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Runway Incursion Mitigation Fiscal Year 2021 Annual Summary Report

May 2022

Final Report

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16. Abstract In fiscal year (FY) 2012, the Federal Aviation Administration (FAA) Office of Airports (ARP) initiated a research study to identify and geographically locate areas at airports with nonstandard taxiway geometry. This research was advanced because an earlier study (Legarreta, 2012) had shown nonstandard taxiway geometries to be associated with a higher prevalence of runway incursions. The FAA defines a runway incursion (RI) as "any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft." These occurrences include wrong runway landings and takeoffs. This research effort developed a geographic information system (GIS) database of approximately 520 airports with civilian air traffic control towers. For each airport, the location of nonstandard geometries, runway incursions, airfield hotspot areas, airport diagrams, and other airport-related information is identified. This research study identified 140 airfield locations with a high incidence of RIs using data from October 1, 2007, to September 30, 2013. As a result, a 15- to 20-year improvement program, known as the Runway Incursion Mitigation (RIM) program, launched in FY2015. The goal of the program was to mitigate airfield locations with high incidents of RIs. A subset of the 140 locations identified was then validated for inclusion in the RIM program and prioritized for mitigation. The RIM program is updated annually utilizing the GIS airport database to identify construction-related changes to airfield layout and their impacts on taxiway geometries, the airfield location of new RIs, and the status of airfield locations prioritized for mitigation. This report summarizes the status of the RIM program through FY2021. In 2021, the program georeferenced 954 RIs, added 263 nonstandard geometry locations, prioritized 8 locations for mitigation, and identified 13 locations as mitigated. Since program initiation, 13,879 RIs have been georeferenced at airports along with more than 6,542 nonstandard geometry locations. In addition, 203 airfield locations were prioritized for mitigation and 75 of these locations have been mitigated. The rate of RIs at the 75 locations considered mitigated has been reduced by approximately 83%.					
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LIST OF ACRONYMS

AC	Advisory Circular
ARP	Office of Airports
ATIS	Automated Traffic Information System
CY	Calendar year
EB	Engineering Brief
FAA	Federal Aviation Administration
FY	Fiscal year
GIS	Geographic information system
HQ	Headquarters
ILS	Instrument Landing System
NOTAM	Notice to Airmen
PD	Pilot deviation
PTG	Problematic taxiway geometry
RDM	RIM Data Management
REIL	Runway end identifier lights
RI	Runway incursion
RIM	Runway incursion mitigation
RWY	Runway
TWY	Taxiway
V/PD	Vehicle/pedestrian deviation

LIST OF FEDERAL AVIATION ADMINISTRATION LOCATION IDENTIFIER AIRPORT
CODES USED IN THIS REPORT

ABQ	Albuquerque International Sunport, Albuquerque, New Mexico
ACT	Waco Regional Airport, Waco, Texas
ADS	Addison Airport, Dallas, Texas
APA	Centennial Airport, Denver, Colorado
APC	Napa County Airport, Napa, California
ARR	Aurora Municipal Airport, Chicago/Aurora, Illinois
ASE	Aspen-Pitkin County Airport/Sardy Field, Aspen, Colorado
ATL	Hartsfield-Jackson Atlanta International Airport, Atlanta, Georgia
AZO	Kalamazoo/Battle Creek International, Kalamazoo, Michigan
BET	Bethel Airport, Bethel, Alaska
BFI	Boeing Field/King County International Airport, Seattle, Washington
BJC	Rocky Mountain Metropolitan Airport, Denver, Colorado
BOI	Boise Air Terminal/Gowen Field Airport, Boise, Idaho
BOS	General Edward Lawrence Logan International Airport, Boston, Massachusetts
BTV	Burlington International Airport, Burlington, Vermont
BUR	Bob Hope Airport, Burbank, California
CAK	Akron-Canton Regional Airport, Akron, Ohio
CCR	Buchanan Field Airport, Concord, California
CLE	Cleveland Hopkins International Airport, Cleveland, Ohio
CLT	Charlotte/Douglas International Airport, Charlotte, North Carolina
CMA	Camarillo Airport, Camarillo, California
CNO	Chino Airport, Chino, California
CRG	Jacksonville Executive at Craig Airport, Jacksonville, Florida
CRP	Corpus Christi International Airport, Corpus Christi, Texas
CRQ	McClellan-Palomar Airport, Carlsbad, California
CSG	Columbus Airport, Columbus, Georgia
CXO	Conroe-North Houston Regional Airport, Houston, Texas
DAB	Daytona Beach International Airport, Daytona Beach, Florida
DAL	Dallas Love Field Airport, Dallas, Texas
DCA	Ronald Reagan Washington National Airport, Washington, DC
DEN	Denver International Airport, Denver, Colorado
DSM	Des Moines International Airport, Des Moines, Iowa
DVT	Phoenix Deer Valley Airport, Phoenix, Arizona
DWH	David Wayne Hooks Memorial Airport, Houston, Texas
FAI	Fairbanks International Airport, Fairbanks, Alaska
FAT	Fresno Yosemite International Airport, Fresno, California
FCM	Flying Cloud Airport, Minneapolis, Minnesota
FDK	Frederick Municipal Airport, Frederick, Maryland
FFZ	Falcon Field Airport, Mesa, Arizona
FTY	Fulton County Airport-Brown Field, Atlanta, Georgia
FXE	Fort Lauderdale Executive Airport, Fort Lauderdale, Florida
GCN	Grand Canyon National Park Airport, Grand Canyon, Arizona
GLS	Scholes International Airport, Galveston, Texas
HIO	Portland-Hillsboro Airport, Portland, Oregon

HLN	Helena Regional Airport, Helena, Montana
HND	Henderson Executive Airport, Las Vegas, Nevada
HNL	Daniel K. Inouye International Airport, Honolulu, Hawaii
HOU	William P. Hobby Airport, Houston, Texas
HUF	Terre Haute Regional Airport, Terre Haute, Indiana
HWD	Hayward Executive Airport, Hayward, California
IDA	Idaho Falls Regional Airport, Idaho Falls, Idaho
ISM	Kissimmee Gateway Airport, Orlando, Florida
IWA	Phoenix-Mesa Gateway Airport, Phoenix, Arizona
JLN	Joplin Regional Airport, Joplin, Missouri
JNU	Juneau International Airport, Juneau, Alaska
LAF	Purdue University Airport, Lafayette, Indiana
LAS	McCarran International Airport, Las Vegas, Nevada
LAX	Los Angeles International Airport, Los Angeles, California
LGB	Long Beach Airport/Daugherty Field, Long Beach, California
LOU	Bowman Field Airport, Louisville, Kentucky
LVK	Livermore Municipal Airport, Livermore, California
MAF	Midland International Air and Space Port, Midland, Texas
MDW	Chicago Midway International Airport, Chicago, Illinois
MEM	Memphis International Airport, Memphis, Tennessee
MFE	McAllen Miller International Airport, McAllen, Texas
MHT	Manchester-Boston Regional Airport, Manchester, New Hampshire
MIA	Miami International Airport, Miami, Florida
MIC	Crystal Airport, Minneapolis, Minnesota
MLI	Quad City Airport, Moline, Illinois
MLU	Monroe Regional Airport, Monroe, Louisiana
MQY	Smyrna Airport, Smyrna, Tennessee
MRI	Merrill Field Airport, Anchorage, Alaska
MYF	Montgomery-Gibbs Executive Airport, San Diego, California
NEW	Lakefront Airport, New Orleans, Louisiana
OPF	Miami-Opa Locka Executive Airport, Miami, Florida
ORD	Chicago O'Hare International Airport, Chicago, Illinois
ORL	Orlando Executive Airport, Orlando, Florida
PAO	Palo Alto Airport, Palo Alto, California
PBI	Palm Beach International Airport, West Palm Beach, Florida
PDK	DeKalb-Peachtree Airport, Atlanta, Georgia
PHL	Philadelphia International Airport, Philadelphia, Pennsylvania
PHX	Phoenix Sky Harbor International Airport, Phoenix, Arizona
PIE	St. Pete-Clearwater International Airport, St. Petersburg-Clearwater, Florida
PNS	Pensacola International Airport, Pensacola, Florida
POC	Brackett Field, LaVerne, California
PRC	Ernest A. Love Field Airport, Prescott, Arizona
PSP	Palm Springs International Airport, Palm Springs, California
RHV	Reid-Hillview Airport of Santa Clara County, San Jose, California
RNO	Reno/Tahoe International Airport, Reno, Nevada
SAT	San Antonio International Airport, San Antonio, Texas

SBA	Santa Barbara Municipal Airport, Santa Barbara, California
SDM	Brown Field Municipal Airport, San Diego, California
SEA	Seattle-Tacoma International Airport, Seattle, Washington
SFB	Orlando Sanford International Airport, Orlando, Florida
SFO	San Francisco International Airport, San Francisco, California
SJC	Norman Y. Mineta San Jose International Airport, San Jose, California
SLC	Salt Lake City International Airport, Salt Lake City, Utah
SMO	Santa Monica Municipal Airport, Santa Monica, California
SNA	John Wayne-Orange County Airport, Santa Ana, California
SPI	Abraham Lincoln Capital Airport, Springfield, Illinois
SRQ	Sarasota/Bradenton International Airport, Sarasota/Bradenton, Florida
STS	Charles M. Schulz-Sonoma County Airport, Santa Rosa, California
TEB	Teterboro Airport, Teterboro, New Jersey
TIW	Tacoma Narrows Airport, Tacoma, Washington
TMB	Miami Executive Airport, Miami, Florida
TOA	Zamperini Field, Torrance, California
TUL	Tulsa International Airport, Tulsa, Oklahoma
TUS	Tucson International Airport, Tucson, Arizona
TYR	Tyler Pounds Regional Airport, Tyler, Texas
UAO	Aurora State Airport, Aurora, Oregon
VGT	North Las Vegas Airport, Las Vegas, Nevada
VNY	Van Nuys Airport, Van Nuys, California

EXECUTIVE SUMMARY

In fiscal year (FY) 2012, the Federal Aviation Administration (FAA) Office of Airports (ARP) initiated a research study to identify and geographically locate areas at airports with nonstandard taxiway geometry. This research was advanced because an earlier study (Legarreta, 2012) had shown nonstandard taxiway geometries to be associated with a higher prevalence of runway incursions. The FAA defines a runway incursion (RI) as “any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft.” These occurrences include wrong runway landings and takeoffs. This research effort developed a geographic information system (GIS) database of approximately 520 airports with civilian air traffic control towers. For each airport, the location of nonstandard geometries, RIs, airfield hotspot areas, airport diagrams, and other airport-related information is identified. This research study identified 140 airfield locations with a high incidence of RIs using data from October 1, 2007, to September 30, 2013. As a result, a 15- to 20-year improvement program, known as the Runway Incursion Mitigation (RIM) program, launched in FY2015. The goal of the program is to mitigate airfield locations with high incidences of runway incursions. A subset of the 140 locations identified was then validated for inclusion in the RIM program and prioritized for mitigation.

The RIM program is updated annually utilizing the GIS airport database to identify construction-related changes to airfield layout and their impacts on taxiway geometries, the airfield location of new RIs, and the status of airfield locations prioritized for mitigation.

This report summarizes the status of the RIM program through FY2021. In 2021 the program georeferenced 954 runway incursions, added 263 nonstandard geometry locations, prioritized 8 locations for mitigation, and identified 13 locations as mitigated. Since program initiation, 13,879 RIs have been georeferenced at airports along with more than 6,542 nonstandard geometry locations. In addition, 203 airfield locations were prioritized for mitigation and 75 of these locations have been mitigated. The rate of RIs at the 75 locations considered mitigated has been reduced by approximately 83%.

1. INTRODUCTION

The Federal Aviation Administration (FAA) defines a runway incursion (RI) as “any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft” (FAA, 2015). These occurrences, including wrong runway landings and takeoffs, are a top airport safety concern for the FAA.

The FAA conducted an initial study of RIs from 1997 to 2003 resulting from a pilot deviation (PD) or vehicle/pedestrian deviation (V/PD). These incursions were then plotted on airport diagrams (Legarreta, 2012). Analysis of these incursions found that certain taxiway locations experienced far more RIs than other locations (Legarreta, 2012). Through additional research, the FAA identified taxiway geometry configurations associated with a higher incidence of RIs (Legarreta, 2012). This led the FAA Airport Engineering Division to publish Engineering Brief (EB) 75, *Incorporation of Runway Incursion Prevention into Taxiway and Apron Design*, in November 2007 (FAA, 2007). Subsequently, the FAA revised Advisory Circular (AC) 150/5300-13, *Airport Design* (FAA, 2012), in September 2012 to incorporate the airport layout recommendations from EB 75. Both documents provide guidance for airports to design taxiways in a manner to reduce confusion and increase situational awareness. Airport layouts not conforming to these recommendations may lead to confusion and, ultimately, RIs.

In fiscal year (FY) 2012, the FAA Office of Airports (ARP) initiated a research study to identify and geographically locate areas at airports with nonstandard geometry and a high incidence of RIs. This effort, detailed in the FAA report *Problematic Taxiway Geometry Study Overview* (Vitagliano, Canter, & Aland, 2018), developed a geographic information system (GIS) database including

- 6,098 airport locations with nonstandard geometry, also known as problematic taxiway geometry (PTG) locations;
- all PD and V/PD deviation RIs, including wrong runway events and surface incidents;
- airport diagrams and information; and
- hot spots.

The initial study and field validation process identified 140 locations with a high incidence of RIs using data from October 1, 2007, to September 30, 2013, after reviewing 5,099 RI reports. As a result, a 15- to 20-year improvement program, known as the Runway Incursion Mitigation (RIM) program, launched in FY2015. The goal of the program is to mitigate airfield locations with high incidents of RIs. A subset of the 140 locations identified was then validated for inclusion in the RIM program and prioritized for mitigation. The FAA maintains a RIM program website, accessed at https://www.faa.gov/airports/special_programs/rim/ (FAA, 2021).

2. ANNUAL DATABASE UPDATES

The FAA maintains the RIM database including all data relevant to the program from towered airports and provides a history of database updates. The following data are maintained for each airport:

- Hub Category
- General Aviation Asset Category
- Annual Operations
- Enplanements
- Title 14 Code of Federal Regulations Part 139 status (Airport Certification, 2004), herein referred to as Part 139

The current FAA airport diagram can be displayed within the database along with Form 5010 Airport Master Record data. Additionally, hot spots and their descriptions are updated every 28 days, when applicable.

The database includes all RIs and surface incidents categorized as V/PDs or PDs by the FAA Office of Runway Safety for each airport. This includes wrong runway landings and takeoffs. On an annual basis, the database incorporates new data. This update typically occurs during the second quarter of the FY, and involves analysis of all RIs from the previous calendar year (CY). Reviewing the narrative in the incursion report determines the RI location. Each incursion is then georeferenced in the database.

In addition to analyzing RIs, an annual review of the layout of each airport determines if locations with previously identified nonstandard geometry characteristics have changes and/or mitigations. Locations with new nonstandard geometry characteristics are identified as well. The FAA identified 19 nonstandard taxiway geometry characteristics that lead to pilot confusion. Locations having at least 1 of the following 19 nonstandard geometry characteristics are categorized as problematic taxiway geometry (PTG) locations (FAA, 2013):

- Y-shaped taxiways crossing a runway
- Wrong runway events
- Wide expanses of taxi pavements entering or along a runway
- Convergence of numerous taxiway types entering a runway
- High-speed exit crossing a taxiway
- Two runway thresholds in close proximity
- Short taxiways (stubs) between runways
- Direct taxiing access to runways from ramp areas
- An aligned taxiway entering runway ends
- Nonstandard markings and/or signage placement
- Greater than three-node taxiway intersection
- Taxiway connection to V-shaped runways
- Taxiway intersects runway at other than a right angle
- Short taxi distance from ramp/apron area to a runway
- High-speed exits leading directly onto another runway
- Taxiway coinciding with the intersection of two runways
- Use of a runway as a taxiway
- Unexpected holding position marking on parallel/entrance taxiway
- Miscellaneous (e.g., nonsequential taxiway designation schemes, absence of full-length parallel taxiway, taxiway intersection along the middle third of a runway)

Once all RIs from the previous CY are georeferenced, a review of annual and cumulative RI counts for each PTG location determines which locations meet RIM program criteria. The criteria are

- (1) three or more RIs in a single CY, or
- (2) an average of one or more RIs per year during the most recent 10 years.

The analysis is limited to the most recent 10-year period to consider changes in an airport operating environment over long periods of time (e.g., operational procedures, activity profiles, fleet mix, airfield redesign).

A review of the unique characteristics of each location further narrows the locations considered for field validation. For certain locations, interpretation of incursion narratives is necessary to confirm RIM status. All RIs are georeferenced regardless of narrative description, but not all narratives provide evidence of a potential issue with taxiway geometry. For example, a lost airport vehicle may cross the same runway hold bar multiple times, generating multiple RIs for one incident. Such a location, which may technically meet RIM criteria, is not a RIM location based on the serial nature of the specific incursion incident. Short-term construction projects may cause temporary airfield hot spots that no longer apply after construction is finished. Aircraft and vehicles operating on an airfield without tower clearance provide another example of an event not related to taxiway geometry. The FAA continues to monitor these locations.

The purpose of field validation, which occurs after each annual database update, is to obtain feedback from FAA field personnel regarding locations considered for classification as RIM locations. Information obtained from the field, such as extenuating circumstances surrounding RIs (e.g., construction activity, air shows, other special events) and whether mitigations are underway, is evaluated. ARP personnel use this information to make a final determination regarding which locations to add to the RIM inventory. After final determinations, the FAA publishes the updated RIM inventory on the FAA website (2022). Figure 1 provides a summary of the annual database update process, which typically begins in January and ends in September.

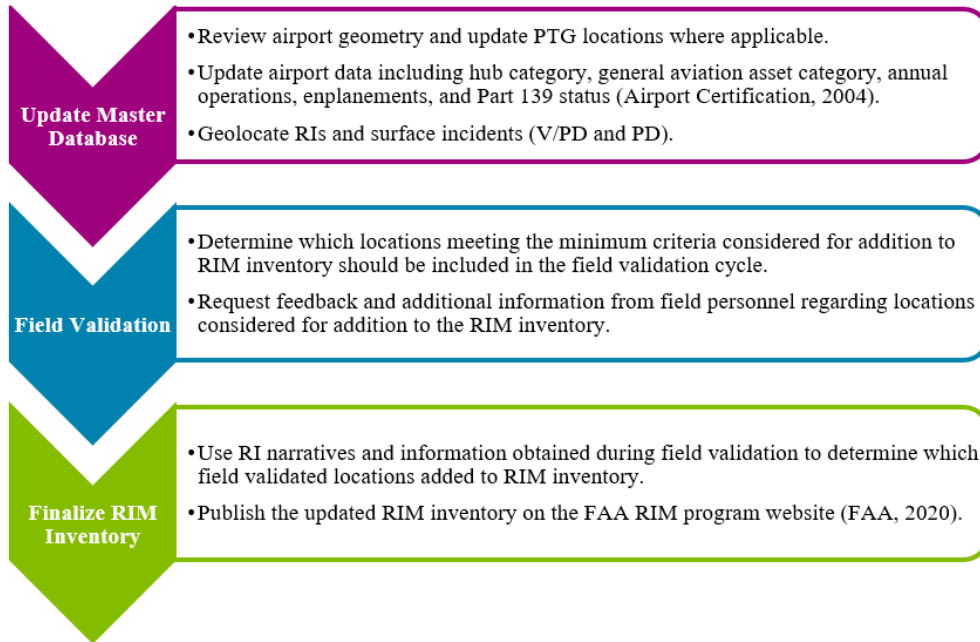


Figure 1. The RIM Database Update Process

Statistical analysis of incursion incidents at RIM locations assesses differences between mitigated and non-mitigated RIM locations. Analysis of incursion data through CY2020 indicates a median annual incursion rate at non-mitigated locations of 0.77 and a median annual incursion rate of 0.13 incursions at mitigated locations—an 83% reduction in incursions post mitigation. These estimates were calculated to be statistically significant with a confidence level of 95%. (Harris, 2021)

The FAA maintains a GIS-based website, referred to as the RIM Data Management (RDM) tool (FAA, 2016). This tool facilitates field and FAA headquarters (HQ) personnel in sharing information related to potential or active RIM locations, monitoring the progress of mitigation for RIM locations, and tracking the success of the overall program. Additionally, non-FAA users, such as state aviation officials, airport sponsors, and industry consultants, have limited, read-only access to the RDM tool. The tool receives annual RI and GIS data updates.

2.1 The FY2015–FY2021 Program Summary

The RIM database has undergone seven annual updates since the completion of the PTG study. These updates added a total of 8,780 RIs and 448 PTG locations to the database. Seven field validation cycles coincided with these annual database updates. These cycles were completed in July 2015, December 2016, July 2017, July 2018, July 2019, July 2020, and July 2021. These validation cycles added 105 new RIM locations. Figure 2 provides a breakdown of RIs added with each update, and Figure 3 shows the number of PTG locations added with each update. As shown, the number of PTG locations decreased by 54 in FY2019 due to the mitigation of nonstandard geometry characteristics, through other projects. The number of PTG locations increased from 6,279 to 6,542 in FY2021 due to the establishment of new numerical criteria for identifying Geocode 14 “Short taxi distance from ramp/apron area to a runway.” Analysis of data from Section 7.4 of the report *Data Gap Assessment and Exploratory Data Analysis for Runway Incursion Mitigation Program* (Baldwin and Harris, 2020) established this criterion (800 feet from non-

movement area marking to runway hold line). This identified new PTG locations added to the RIM database. Figure 4 shows the counts of locations that entered into the RIM inventory after each validation cycle, as well as the counts of RIM locations mitigated per fiscal year. This figure represents additions since the initial FY2012 study and does not take into consideration differences in yearly values that result from adjustments made to individual RIM locations to account for changes in RIM location status. Section 2.2 provides an in-depth discussion of the most recent database update and validation cycle, which took place in 2021.

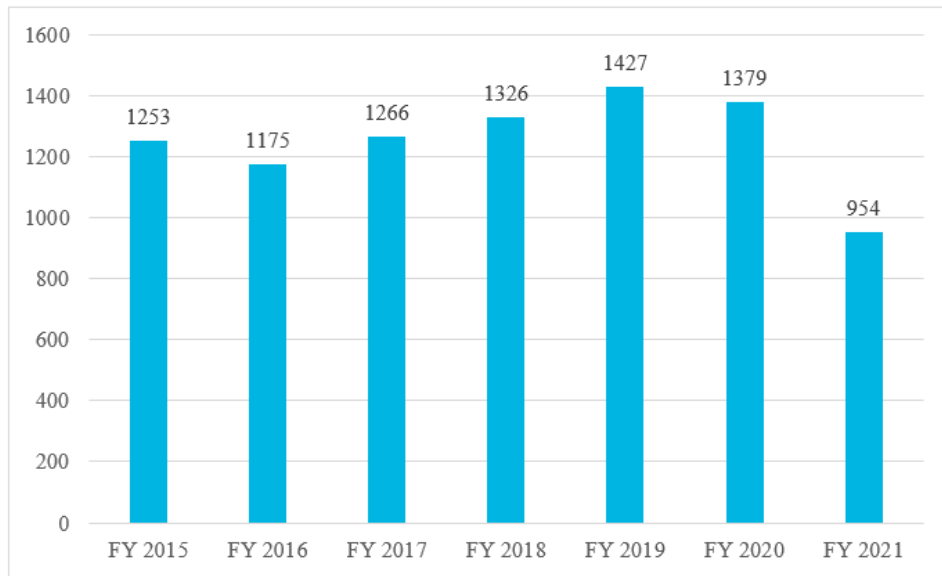


Figure 2. The RIs Added to RIM Database With Each Update

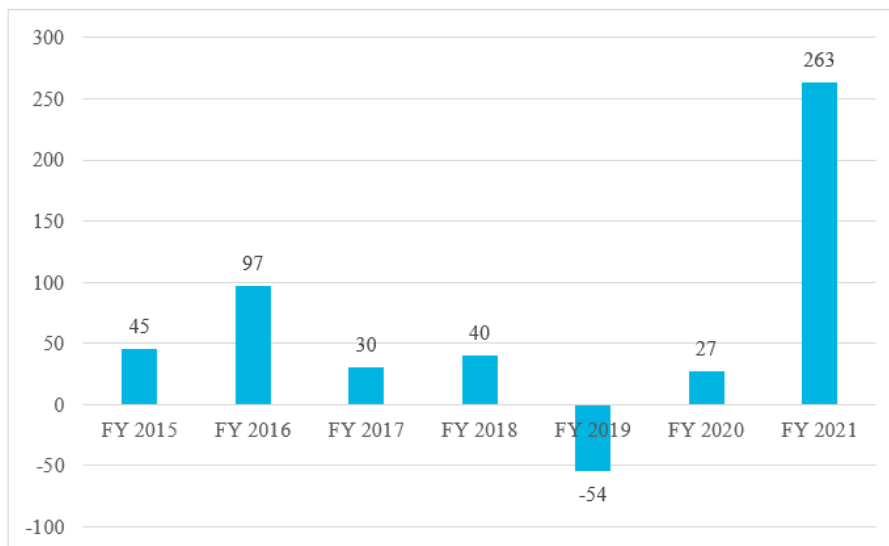


Figure 3. The PTG Locations Added to RIM Database With Each Update

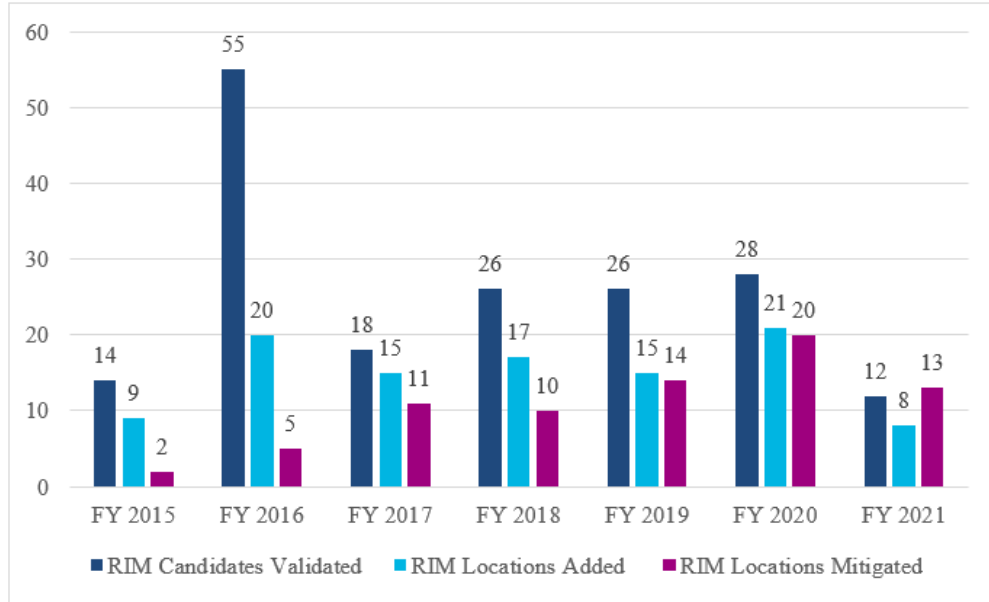


Figure 4. The RIM Locations Added/Mitigated Per FY

2.2 The FY2021 Program Update

The FY2021 RIM database update was completed in September 2021. This update analyzed and georeferenced 954 RIs from CY2020. This increased the overall number of RIs in the database to 13,879. These incursions occurred at 520 towered airports between FY2008 and the end of CY2020.

Analysis of RI counts identified 22 PTG locations that met the minimum criteria for entry into the RIM inventory. Of these locations, 12 were ultimately included in the field validation/review cycle based on assessment of individual location characteristics and history. Based on information obtained during field validation, 8 PTG locations were added to the RIM inventory in FY2021. Table 1 lists these 8 locations and provides relevant details such as location, peak year RI counts, and cumulative RI counts during the past 10 years. Due to CY2020 RI counts, one location (indicated by an asterisk in Table 1) returned to the RIM inventory in FY2021 for additional mitigation action.

Table 1. The FY2021 New RIM Locations: Summary Data

Airport Name	Airport Identifier	Location Description	Peak CY Annual RI	Cumulative ¹ RI Count
Albuquerque International Sunport, Albuquerque, New Mexico	ABQ	Hot Spot 3: Section of Taxiway G where it intersects Taxiway C and Runway 3/21	5	14
Bethel Airport, Bethel, Alaska	BET	Hot Spot 1: Intersection of Runway 12/30 and Runway 1R/19L	5	6

Airport Name	Airport Identifier	Location Description	Peak CY Annual RI	Cumulative ¹ RI Count
Rocky Mountain Metropolitan Airport, Denver, Colorado*	BJC	Approach end of Runway 30R	2	11
Chandler Municipal Airport, Chandler, Arizona	CHD	Approach end of Runway 22L	4	8
David Wayne Hooks Memorial Airport, Houston, Texas	DWH	Hold bar at Taxiway K for Runway 17L/35R	6	9
Hayward Executive Airport, Hayward, California	HWD	Landing threshold of Runway 28L	2	11
Montgomery-Gibbs Executive Airport, San Diego, California	MYF	Hot Spot 2: Holding position on Runway 5/23 southbound for Runway 10R/28L	5	7
Tacoma Narrows Airport, Tacoma, Washington	TIW	Hold bar at Taxiway A4 for Runway 35	5	6

* RIM locations mitigated previously but then returned to RIM inventory in FY2021 for additional mitigation.

¹ Incursion count to date from the previous 10 calendar years of available RI data (CY2011–CY2020).

2.3 The RIM Inventory

At the end of FY2021, the RIM inventory consisted of 128 active RIM locations at 79 airports in every FAA region. Several airports have more than one active RIM location. Airports with the most RIM locations are

- Montgomery-Gibbs Executive Airport (MYF), San Diego, California – 6 RIM locations
- Chino Airport (CNO), Chino, California – 5 RIM locations

The FAA categorizes airports with the greatest impact on system performance (having 1 percent of passenger enplanements or .75 percent or more of the total nonmilitary itinerant operations) as core airports. Table 2 lists the Core 30 airports with current RIM locations.

Table 2. Core 30 Airports With RIM Locations

Airport Name	Airport Identifier	Number of RIM Locations
Hartsfield-Jackson Atlanta International Airport, Atlanta, Georgia	ATL	1
Ronald Reagan Washington National Airport, Washington, DC	DCA	1
Denver International Airport, Denver, Colorado	DEN	1
Daniel K. Inouye International Airport, Honolulu, Hawaii	HNL	3

Airport Name	Airport Identifier	Number of RIM Locations
McCarran International Airport, Las Vegas, Nevada	LAS	1
Los Angeles International Airport, Los Angeles, California	LAX	1
Memphis International Airport, Memphis, Tennessee	MEM	1
Miami International Airport, Miami, Florida	MIA	2
Chicago O’Hare International Airport, Chicago, Illinois	ORD	1
Seattle-Tacoma International Airport, Seattle, Washington	SEA	1
San Francisco International Airport, San Francisco, California	SFO	1
Salt Lake City International Airport, Salt Lake City, Utah	SLC	2

The complete RIM inventory as of the end of FY2021 is provided in Appendix A.

3. MITIGATION ANALYSIS

Once a PTG location is added to the RIM inventory, relevant stakeholders (e.g., FAA personnel, local airport sponsor) coordinate to determine the most appropriate mitigation strategies for the location, as is typical for proper airport planning and design. Upon selecting mitigation strategies, the project progresses through the typical phases of planning, environmental assessment, design, and construction. The 128 active RIM locations are in various stages of mitigation. Figure 5 provides a breakdown of RIM locations by mitigation milestone. As shown, 106 (83%) active RIM locations have initiated mitigation activities and are in the planning, design, or construction phases. Note that 8 of the 22 RIM locations with no project identified entered the RIM inventory in the fourth quarter of FY2021.

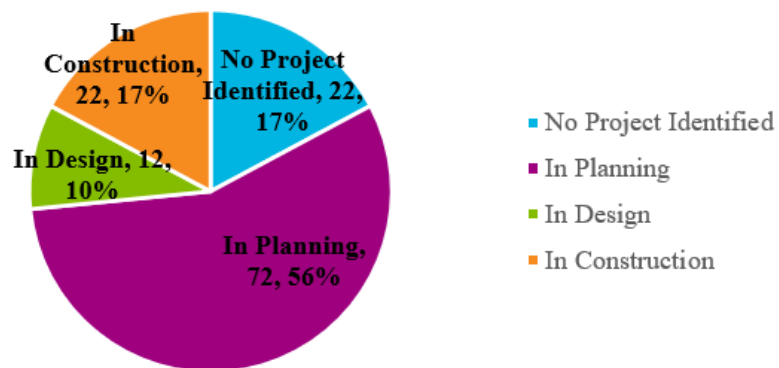


Figure 5. Status of Active RIM Locations

Airports utilize a variety of mitigation strategies to eliminate nonstandard geometry configurations and reduce the likelihood of pilot confusion and, ultimately, RIs. AC 150/5300-13 (FAA, 2012) and EB 75 (FAA, 2007) provide airports with airport geometry strategies to reduce the risk of RIs. In addition to geometry improvements, airports often use a combination of mitigation strategies

for RIM locations. Mitigation strategies include changes to airfield lighting, signage, markings, and/or operational procedures. Table 3 provides examples of mitigation strategies.

Table 3. Mitigation Strategy Examples (FAA, 2016)

Mitigation Type	Mitigation Strategy Examples
Airport Geometry Changes	<ul style="list-style-type: none"> • Reconfigure taxiway to intersect runway at 90-degree angle • Relocate taxiway to eliminate direct access • Narrow the taxiway pavement entrance • Close a taxiway or runway
Lighting	<ul style="list-style-type: none"> • Install runway end identifier lights (REILs) • Install elevated or in-pavement runway guard lights
Signage	<ul style="list-style-type: none"> • Relocate signs to meet FAA standards • Install runway holding position signs at runway/runway intersections where operational use as a taxiway cannot be avoided • Adjust hold position signs to align with incoming taxiway centerline
Markings	<ul style="list-style-type: none"> • Relocate markings to meet FAA standards • Install enhanced centerline markings • Collocate instrument landing system (ILS) and hold position markings • Install runway holding position markings at runway/runway intersections
Procedures/Operational	<ul style="list-style-type: none"> • Notify pilots of problems with correct runway selection through Automated Traffic Information System (ATIS), Notices to Airmen (NOTAMs), and airport diagram notations • Discontinue use of runways as taxiways

FAA personnel have developed procedures to confirm mitigation of RIM locations and assess the success of mitigation techniques.

At the end of FY2021, the RIM program mitigated 75 locations. Airports utilized a variety of mitigation strategies to eliminate the problematic geometry characteristics or reduce their effects at these locations. Refer to Appendix B for the location descriptions of each mitigated RIM location by FY.

The RIM-mitigated locations experienced a total of 931 RIs prior to mitigation, compared to 51 RIs after mitigation. Because some of these locations were mitigated relatively recently, within the past 5 years, significant post-mitigation RI trending data do not yet exist. Monitoring of these locations over time determines if mitigation efforts are successful. Appendix C provides summary data for all RIM-mitigated locations.

4. CONCLUSION

The goal of the RIM program is to identify locations at towered airports with nonstandard geometry characteristics and a high occurrence of RIs, mitigate the nonstandard geometry

characteristics present at these locations, and ultimately reduce the number of RIs at these locations. This program continues to be one of the most successful safety programs in the FAA.

At the end of FY2021, there were 128 active RIM locations at 79 airports. Of these locations, 106 initiated mitigation activities were in the planning, design, or construction phases. The RIM program has mitigated 75 locations since its inception and RI rates have fallen by approximately 83% at these locations. Mitigations eliminated hot spots from the airport diagrams at 20 of these locations. The FAA continues to monitor these locations to ensure the mitigations successfully reduce the number of RIs.

FAA HQ personnel continue to monitor the progress of the program by visiting as many airports with RIM locations as feasible. Personnel from FAA HQ, the regions, and the Airports District Offices are available to provide advisory and financial assistance to airport sponsors with mitigation strategies, as the ultimate goal is to reduce RIs as much as possible.

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APPENDIX A—RUNWAY INCURSION MITIGATION INVENTORY

The Federal Aviation Administration (FAA) Runway Incursion Mitigation (RIM) program personnel developed this preliminary inventory of airport locations where runway incursions (RIs) have occurred and are now working with airports on mitigation strategies. The RI data collected from fiscal year (FY) 2008–calendar year (CY) 2020 indicate airport locations where three or more peak annual RIs have occurred in a given CY or where cumulative incursion counts averaged one or more RIs per year of data analyzed. Cumulative RI counts reflect total RIs to date since FY 2008 for each location validated prior to 2020. For locations validated in 2020 and later, cumulative RI counts reflect total RIs beginning 10 calendar years prior to their validation year. Table A-1 shows this information, which is subject to change as the FAA works with the airport sponsors. Bold and italic rows in Table A-1 indicate new RIM locations that were added to the inventory in FY2021. The RIM program inventory will be updated as projects proceed, and additional RI data are collected.

Table A-1. The RIM Program Inventory of Airport Locations as of October 2021

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
<i>ABQ</i>	<i>Albuquerque International Sunport, Albuquerque, New Mexico</i>	<i>Section of Taxiway G where it intersects Taxiway C and Runway 3/21</i>	<i>ABQ-HS3</i>	<i>2021</i>	<i>ASW</i>	<i>Medium</i>	<i>NA</i>	<i>Y</i>	<i>14</i>	<i>5</i>
APA	Centennial Airport, Denver, Colorado	Approach end of RWY 35R	APA-07	2019*	ANM	Reliever	National	N	13	4
APA	Centennial Airport, Denver, Colorado	TWY C1 at approach end of RWY 10	APA-HS3	2015	ANM	Reliever	National	N	30	4
APA	Centennial Airport, Denver, Colorado	Hold bar on TWY B8 at intersection with RWY 17L/35R	APA-HS4	2020* (2016)	ANM	Reliever	National	N	32	8
APC	Napa County Airport, Napa, California	Approach end of RWY 18R	APC-09	2019	AWP	Reliever	Regional	N	7	4
ARR	Aurora Municipal Airport, Chicago, Illinois	Hold bar on TWY A3 at intersection with RWY 9/27	ARR-03	2020	AGL	Reliever	National	N	4	3

Bold and italic rows are new RIM locations that were added to the inventory in FY2021.

¹ NPIAS = National Plan of Integrated Airport Systems

² Airport Certification, Title 14 Code of Federal Regulations Part 139 (14 C.F.R § 139).

* RIM locations that were mitigated previously but then returned to the RIM inventory for additional mitigation efforts.

() Original year RIM location was added to inventory

Y = Yes

N = No

NA = Not Applicable

ILS = Instrument Landing System

RWY = Runway

TWY = Taxiway

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
ASE	Aspen-Pitkin County Airport/Sardy Field, Aspen, Colorado	TWY A9 at approach end of RWY 33	ASE-HS3	2019	ANM	Non-Hub Primary	NA	Y	15	4
ATL	Hartsfield-Jackson Atlanta International Airport, Atlanta, Georgia	RWY 8L - 26R / TWY C, D intersections	ATL-HS1	2015	ASO	Large	NA	Y	15	4
AZO	Kalamazoo/Battle Creek International Airport, Kalamazoo, Michigan	RWY 17 / TWY C intersection	AZO-02	2015	AGL	Non-Hub Primary	NA	Y	6	3
BET	Bethal Airport, Bethal, Alaska	Intersection of Runway 12/30 and Runway 1R/19L	BET-HS1	2021	AAL	Non-Hub Primary	NA	Y	6	5
BFI	Boeing Field King County International Airport, Seattle, Washington	Hold bar on TWY Z parallel to approach end of RWY 14R	BFI-HS1	2020	ANM	Non-Hub Primary	NA	Y	6	3
BJC	Rocky Mountain Metropolitan Airport, Denver, Colorado	Approach end of Runway 30R	BJC-02	2021* (2015)	ANM	Reliever	National	Y	11	2
BJC	Rocky Mountain Metropolitan Airport, Denver, Colorado	Hold bar on RWY 3 at intersection with RWY 12R/30L (south of runway)	BJC-18	2020	ANM	Reliever	National	Y	5	3
BOI	Boise Air Terminal/Gowen Field Airport, Boise, Idaho	Hold short bar on TWY J, north of RWY 10R approach end	BOI-01	2018	ANM	Small	NA	Y	13	3

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
BOI	Boise Air Terminal/Gowen Field Airport, Boise, Idaho	Intersection of TWYs F, B3 and RWY 10R/28L	BOI-08	2020	ANM	Small	NA	Y	4	3
BOI	Boise Air Terminal/Gowen Field Airport, Boise, Idaho	Approach hold marking on TWY J/A at approach end of RWY 10L and hold short bar on TWY W at approach end of RWY 10L	BOI-HS1	2019	ANM	Small	NA	Y	11	3
BOS	General Edward Lawrence Logan International Airport, Boston, Massachusetts	RWY 4R / 14 - 32 intersection	BOS-47	2015	ANE	Large	NA	Y	9	3
BOS	General Edward Lawrence Logan International Airport, Boston, Massachusetts	RWY 15L / RWY 22R intersection	BOS-HS1	2015	ANE	Large	NA	Y	14	3
BOS	General Edward Lawrence Logan International Airport, Boston, Massachusetts	RWY 4L approach end / TWY E, K intersections	BOS-HS3	2015	ANE	Large	NA	Y	26	4
BTV	Burlington International Airport, Burlington, Vermont	Intersection of TWY C and RWY 1/19	BTV-HS2	2018	ANE	Small	NA	Y	14	3
BUR	Bob Hope Airport, Burbank, California	Hold short bars for RWYs 8/26 and 15/33 at northwest corner of air carrier ramp (non-movement area)	BUR-HS1	2019	AWP	Medium	NA	Y	10	4

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
CAK	Akron-Canton Regional Airport, Akron, Ohio	Intersection of TWYs H, J and RWY 1/19 (west of runway)	CAK-HS1	2020	AGL	Small	NA	Y	5	3
CCR	Buchanan Field Airport, Concord, California	RWY 32R / TWY B intersection	CCR-HS4	2016	AWP	Reliever	National	Y	15	4
CHD	Chandler Municipal Airport, Chandler, Arizona	Approach end of RWY 22L	CHD-12	2021	AWP	Reliever	Regional	N	8	4
CLE	Cleveland Hopkins International Airport, Cleveland, Ohio	Five-point intersection of TWYs J, L, S, and RWY 6R/24L	CLE-HS1	2015	AGL	Medium	NA	Y	6	4
CMA	Camarillo Airport, Camarillo, California	TWY A at RWY 26 approach end	CMA-01	2015	AWP	Reliever	National	N	16	5
CNO	Chino Airport, Chino, California	TWY P between RWY 26R approach end and 26L	CNO-05	2015	AWP	Reliever	National	N	12	4
CNO	Chino Airport, Chino, California	Hold short bar on TWY P north of RWY 26R	CNO-10	2017	AWP	Reliever	National	N	25	8
CNO	Chino Airport, Chino, California	RWY 26L approach end	CNO-19	2015	AWP	Reliever	National	N	20	6
CNO	Chino Airport, Chino, California	TWY L between RWYs 3/21 and 8R/26L	CNO-HS2	2018	AWP	Reliever	National	N	7	5
CNO	Chino Airport, Chino, California	Intersections of TWYs D, K, and L and RWYs 8L-26R and 3/21	CNO-HS4	2016	AWP	Reliever	National	N	23	5
CRG	Jacksonville Executive at Craig Airport, Jacksonville, Florida	Hold bar at intersection of TWYs C and E and approach ends of RWYs 23 and 32	CRG-HS1	2020	ASO	Reliever	Regional	N	6	3

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
CSG	Columbus Airport, Columbus, Georgia	Convergence of TWYs A, C, D at the intersection of RWYs 13/31 and 6/24	CSG-HS1	2020	ASO	Non-Hub Primary	NA	Y	4	4
DAL	Dallas Love Field Airport, Dallas, Texas	Hold short bar on TWY L for approach end of RWY 13R	DAL-15	2019	ASW	Medium	NA	Y	12	7
DAL	Dallas Love Field Airport, Dallas, Texas	Hold short bar on TWY A at approach end of RWY 13L	DAL-HS1	2019* (2015)	ASW	Medium	NA	Y	36	12
DAL	Dallas Love Field Airport, Dallas, Texas	Hold bar on TWY C parallel to approach end of RWY 13R	DAL-HS2	2020* (2014)	ASW	Medium	NA	Y	26	6
DCA	Ronald Reagan Washington National Airport, Washington, DC	TWY J at RWY 19 approach end	DCA-HS2	2015	AEA	Large	NA	Y	22	4
DEN	Denver International Airport, Denver, Colorado	RWY 17R approach area on TWY ED	DEN-HS1	2017	ANM	Large	NA	Y	23	4
DVT	Phoenix Deer Valley Airport, Phoenix, Arizona	Approach end of RWY 7R	DVT-07	2018	AWP	Reliever	National	N	16	3
DVT	Phoenix Deer Valley Airport, Phoenix, Arizona	TWY B5 between TWY B and RWY 7R-25L	DVT-HS1	2015	AWP	Reliever	National	N	11	3
DVT	Phoenix Deer Valley Airport, Phoenix, Arizona	RWY 7R-25L / TWY B9 intersection	DVT-HS2	2016	AWP	Reliever	National	N	45	7
DWH	David Wayne Hooks Memorial Airport, Houston, Texas	Hold bar at TWY K for RWY 17L/35R	DWH-18	2021	ASW	Reliever	Regional	N	9	6

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
DWH	David Wayne Hooks Memorial Airport, Houston, Texas	RWY 17R approach end	DWH-HS1	2015	ASW	Reliever	Regional	N	26	5
DWH	David Wayne Hooks Memorial Airport, Houston, Texas	Intersection of TWY G and RWY 17L/35R	DWH-HS4	2018	ASW	Reliever	Regional	N	17	5
FAI	Fairbanks International Airport, Fairbanks, Alaska	RWY 20L approach end/ RWY 2 ski strip	FAI-11	2015	AAL	Small	NA	Y	9	3
FAI	Fairbanks International Airport, Fairbanks, Alaska	Approach end of ski strip 20	FAI-25	2017	AAL	Small	NA	Y	4	3
FAI	Fairbanks International Airport, Fairbanks, Alaska	Closely located TWYs (B, T, U) and RWYs (approach ends of 20L and 2)	FAI-HS1	2017	AAL	Small	NA	Y	23	5
FAT	Fresno Yosemite International Airport, Fresno, California	RWY 29R approach end	FAT-21	2016	AWP	Small	NA	Y	12	3
FCM	Flying Cloud Airport, Minneapolis, Minnesota	RWY 28L approach end	FCM-HS1	2015	AGL	Reliever	National	N	21	4
FCM	Flying Cloud Airport, Minneapolis, Minnesota	Approach runway ends of RWY 10L and 10R	FCM-HS6	2020	AGL	Reliever	National	N	13	3
FFZ	Falcon Field Airport, Mesa, Arizona	Hold position bar for RWY 4R/22L on TWY B	FFZ-01	2019	AWP	Reliever	Regional	N	16	3

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
FFZ	Falcon Field Airport, Mesa, Arizona	Approach end of RWY 22L	FFZ-13	2018	AWP	Reliever	Regional	N	16	3
GCN	Grand Canyon National Park Airport, Grand Canyon, Arizona	Hold bars on TWYs A, B at approach end of RWY 21	GCN-HS1	2020	AWP	Non-Hub Primary	NA	Y	16	5
GLS	Scholes International Airport, Galveston, Texas	RWY 18 / TWY E intersection	GLS-04	2015	ASW	Reliever	Regional	N	12	4
HIO	Portland-Hillsboro Airport, Portland, Oregon	Hold short bar on TWY A9 at the approach end of RWY 31L	HIO-05	2017	ANM	Reliever	National	N	13	3
HIO	Portland-Hillsboro Airport, Portland, Oregon	Intersection of TWYs A, A6, and RWY 13R/31L	HIO-HS1	2018	ANM	Reliever	National	N	5	3
HIO	Portland-Hillsboro Airport, Portland, Oregon	TWY A8 between TWY A and RWY 13R/31L	HIO-HS2	2015	ANM	Reliever	National	N	17	4
HLN	Helena Regional Airport, Helena, Montana	Intersection of TWY C and approach end of RWY 35	HLN-01	2018	ANM	Non-Hub Primary	NA	Y	10	3
HND	Henderson Executive Airport, Las Vegas, Nevada	Hold bar on TWY E at intersection with RWY 17R/35L	HND-HS2	2020	AWP	Non-Hub Primary	NA	N	5	3
HNL	Daniel K. Inouye International Airport, Honolulu, Hawaii	RWY 4L and 4R approach ends	HNL-HS1	2015	AWP	Large	NA	Y	21	4
HNL	Daniel K. Inouye International Airport, Honolulu, Hawaii	RWY 8L-26R / TWY E / TWY B	HNL-HS3	2016	AWP	Large	NA	Y	10	3

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
HNL	Daniel K. Inouye International Airport, Honolulu, Hawaii	RWY 8L approach / TWYs A, V, T, RB, M intersection	HNL-HS4	2015	AWP	Large	NA	Y	21	5
HOU	William P. Hobby Airport, Houston, Texas	RWY 17 TWY E entrance	HOU-01	2015	ASW	Medium	NA	Y	13	3
HOU	William P. Hobby Airport, Houston, Texas	Hold short bar on TWY G at approach end of RWY 4	HOU-15	2018	ASW	Medium	NA	Y	8	3
HOU	William P. Hobby Airport, Houston, Texas	RWY 13R / TWY G entrance	HOU-HS2	2015	ASW	Medium	NA	Y	19	4
HWD	Hayward Executive Airport, Hayward, California	Hold bar on TWY Z1 parallel to approach end of RWY 28L	HWD-04	2020	AWP	Reliever	National	N	9	3
HWD	Hayward Executive Airport, Hayward, California	Landing threshold of RWY 28L	HWD-24	2021	AWP	Reliever	National	N	11	2
HWD	Hayward Executive Airport, Hayward, California	RWY 28L / TWY A1 intersection	HWD-HS5	2016	AWP	Reliever	National	N	40	13
IWA	Phoenix-Mesa Gateway Airport, Phoenix, Arizona	Approach end of RWY 12C	IWA-04	2015	AWP	Small	NA	Y	12	3
JLN	Joplin Regional Airport, Joplin, Missouri	ILS hold line and hold short bar on TWY E at approach end of RWY 13	JLN-HS1	2018	ACE	Non-Hub Primary	NA	Y	10	3
LAF	Purdue University Airport, Lafayette, Indiana	Intersection of TWYs B, B3, C and RWYs 10/28 and 5/23	LAF-HS1	2019	AGL	General Aviation	Regional	Y	23	6

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
LAS	McCarran International Airport, Las Vegas, Nevada	RWY 8L/1L intersection	LAS-HS3	2015	AWP	Large	NA	Y	28	3
LAX	Los Angeles International Airport, Los Angeles, California	RWY 6R-24L / TWY AA intersection	LAX-HS1	2016	AWP	Large	NA	Y	29	6
LVK	Livermore Municipal Airport, Livermore, California	RWY 25R / TWY B intersection	LVK-HS1	2015	AWP	Reliever	Regional	N	38	6
LVK	Livermore Municipal Airport, Livermore, California	RWY 25L / TWY C intersection	LVK-HS2	2015	AWP	Reliever	Regional	N	22	6
MEM	Memphis International Airport, Memphis, Tennessee	RWY 27 / TWY V2 intersection	MEM-01	2020	ASO	Small	NA	Y	3	3
MFE	McAllen Miller International Airport, McAllen, Texas	Hold bar on TWY A at approach end of RWY 14	MFE-HS1	2015	ASW	Non-Hub Primary	NA	Y	11	4
MHT	Manchester-Boston Regional Airport, Manchester, New Hampshire	RWY 17 / TWY H intersection	MHT-HS1	2015	ANE	Small	NA	Y	15	10
MIA	Miami International Airport, Miami, Florida	TWY L1 between approach ends of RWYs 8L and 8R	MIA-24	2020	ASO	Large	NA	Y	3	3

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
MIA	Miami International Airport, Miami, Florida	RWY 8R-26L / 12-30 / TWY N / M / M1 / Q1 / Q / P intersection	MIA-HS4	2016	ASO	Large	NA	Y	13	3
MLI	Quad City International Airport, Moline, Illinois	RWY 13-31 / 9-27 / 5-23 intersection	MLI-HS2	2015	AGL	Non-Hub Primary	NA	Y	13	8
MRI	Merrill Field Airport, Anchorage, Alaska	Hold bar on TWY K north of approach end of RWY 25	MRI-24	2020	AAL	Non-Hub Primary	NA	N	12	3
MRI	Merrill Field Airport, Anchorage, Alaska	RWY 25 / TWY K intersection	MRI-25	2015	AAL	Non-Hub Primary	NA	N	14	3
MRI	Merrill Field Airport, Anchorage, Alaska	RWY 5-23 / TWY G intersection	MRI-26	2015	AAL	Non-Hub Primary	NA	N	13	5
MYF	Montgomery-Gibbs Executive Airport, San Diego, California	TWY A at approach end of RWY 28R	MYF-01	2018	AWP	Reliever	Regional	N	16	4
MYF	Montgomery-Gibbs Executive Airport, San Diego, California	TWY H hold bar between approach ends of RWY 5 and RWY 10R	MYF-13	2018	AWP	Reliever	Regional	N	6	4
MYF	Montgomery-Gibbs Executive Airport, San Diego, California	Approach end of RWY 28R	MYF-15	2017	AWP	Reliever	Regional	N	16	5
MYF	Montgomery-Gibbs Executive Airport, San Diego, California	TWY F between RWYs 10L/28R and 10R/28L	MYF-22	2017	AWP	Reliever	Regional	N	13	9

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
<i>MYF</i>	<i>Montgomery-Gibbs Executive Airport, San Diego, California</i>	<i>Holding position on RWY 5/23 southbound for RWY 10R/28L</i>	<i>MYF-HS2</i>	<i>2021</i>	<i>AWP</i>	<i>Reliever</i>	<i>Regional</i>	<i>N</i>	<i>7</i>	<i>5</i>
MYF	Montgomery-Gibbs Executive Airport, San Diego, California	RWY 28L / TWY B intersection	MYF-HS3	2015	AWP	Reliever	Regional	N	21	5
NEW	Lakefront Airport, New Orleans, Louisiana	Hold short bar on TWY F at approach end of RWY 36L	NEW-HS3	2017	ASW	Reliever	National	N	23	11
OPF	Miami-Opa Locka Executive Airport, Miami, Florida	Hold short bar on TWY T8 at approach end of RWY 30	OPF-03	2019	ASO	Reliever	National	N	6	4
OPF	Miami-Opa Locka Executive Airport, Miami, Florida	Hold bar on TWYs T1, T2 at approach end of RWY 12	OPF-20	2020	ASO	Reliever	National	N	8	3
ORD	Chicago O'Hare International Airport, Chicago, Illinois	Intersection of TWYs B, G, A1, and RWYs 4L/22R and 9R/27L	ORD-HS1	2020	AGL	Large	NA	Y	12	6
PBI	Palm Beach International Airport, West Palm Beach, Florida	Hold bar on TWY R parallel to approach end of RWY 10R	PBI-42	2020	ASO	Medium	NA	N	5	3
PDK	DeKalb-Peachtree Airport, Atlanta, Georgia	RWY 16-34 / 3L-21R / 3R-21L / TWY C / B intersection	PDK-11	2016	ASO	Reliever	National	N	13	4
PIE	St. Pete-Clearwater International Airport, St. Petersburg-Clearwater, Florida	Hold short bar on TWY A, north of approach end of RWY 4	PIE-05	2018	ASO	Small	NA	Y	10	3

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
PNS	Pensacola International Airport, Pensacola, Florida	Intersections of RWY 8/26, 17/35 and TWYs A, B, D	PNS-HS1	2018	ASO	Small	NA	Y	25	6
POC	Brackett Field Airport, La Verne, California	RWY 8L-26R / TWY E intersection (north of runway)	POC-02	2015	AWP	Reliever	Regional	N	10	2
PRC	Ernest A. Love Field Airport, Prescott, Arizona	RWY 3L approach end	PRC-HS2	2015	AWP	Non-Primary Commercial	Regional	Y	23	4
PRC	Ernest A. Love Field Airport, Prescott, Arizona	RWY 3R-21L / TWY C4-D4 intersection	PRC-HS3	2015	AWP	Non-Primary Commercial	Regional	Y	13	4
PSP	Palm Springs International Airport, Palm Springs, California	RWY 31R / TWY B intersection	PSP-HS3	2015	AWP	Small	NA	Y	14	4
RHV	Reid-Hillview Airport of Santa Clara County, San Jose, California	TWY E between RWYs 13L and 13R	RHV-01	2015	AWP	Reliever	Regional	N	18	4
RHV	Reid-Hillview Airport of Santa Clara County, San Jose, California	RWY 31R approach / TWY A intersection	RHV-HS2	2015	AWP	Reliever	Regional	N	18	3
SAT	San Antonio International Airport, San Antonio, Texas	RWY 13R / TWY K intersection	SAT-05	2015	ASW	Medium	NA	Y	11	6
SAT	San Antonio International Airport, San Antonio, Texas	RWY 4-22 / 13R-31L intersection	SAT-HS1	2015	ASW	Medium	NA	Y	40	10

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
SDM	Brown Field Municipal Airport, San Diego, California	TWY B between RWYs 8L/26R and 8R/26L	SDM-04	2018	AWP	Reliever	National	N	4	4
SEA	Seattle-Tacoma International Airport, Seattle, Washington	RWY 16L / TWY C intersection	SEA-02	2015	ANM	Large	NA	Y	5	3
SFO	San Francisco International Airport, San Francisco, California	TWY T between RWY 10L-28R / RWY 10R-28L	SFO-HS3	2015	AWP	Large	NA	Y	18	4
SJC	Norman Y. Mineta San Jose International Airport, San Jose, California	Approach end of RWY 30R	SJC-28	2015	AWP	Medium	NA	Y	5	2
SJC	Norman Y. Mineta San Jose International Airport, San Jose, California	Approach end of RWY 30L	SJC-29	2015	AWP	Medium	NA	Y	4	2
SLC	Salt Lake City International Airport, Salt Lake City, Utah	RWY 35 / RWY 32 / TWY K1 / TWY M intersection	SLC-HS1	2015	ANM	Large	NA	Y	39	11
SLC	Salt Lake City International Airport, Salt Lake City, Utah	RWY 34R-16L / 14-32 / TWY Q intersection	SLC-HS2	2016	ANM	Large	NA	Y	12	3
SNA	John Wayne-Orange County Airport, Santa Ana, California	TWY L between RWY 20L and 20R approach ends	SNA-03	2015	AWP	Medium	NA	Y	6	2

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
SNA	John Wayne-Orange County Airport, Santa Ana, California	TWY L entrance to RWY 20L	SNA-HS1	2015	AWP	Medium	NA	Y	15	3
SPI	Abraham Lincoln Capital Airport, Springfield, Illinois	RWY 13-31 / 18-36 / 4-22 intersections	SPI-HS1	2015	AGL	Non-Hub Primary	NA	Y	7	3
STS	Charles M. Schulz - Sonoma County Airport, Santa Rosa, California	TWY A / approach path of RWY 20	STS-08	2016	AWP	Non-Hub Primary	NA	Y	17	7
STS	Charles M. Schulz - Sonoma County Airport, Santa Rosa, California	Run-up area east of TWY A, TWY H at approach end of RWY 20, TWY A3 at RWY 14/32	STS-HS3	2017	AWP	Non-Hub Primary	NA	Y	15	6
STS	Charles M. Schulz - Sonoma County Airport, Santa Rosa, California	Intersection of RWY 14/32 and 2/20	STS-HS4	2019	AWP	Non-Hub Primary	NA	Y	16	6
TIW	Tacoma Narrows Airport, Tacoma, Washington	Hold bar at TWY A4 for Runway 35	TIW-02	2021	ANM	General Aviation	Regional	N	6	5
TMB	Miami Executive Airport, Miami, Florida	RWY 31 / TWYs E, H intersection	TMB-HS1	2015	ASO	Reliever	National	N	15	3
TOA	Zamperini Field, Torrance, California	Hold bar on TWY H at RWY 29L approach	TOA-HS1	2020	AWP	Reliever	Regional	N	10	3
TUS	Tucson International Airport, Tucson, Arizona	RWY 29R approach end	TUS-03	2015	AWP	Small	NA	Y	18	4

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPIAS ¹ Hub Classification	Asset Category	Part 139 ²	Cumulative RI	Peak CY Annual RI
TUS	Tucson International Airport, Tucson, Arizona	TWY D between RWYs 11L and 11R	TUS-HS2	2015	AWP	Small	NA	Y	49	10
TYR	Tyler Pounds Regional Airport, Tyler, Texas	Hold bar on TWY F at approach end of RWY 22	TYR-HS2	2020	ASW	Non-Hub Primary	NA	Y	6	5
UAO	Aurora State Airport, Aurora, Oregon	TWY A1 at RWY 17 approach end	UAO-HS1	2018	ANM	General Aviation	National	N	9	5
VGT	North Las Vegas Airport, Las Vegas, Nevada	TWY F / G at RWY 7 approach end	VGT-HS1	2016	AWP	Reliever	NA	Y	58	12
VGT	North Las Vegas Airport, Las Vegas, Nevada	RWY 12R / TWY G	VGT-HS2	2015	AWP	Reliever	NA	Y	33	7

**APPENDIX B—LOCATION DESCRIPTIONS OF RUNWAY INCURSION MITIGATION
LOCATIONS REMOVED FROM INVENTORY**

Table B-1 shows the location descriptions of runway incursion mitigation (RIM)-mitigated locations by year.

Table B-1. The RIM-Mitigated Locations By Year

FY	Airport Identifier	Airport Name	Location Description
2015	CLT	Charlotte/Douglas International Airport, Charlotte, North Carolina	Hold short bar on TWY D at intersection with RWY 5/23 (south of runway)
	FDK	Frederick Municipal Airport, Frederick, Maryland	Intersection of TWY A and RWY 12/30
2016	APA	Centennial Airport, Denver, Colorado	TWY A1 hold short bar at approach end of RWY 17L
	MDW	Chicago Midway International Airport, Chicago, Illinois	Hold short bar on TWYs E1, E2, and E3 at approach end of RWY 31C
	CRP	Corpus Christi International Airport, Corpus Christi, Texas	Hold short bars on taxiways at approach ends of RWY 31 and RWY 36
	RNO	Reno/Tahoe International Airport, Reno, Nevada	Hold short bar on TWY J, east of RWY 16L/34R
	SBA	Santa Barbara Municipal Airport, Santa Barbara, California	TWY C between approach ends of RWY 15R and RWY 15L
2017	DWH	David Wayne Hooks Memorial Airport, Houston, Texas	Intersection of TWY D, TWY E, and approach end of RWY 17L
	DWH	David Wayne Hooks Memorial Airport, Houston, Texas	Intersection of RWY 17R/35L and TWY E
	FXE	Fort Lauderdale Executive Airport, Fort Lauderdale, Florida	Intersection of RWY 27 and TWY C
	FXE	Fort Lauderdale Executive Airport, Fort Lauderdale, Florida	TWYs E, J, L, and P at the approach end of RWY 9
	FXE	Fort Lauderdale Executive Airport, Fort Lauderdale, Florida	Intersection of RWY 13/31 and TWY A
	CRQ	McClellan-Palomar Airport, Carlsbad, California	Hold short bar on TWY A1 at intersection with approach end of RWY 24
	PBI	Palm Beach International Airport, West Palm Beach, Florida	Intersection of RWY 10R and TWY S
	PBI	Palm Beach International Airport, West Palm Beach, Florida	Intersection of RWY 10L and TWY L
	PHL	Philadelphia International Airport, Philadelphia, Pennsylvania	Hold short bar on TWY D (north side of runway) at intersection with RWY 9L/22R
	PHL	Philadelphia International Airport, Philadelphia, Pennsylvania	Intersection of TWY D and the approach end of RWY 8
ACT	Waco Regional Airport, Waco, Texas	Approach end of RWY 32	
2018	ABQ	Albuquerque International Sunport, Albuquerque, New Mexico	Approach ends of RWY 8 and RWY 12
	DAB	Daytona Beach International Airport, Daytona, Florida	Intersection of RWY 7L/25R and TWY P5
	PRC	Ernest A. Love Field Airport, Prescott, Arizona	Hold short bar at intersection of RWY 3R/21L and TWY C2 and E

FY	Airport Identifier	Airport Name	Location Description
	ISM	Kissimmee Gateway Airport, Orlando, Florida	Intersection of RWY 15/33 and TWY B
	SMO	Santa Monica Municipal Airport, Santa Monica, California	TWY B at approach end of RWY 21
	SEA	Seattle-Tacoma International Airport, Seattle, Washington	Hold short bars on TWY F at intersection with RWY 16C/34C
	SEA	Seattle-Tacoma International Airport, Seattle, Washington	Hold short bar on TWY Q for RWY 16L/34R
	HUF	Terre Haute Regional Airport, Terre Haute, Indiana	Hold short bar for TWY D at approach end of RWY 14 and former RWY 18
	MLU	Monroe Regional Airport, Monroe, Louisiana	Hold bar on TWY A between RWY 14 and RWY 18
	TUL	Tulsa International Airport, Tulsa, Oklahoma	Intersection of RWY 8/26 and TWY C, J, and K
2019	LOU	Bowman Field Airport, Louisville, Kentucky	Hold short bar on TWY J at the intersection with RWY 6/24
	FTY	Fulton County Airport-Brown Field, Atlanta, Georgia	Intersection of RWY 8/26 and TWY K
	LGB	Long Beach Airport/Daugherty Field, Long Beach, California	Intersection of approach end of RWY 26L and TWYs D and F
	MHT	Manchester-Boston Regional Airport, Manchester, New Hampshire	Hold short bars on TWYs P and U at intersection with approach end of RWY 35
	TMB	Miami Executive Airport, Miami, Florida	Hold short bar on TWY A at approach end of RWY 9L
	MIA	Miami International Airport, Miami, Florida	Intersection of RWY 8R/26L and TWY M5
	MIA	Miami International Airport, Miami, Florida	TWY T8 between RWY 12/30 and RWY 9/27
	MAF	Midland International Air and Space Port Airport, Midland, Texas	Hold short bar on TWY A at approach end of RWY 10
	SFB	Orlando Sanford International Airport, Orlando, Florida	Hold short bar on RWY 18/36 south of RWY 9R
	SFB	Orlando Sanford International Airport, Orlando, Florida	TWY R under approach path for RWY 9R
	DVT	Phoenix Deer Valley Airport, Phoenix, Arizona	Hold short bar at intersection of TWY A4 and approach end of RWY 7L
	SRQ	Sarasota/Bradenton International Airport, Sarasota/Bradenton, Florida	Intersections of RWY 4/22; RWY 14/32; and TWYs A, B, C, and D
	MQY	Smyrna Airport, Smyrna, Tennessee	Convergence of TWYs B, C, and D at the approach end of RWY 19
	VNY	Van Nuys Airport	TWY C and approach end of RWY 16L
2020	ADS	Addison Airport, Dallas, Texas	TWY A north connector to RWY 15 end
	ADS	Addison Airport, Dallas, Texas	Intersection of TWY G and RWY 15
	ADS	Addison Airport, Dallas, Texas	Intersection of TWY C and RWY 33
	ATL	Hartsfield-Jackson Atlanta International Airport, Atlanta, Georgia	Hold bar on TWY D at intersection with RWY 9L/27R (south of runway)
	ATL	Hartsfield-Jackson Atlanta International Airport, Atlanta, Georgia	Intersection of TWY C and D at RWY 8R/26L
	CXO	Conroe-North Houston Regional Airport, Houston, Texas	Intersection of TWY J and RWY 14/32 (eastbound)
	DAL	Dallas Love Field Airport, Dallas, Texas	Intersection of TWYs B5, B6 and RWY 13L/31R

FY	Airport Identifier	Airport Name	Location Description
	FCM	Flying Cloud Airport, Minneapolis, Minnesota	Hold bar on TWY C at approach end of RWY 28R from north FBO Ramp
	IWA	Phoenix-Mesa Gateway Airport, Phoenix, Arizona	Intersection of TWYs V and K and RWY 12R/30L
	JNU	Juneau International Airport, Juneau, Alaska	Intersection of TWY D and RWY 8/26
	LGB	Long Beach Airport/Daugherty Field, Long Beach, California	TWY J-D / RWY 8R-26L / RWY 12-30 Intersection
	MIC	Crystal Airport, Minneapolis, Minnesota	Hold bars on TWY E4 between approach ends of RWY 14L and 14R
	ORD	Chicago O'Hare International Airport, Chicago, Illinois	The north portion of TWY T (Former RWY 14R/32L) within the approach area of RWY 9R/27L
	ORL	Orlando Executive Airport, Orlando, Florida	Intersection of TWY E4 and RWY 7/25
	PAO	Palo Alto Airport, Palo Alto, California	Intersection of RWY 31 and TWY A
	PDK	DeKalb-Peachtree Airport, Atlanta, Georgia	Intersection of RWY 21R and TWY G
	PDK	DeKalb-Peachtree Airport, Atlanta, Georgia	Intersection of RWY 3L and TWY A
	RNO	Reno/Tahoe International Airport, Reno, Nevada	RWY 34L threshold
	RNO	Reno/Tahoe International Airport, Reno, Nevada	Intersection of TWY C and TWY L
	TEB	Teterboro Airport, Teterboro, New Jersey	TWY B between RWY 19 and RWY 24
2021	CLE	Cleveland Hopkins International Airport, Cleveland, Ohio	Intersection of TWY R, TWY A, and TWY L
	DSM	Des Moines International Airport, Des Moines, Iowa	Intersection of TWY P and RWY 13/31
	HNL	Honolulu International Airport, Honolulu, Hawaii	TWY E between RWY 4L/22R and RWY 4R/22L
	HNL	Honolulu International Airport, Honolulu, Hawaii	TWY D between RWY 4L/22R and RWY 4R/22L
	HNL	Honolulu International Airport, Honolulu, Hawaii	TWY F between RWY 4L/22R and RWY 4R/22L
	HNL	Honolulu International Airport, Honolulu, Hawaii	Intersection of TWY F and RWY 4R/22L
	IDA	Idaho Falls Regional Airport, Idaho Falls, Idaho	Approach ends of RWY 17 and RWY 21
	LAX	Los Angeles International Airport, Los Angeles, California	Intersection of TWY F and RWY 7L/25R and RWY 7R/25L
	LGB	Long Beach Airport/Daugherty Field, Long Beach, California	Intersection of TWYs B, D and K between RWY 8L/26R and RWY 12/30
	MRI	Merrill Field Airport, Anchorage, Alaska	Intersection of TWY C and RWY 7/25
	PHX	Phoenix Sky Harbor International Airport, Phoenix, Arizona	Landing threshold of RWY 25R
	SNA	John Wayne Airport-Orange County Airport	TWY H between RWY 2L/20R and RWY 22 approach
	TEB	Teterboro Airport, Teterboro, New York	Intersection of TWY L and RWY 6/24

RWY-Runway
TWY-Taxiway

APPENDIX C—RUNWAY INCURSION MITIGATION LOCATIONS REMOVED
FROM INVENTORY

Table C-1 shows the summary of runway incursion mitigation (RIM)-mitigated locations, runway incursion (RI) pilot deviation (PD) and vehicle/pedestrian deviation (V/PD) totals for years 2007 to 2020, RI totals before and after mitigation, and average RIs per year before and after mitigation. Locations mitigated in fiscal year 2021 are highlighted in the Date Complete column. In the RI Totals Per Year column, red represents years with no mitigation in place, yellow represents year of mitigation, and green represents years after mitigation in place.

Table C-1. The RIM-Mitigated Locations Summary

Color Legend

Years Prior to Mitigation	Year Mitigation Was Completed	Years After Mitigation Was Completed

RIM-Mitigated Locations					Runway Incursion (PD & V/PD) Totals Per Year														Runway Incursion (PD & V/PD) Totals		Average Runway Incursions (PD & V/PD) Per Year	
Region	Airport Name	Identifier	Mitigation Type	Date Complete	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
AAL	Juneau International Airport	JNU-01	Taxiway/Runway Geometry Reconfiguration	08/05/2020	0	0	1	0	0	3	1	2	2	0	0	1	0	1	11	0	0.86	NA ¹
AAL	Merrill Field Airport	MRI-13	Taxiway/Runway Geometry Reconfiguration	10/05/2020	0	2	1	4	0	0	0	4	1	2	0	0	0	1	15	0	1.15	N/A ¹
ACE	Des Moines International Airport	DSM-HS2	Taxiway/Runway Geometry Reconfiguration	10/30/2020	1	0	1	1	0	0	0	1	0	3	2	0	0	1	10	0	0.76	N/A ¹
AEA	Frederick Municipal Airport	FDK-HS3	Signage, Marking, and/or Lighting	07/10/2015	0	0	0	0	0	0	0	1	4	0	0	0	0	1	5	1	0.64	0.18
AEA	Philadelphia International Airport	PHL-01	Signage, Marking, and/or Lighting; Operational/Procedural	07/27/2017	0	0	2	0	2	1	1	0	0	0	1	0	0	0	6	1	0.61	0.29
AEA	Philadelphia International Airport	PHL-HS1	Signage, Marking, and/or Lighting; Taxiway/Runway Geometry Reconfiguration	08/24/2017	1	2	1	1	0	1	0	0	0	1	0	0	0	0	7	0	0.71	0

¹ Post-mitigation period is not long enough to provide a meaningful average that reflects the result of mitigation efforts.

RIM-Mitigated Locations					Runway Incursion (PD & V/PD) Totals Per Year														Runway Incursion (PD & V/PD) Totals		Average Runway Incursions (PD & V/PD) Per Year		
Region	Airport Name	Identifier	Mitigation Type	Date Complete	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
AEA	Teterboro Airport	TEB-HS1-2019	Taxiway/Runway Geometry Reconfiguration	11/22/2019	0	0	0	0	1	3	1	1	0	0	1	1	0	0	8	0	0.66	N/A ¹	
AEA	Teterboro Airport	TEB-HS1-2021	Signage, Marking, and/or Lighting	06/01/2021	0	0	0	0	1	1	1	0	1	0	3	1	0	0	8	N/A ²	0.60	N/A ¹	
AGL	Cleveland Hopkins International Airport	CLE-HS2	Taxiway/Runway Geometry Reconfiguration	11/02/2020	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0.38	N/A ¹	
AGL	Flying Cloud Airport	FCM-HS2	Taxiway/Runway Geometry Reconfiguration	08/27/2020	0	0	2	0	1	0	0	1	0	1	6	0	0	0	11	0	0.85	N/A ¹	
AGL	Terre Haute Regional Airport	HUF-HS1	Taxiway/Runway Geometry Reconfiguration	12/10/2017	0	0	0	0	0	0	2	0	1	8	0	0	0	0	11	0	1.08	0	
AGL	Chicago Midway International Airport	MDW-03	Signage, Marking, and/or Lighting	05/09/2016	0	0	1	0	0	3	0	1	0	0	0	0	1	0	5	1	0.58	0.22	
AGL	Crystal Airport	MIC-HS6	Taxiway/Runway Geometry Reconfiguration	08/25/2020	0	1	1	4	4	1	2	0	0	1	2	2	1	1	20	0	1.55	N/A ¹	
AGL	Chicago O'Hare International Airport	ORD-73	Taxiway/Runway Geometry Reconfiguration	06/01/2020	0	0	0	0	0	0	1	0	6	0	1	1	1	0	10	0	0.79	N/A ¹	

² Post-mitigation runway incursion data are not yet available for mitigations implemented in calendar year 2021.

RIM-Mitigated Locations					Runway Incursion (PD & V/PD) Totals Per Year												Runway Incursion (PD & V/PD) Totals		Average Runway Incursions (PD & V/PD) Per Year				
Region	Airport Name	Identifier	Mitigation Type	Date Complete	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
ANE	Manchester Airport	MHT-HS2	Taxiway/Runway Geometry Reconfiguration	09/24/2019	2	1	1	0	1	1	0	0	0	0	0	0	0	0	0	6	0	0.50	N/A ¹
ANM	Centennial Airport	APA-HS1	Taxiway/Runway Geometry Reconfiguration; Other	03/09/2016	0	3	2	2	3	1	2	1	4	0	1	1	2	1	1	18	5	2.13	1.04
ANM	Idaho Falls Regional Airport	IDA-HS2	Taxiway/Runway Geometry Reconfiguration	06/21/2021	1	0	1	0	0	4	1	0	0	1	0	1	2	0	1	11	0	0.83	N/A ¹
ANM	Seattle-Tacoma International Airport	SEA-26	Operational/Procedural	08/10/2018	0	1	0	1	0	0	0	4	0	0	0	0	1	0	0	6	1	0.55	N/A ¹
ANM	Seattle-Tacoma International Airport	SEA-HS1	Signage, Marking, and/or Lighting	04/29/2018	0	1	2	2	0	1	1	1	0	0	0	1	0	0	0	8	1	0.76	N/A ¹
ASO	Hartsfield Jackson Atlanta International Airport	ATL-18	Operational/Procedural	05/29/2020	0	1	0	1	0	3	0	0	0	0	0	2	0	0	0	7	0	0.55	N/A ¹
ASO	Hartsfield Jackson Atlanta International Airport	ATL-HS2	Operational/Procedural	05/29/2020	2	5	4	3	2	3	2	3	2	3	4	3	2	0	0	38	0	3.00	N/A ¹
ASO	Charlotte/Douglas International Airport	CLT-06	Operational/Procedural; Signage, Markings, and/or Lighting	06/18/2015	0	0	0	0	4	0	1	0	0	0	0	0	0	0	0	5	0	0.65	0

RIM-Mitigated Locations					Runway Incursion (PD & V/PD) Totals Per Year												Runway Incursion (PD & V/PD) Totals		Average Runway Incursions (PD & V/PD) Per Year			
Region	Airport Name	Identifier	Mitigation Type	Date Complete	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
ASO	Daytona Beach International Airport	DAB-02	Taxiway/Runway Geometry Reconfiguration	08/04/2018	0	0	1	0	0	0	3	1	0	0	0	0	0	0	5	0	0.46	N/A ¹
ASO	Fulton County Airport/Brown Field	FTY-04	Taxiway/Runway Geometry Reconfiguration	09/01/2019	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4	0	0.34	N/A ¹
ASO	Fort Lauderdale Executive Airport	FXE-08	Signage, Markings, and/or Lighting	02/16/2017	0	1	0	3	0	0	0	0	0	0	0	0	0	0	4	0	0.43	0
ASO	Fort Lauderdale Executive Airport	FXE-HS1	Signage, Markings, and/or Lighting	02/16/2017	0	2	1	1	0	3	3	3	4	0	0	1	4	0	17	5	1.81	1.29
ASO	Fort Lauderdale Executive Airport	FXE-HS3	Signage, Markings, and/or Lighting	02/16/2017	0	0	1	0	3	0	5	1	1	2	0	0	1	1	13	2	1.38	0.52
ASO	Kissimmee Gateway Airport	ISM-02	Signage, Markings, and/or Lighting	07/31/2018	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3	0	0.28	N/A ¹
ASO	Bowman Field Airport	LOU-01	Signage, Markings, and/or Lighting	05/01/2019	0	0	1	0	3	1	0	0	0	0	0	0	0	0	5	0	0.43	N/A ¹
ASO	Miami International Airport	MIA-HS1	Taxiway/Runway Geometry Reconfiguration; Signage, Marking, and/or Lighting	11/16/2018	0	3	0	0	1	0	0	1	0	0	0	0	0	0	5	0	0.45	N/A ¹

RIM-Mitigated Locations					Runway Incursion (PD & V/PD) Totals Per Year												Runway Incursion (PD & V/PD) Totals		Average Runway Incursions (PD & V/PD) Per Year			
Region	Airport Name	Identifier	Mitigation Type	Date Complete	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
ASO	Miami International Airport	MIA-HS3	Taxiway/Runway Geometry Reconfiguration	8/16/2019	0	0	0	4	3	0	0	2	0	0	0	1	0	0	10	0	0.84	N/A ¹
ASO	Smyrna Airport	MQY-HS3	Signage, Marking, and/or Lighting	05/29/2019	0	0	0	0	1	4	2	0	1	0	3	8	2	0	19	2	1.63	N/A ¹
ASO	Orlando Executive Airport	ORL-01	Taxiway/Runway Geometry Reconfiguration	05/06/2020	0	3	0	0	3	0	1	1	0	1	2	3	2	0	16	0	1.27	N/A ¹
ASO	Palm Beach International Airport	PBI-02	Taxiway/Runway Geometry Reconfiguration; Signage, Markings, and/or Lighting	09/01/2017	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0.30	0
ASO	Palm Beach International Airport	PBI-HS1	Signage, Markings, and/or Lighting	02/03/2017	1	1	1	0	0	2	5	0	0	0	1	0	1	0	10	2	1.07	0.51
ASO	DeKalb Peachtree Airport	PDK-HS1	Signage, Markings and/or Lighting	12/31/2019	0	3	4	1	1	0	1	3	2	0	1	1	0	0	17	0	1.39	N/A ¹
ASO	DeKalb Peachtree Airport	PDK-HS3	Signage, Markings and/or Lighting	12/31/2019	0	0	4	1	1	0	1	0	0	1	1	0	0	1	9	1	0.73	N/A ¹
ASO	Orlando Sanford International Airport	SFB-05	Taxiway/Runway Geometry Reconfiguration	10/15/2018	0	0	1	0	1	2	2	0	1	0	1	0	0	0	8	0	0.72	N/A ¹
ASO	Orlando Sanford International Airport	SFB-HS2	Taxiway/Runway Geometry Reconfiguration	10/15/2018	0	3	1	0	1	3	0	2	5	2	0	0	0	0	17	0	1.54	N/A ¹

RIM-Mitigated Locations					Runway Incursion (PD & V/PD) Totals Per Year												Runway Incursion (PD & V/PD) Totals		Average Runway Incursions (PD & V/PD) Per Year			
Region	Airport Name	Identifier	Mitigation Type	Date Complete	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
ASO	Sarasota/Bradenton International Airport	SRQ-HS1	Taxiway/Runway Geometric Reconfiguration, Signage, Marking, and/or Lighting Change(s), Technological Enhancements	08/08/2019	0	0	0	1	2	5	7	2	2	7	5	3	6	0	39	1	3.29	N/A ¹
ASO	Miami Executive Airport	TMB-04	Taxiway/Runway Geometry Reconfiguration; Signage, Marking, and/or Lighting Change(s)	03/29/2019	0	0	0	1	0	3	2	2	4	3	2	4	0	0	21	0	1.83	N/A ¹
ASW	Albuquerque International Sunport	ABQ-HS1	Taxiway/Runway Geometry Reconfiguration	05/11/2018	0	1	0	2	1	2	2	2	1	0	0	2	1	0	12	2	1.13	N/A ¹
ASW	Waco Regional Airport	ACT-04	Taxiway/Runway Geometry Reconfiguration; Operational/Procedural	10/10/2016	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0.11	0
ASW	Addison Airport	ADS-HS1	Operational/Procedural	11/11/2019	0	3	5	4	5	2	3	0	2	2	2	1	1	1	29	2	2.39	N/A ¹
ASW	Addison Airport	ADS-HS4	Operational/Procedural	11/11/2019	0	0	0	1	1	0	9	0	0	0	0	0	0	0	11	0	0.91	N/A ¹
ASW	Addison Airport	ADS-HS8	Operational/Procedural	11/11/2019	1	1	0	1	2	1	0	0	1	0	0	0	0	0	7	0	0.58	N/A ¹
ASW	Corpus Christi International Airport	CRP-HS1	Taxiway/Runway Geometry Reconfiguration	05/26/2016	0	1	6	2	2	2	1	1	0	0	0	0	0	0	15	0	1.73	0

RIM-Mitigated Locations					Runway Incursion (PD & V/PD) Totals Per Year												Runway Incursion (PD & V/PD) Totals		Average Runway Incursions (PD & V/PD) Per Year			
Region	Airport Name	Identifier	Mitigation Type	Date Complete	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
ASW	Conroe-North Houston Regional Airport	CXO-02	Signage, Markings, and/or Lighting	09/14/2020	0	0	0	0	4	1	0	0	0	0	0	0	0	0	5	0	0.39	N/A ¹
ASW	Dallas Love Field Airport	DAL-33	Taxiway/Runway Geometry Reconfiguration	10/31/2019	0	0	1	0	3	0	3	2	0	0	0	1	0	0	10	0	0.83	N/A ¹
ASW	David Wayne Hooks Memorial Airport	DWH-HS2	Signage, Markings, and/or Lighting; Operational/Procedural; Taxiway/Runway Geometry Reconfiguration	12/31/2016	1	0	1	1	1	1	6	5	15	9	0	0	0	0	40	0	4.32	0
ASW	David Wayne Hooks Memorial Airport	DWH-HS3	Signage, Markings, and/or Lighting	12/31/2016	0	1	0	2	0	1	1	3	6	0	3	3	4	1	14	11	1.51	2.75
ASW	Midland International Air and Space Port Airport	MAF-HS2	Taxiway/Runway Geometry Reconfiguration	01/01/2019	0	1	0	0	6	1	1	0	1	2	1	0	0	0	13	0	1.15	N/A ¹
ASW	Monroe Regional Airport	MLU-HS1	Taxiway/Runway Geometry Reconfiguration	05/04/2018	1	0	0	4	0	0	0	0	0	1	0	0	1	0	6	1	0.57	N/A ¹
ASW	Tulsa International Airport	TUL-HS1	Taxiway/Runway Geometry Reconfiguration	08/01/2018	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0.28	N/A ¹

RIM-Mitigated Locations					Runway Incursion (PD & V/PD) Totals Per Year														Runway Incursion (PD & V/PD) Totals		Average Runway Incursions (PD & V/PD) Per Year	
Region	Airport Name	Identifier	Mitigation Type	Date Complete	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
AWP	McClellan-Palomar Airport	CRQ-03	Signage, Marking, and/or Lighting	03/31/2017	0	1	1	2	0	1	2	0	2	5	1	1	2	0	14	4	1.47	1.06
AWP	Phoenix Deer Valley Airport	DVT-12	Taxiway/Runway Geometry Reconfiguration	05/07/2019	0	0	0	1	2	3	0	1	2	3	0	1	0	2	13	2	1.12	N/A ¹
AWP	Honolulu International Airport	HNL-01	Signage, Marking, and/or Lighting	07/02/2021	0	0	1	1	0	1	2	0	2	3	1	0	0	1	12	N/A ²	0.90	N/A ¹
AWP	Honolulu International Airport	HNL-02	Signage, Marking, and/or Lighting	07/02/2021	0	0	1	0	1	4	2	2	3	2	2	2	0	0	19	N/A ²	1.43	N/A ¹
AWP	Honolulu International Airport	HNL-HS6	Signage, Marking, and/or Lighting	07/02/2021	0	0	1	0	0	1	0	4	3	1	2	0	2	0	14	N/A ²	1.06	N/A ¹
AWP	Honolulu International Airport	HNL-36	Signage, Marking, and/or Lighting	07/02/2021	0	0	0	0	0	1	0	0	1	3	0	4	1	0	10	N/A ²	0.75	N/A ¹
AWP	Phoenix-Mesa-Gateway Airport	IWA-16	Taxiway/Runway Geometry Reconfiguration	07/16/2020	1	1	3	0	1	1	2	0	0	0	1	3	0	0	13	0	1.02	N/A ¹
AWP	Los Angeles International Airport	LAX-HS3	Signage, Marking, and/or Lighting	08/08/2021	3	1	3	1	2	3	1	3	3	5	2	1	6	2	36	N/A ²	2.71	N/A ¹
AWP	Long Beach Airport (Daugherty Field)	LGB-HS1	Taxiway/Runway Geometry Reconfiguration	12/29/2020	0	1	0	0	0	1	0	0	0	0	2	3	0	0	7	0	0.53	N/A ¹

RIM-Mitigated Locations					Runway Incursion (PD & V/PD) Totals Per Year												Runway Incursion (PD & V/PD) Totals		Average Runway Incursions (PD & V/PD) Per Year				
Region	Airport Name	Identifier	Mitigation Type	Date Complete	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
AWP	Long Beach Airport (Daugherty Field)	LGB-HS3	Taxiway/Runway Geometry Reconfiguration	09/15/2020	0	2	3	2	0	0	1	1	1	1	1	0	0	1		13	0	1.00	N/A ¹
AWP	Long Beach Airport (Daugherty Field)	LGB-35	Taxiway/Runway Geometry Reconfiguration	10/11/2018	0	0	1	1	0	1	4	0	0	0	1	0	0	0		8	0	0.72	N/A ¹
AWP	Palo Alto Airport	PAO-01	Taxiway/Runway Geometry Reconfiguration	12/31/2019	0	5	0	3	1	2	1	5	4	7	7	4	5	1		44	1	3.59	N/A ¹
AWP	Phoenix Sky Harbor International Airport	PHX-02	Technological Enhancements	08/26/2021	0	2	0	1	0	1	1	0	0	0	0	1	0	0		6	0	0.45	N/A ¹
AWP	Ernest A. Love Field Airport	PRC-HS2	Taxiway/Runway Geometry Reconfiguration	08/31/2018	0	0	2	0	0	3	2	1	2	1	0	1	0	0		12	0	1.10	N/A ¹
AWP	Reno/Tahoe International Airport	RNO-11	Taxiway/Runway Geometry Reconfiguration; Signage, Markings, and/or Lighting	05/31/2016	0	0	0	0	0	0	0	0	5	0	0	0	0	0		5	0	0.58	0
AWP	Reno/Tahoe International Airport	RNO-18	Taxiway/Runway Geometry Reconfiguration	09/11/2020	0	0	0	0	0	0	0	1	5	1	2	2	2	2		13	2	1.00	N/A ¹
AWP	Reno/Tahoe International Airport	RNO-HS2	Taxiway/Runway Geometry Reconfiguration	07/11/2020	0	0	0	1	0	0	0	2	4	5	3	0	2	0		17	0	1.33	N/A ¹

RIM-Mitigated Locations					Runway Incursion (PD & V/PD) Totals Per Year														Runway Incursion (PD & V/PD) Totals		Average Runway Incursions (PD & V/PD) Per Year	
Region	Airport Name	Identifier	Mitigation Type	Date Complete	2 0 0 7	2 0 0 8	2 0 0 9	2 0 1 0	2 0 1 1	2 0 1 2	2 0 1 3	2 0 1 4	2 0 1 5	2 0 1 6	2 0 1 7	2 0 1 8	2 0 1 9	2 0 2 0	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
AWP	Santa Barbara Municipal Airport	SBA-17	Signage, Marking, and/or Lighting	05/18/2016	0	3	1	2	1	1	0	0	0	0	0	1	0	1	8	2	0.93	0.43
AWP	Santa Monica Municipal Airport	SMO-02	Taxiway/Runway Geometry Reconfiguration	12/22/2017	0	0	0	0	0	3	3	5	3	5	1	1	0	0	20	1	1.95	0.33
AWP	John Wayne Airport-Orange County Airport	SNA-HS2	Signage, Marking, and/or Lighting	04/03/2021	0	1	1	0	0	1	0	4	0	6	0	1	0	0	14	N/A ²	1.06	N/A ¹
AWP	Van Nuys Airport	VNY-02	Signage, Marking, and/or Lighting	03/31/2019	0	1	0	0	0	1	2	4	1	0	2	0	0	0	11	0	0.96	N/A ¹
																			931	51	1.09	0.43