace*; and 14 CFR Part 157, *Notice of Construction, Alteration, Activation, and Deactivation of Airports*;

- Determinations under 49 USC §§ 47106 and 47107 relating to the eligibility of the Proposed Action for Federal funding under the Airport Improvement Program;

- Determination under 49 USC § 44502(b) that the Proposed Action is reasonably necessary for use in air commerce or in the interest of national defense;

- Establishment of instrument flight rule (IFR) procedure modifications pursuant to 14 CFR Part 95, *IFR Altitudes*;

- Determination that the Proposed Action would meet the federal Clean Air Act requirements;

- Continued close coordination with the Authority and appropriate FAA program offices, as required for safety during construction pursuant to 14 CFR Part 139 under 49 USC § 44706;

- Approval of the appropriate amendments to the *Airport Certification Manual* pursuant to 14 CFR Part 139;

- Appropriate amendment to air carrier operating specifications pursuant to 49 USC § 44705; and

- FAA determination of the effects on the safe and efficient use of airspace, including a review of changes to air traffic procedures for consistency with the Potomac TRACON Environmental Impact Statement.

2.5 Timeframe of the Proposed Action

The Authority currently expects to submit the Final EA for the proposed improvements to the FAA early in the first quarter of 2011 and anticipates that the FAA could issue its finding shortly thereafter. If the EA schedule is met and the FAA issues a favorable finding, the Authority plans to: initiate construction of the Runway 15-33 RSA enhancements late in the first quarter of 2013 and to complete construction by the fourth quarter of 2014, and to initiate construction of the Runway 4-22 RSA enhancements late in the first quarter of 2015 and to complete construction by the fourth quarter of 2015.
2.6 RSA for the Primary Runway

The FAA’s February 21, 2007, Runway Safety Area Determination for the Airport concluded that RSA enhancements were required to bring the RSAs for each of the Airport’s three runways into compliance with FAA Order 5200.8 and FAA AC 150/5300-13.

The potential environmental impacts resulting from the Authority’s enhancements to the Runway 1-19 RSA were evaluated in a previous environmental assessment. The FAA determined that the proposed enhancements to the Runway 1-19 RSA would not result in significant impacts to the environment and issued a Finding of No Significant Impact (FONSI) and Record of Decision (ROD) on March 17, 2010.