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Runway Incursion Mitigation Fiscal Year 2020 Annual Summary Report

April 2021

Final Report

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16. Abstract 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.” These occurrences, including wrong runway landings and takeoffs, remain a top airport safety concern for the FAA. Research shows that airport geometry can contribute to RIs. The FAA provides airports with guidance on recommended taxiway layouts in both Advisory Circular 150/5300-13 and Engineering Brief Number 75. Airport layouts not conforming to these recommendations may lead to pilot confusion and ultimately, RIs. The FAA launched the Runway Incursion Mitigation (RIM) program in fiscal year (FY) 2015 in an effort to mitigate the nonstandard geometry factors present at airport locations that experienced a high number of RIs. The FAA maintains a RIM program database updated on an annual basis, including only towered airports. During each annual update, all RIs (pilot deviation (PD) and vehicle/pedestrian deviation (V/PD)) and surface incidents from the previous calendar year (CY), including wrong surface landings and takeoffs, are georeferenced in the geographic information system database. An annual review of the layout of each airport determines if locations with previously identified nonstandard geometry characteristics have changed and/or been mitigated. New locations with nonstandard geometry characteristics are also identified. If a location has three or more RIs that occur in a CY, or cumulative incursion counts that average one or more RIs per year of data analyzed, it is considered for inclusion in the RIM inventory. Since the 2019 database update, cumulative incursion analyses are limited to the previous 10 calendar years of available RI data (e.g., 2010-2019). This report captures the RIM program summary through FY2020, annual updates, and current inventory. Since initiation of the RIM program in FY2015, a total of 7,826 RIs (PD and V/PD) and 185 nonstandard geometry locations were added to the database, bringing the total to 12,925 RIs and 6,286 nonstandard geometry locations. At the end of FY2020, there were 134 locations in the RIM inventory at 79 airports and 63 locations mitigated since the program’s inception. Airports utilized a variety of mitigation strategies to eliminate the problematic geometry characteristics or reduce their effect at these locations. Mitigation strategies include modifications to airport geometry, changes to lighting, markings, or signage, or changes to procedures or operations.					
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LIST OF ACRONYMS

AC	Advisory Circular
ARP	Office of Airports
CY	Calendar year
EB	Engineering Brief
FAA	Federal Aviation Administration
FY	Fiscal year
GIS	Geographic information system
HQ	Headquarters
ILS	Instrument Landing System
PD	Pilot deviation
PTG	Problematic taxiway geometry
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 Airport, 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
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	Mc Clellan-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	Mc Allen Miller International Airport, Mc Allen, 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
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

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.” These occurrences, including wrong runway landings and takeoffs, remain a top airport safety concern for the FAA. Research shows that airport geometry can contribute to RIs. As a result, the FAA provides airports with guidance on recommended taxiway layouts in both Advisory Circular 150/5300-13 “Airport Design” and Engineering Brief Number 75, “Incorporation of Runway Incursion Prevention into Taxiway and Apron Design.” Airport layouts not conforming to these recommendations may lead to pilot confusion and ultimately, RIs.

In fiscal year (FY) 2012, the FAA Office of Airports initiated a research study to identify and geographically locate areas at airports with nonstandard geometry. This effort developed a geographic information system (GIS) database including a graphical interface of airport locations with nonstandard geometry, also known as problematic taxiway geometry (PTG) locations, all pilot deviation (PD) and vehicle/pedestrian deviation (V/PD) RIs, including wrong runway events, surface incidents, airport diagrams and information, and hot spots. The initial study and field verification process identified 140 locations with a high incidence of RIs using data from October 1, 2007 to September 30, 2013 after studying 5,099 RI reports. As a result, the FAA launched the Runway Incursion Mitigation (RIM) program in FY2015 in an effort to mitigate the nonstandard geometry factors present at these locations and ultimately reduce the number of RIs.

Updated annually, the RIM program database only includes towered airports. During each annual update, all RIs and surface incidents (PD and V/PD) from the previous calendar year (CY), including wrong surface landings and takeoffs, are georeferenced in the GIS database. An annual review of the layout of each airport determines if locations with previously identified nonstandard geometry characteristics have changed and/or been mitigated. New locations with nonstandard geometry characteristics are also identified. If a location has three or more RIs that occur in a calendar year or cumulative incursion counts that average one or more RIs per year of data analyzed, it is considered for inclusion in the RIM inventory. Since the 2019 database update, cumulative incursion analyses are limited to the previous 10 calendar years of available RI data (e.g., 2010-2019). FAA staff then performs a series of reviews and validation of the data to determine which locations ultimately go into the inventory.

This report captures the RIM program summary through FY2020, annual updates, and current inventory. Since initiation of the RIM program in FY2015, 7,826 RIs (PD and V/PD) and 185 nonstandard geometry locations were added to the database, bringing the total to 12,925 RIs and 6,286 nonstandard geometry locations. At the end of FY2020, there were 134 locations in the RIM inventory at 79 airports and 63 locations mitigated through the program. The number of PTG locations decreased by 54 in FY2019 due to mitigation of nonstandard geometry characteristics through various projects unrelated to RIM. Airports use a variety of mitigation strategies to eliminate the problematic geometry characteristics or reduce their effect at these locations. Mitigation strategies include modifications to airport geometry; changes to lighting, markings, or signage; or changes to procedures or operations.

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. Several studies in recent years have linked confusing airport geometry with these incursions.

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 or 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 to airports in how 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” (FAA, 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, 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 in an effort to mitigate the nonstandard geometry factors present at these locations and ultimately reduce the number of RIs. The FAA maintains a RIM program website, which can be accessed at https://www.faa.gov/airports/special_programs/rim/ (FAA, 2020).

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 updated every 28 days, when applicable.

All RIs and surface incidents categorized as V/PDs or PDs by the FAA Office of Runway Safety are included for each airport in the database. This includes wrong runway landings and takeoffs. On an annual basis, the database incorporates new data. This update process 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 changed and/or mitigated. 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 19 nonstandard geometry characteristics below are categorized as 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 (i.e., nonsequential taxiway designation schemes, absence of full-length parallel taxiway, taxiway intersection along the middle third of a runway, etc.)

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 the criteria considered as a potential new

RIM location. 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 a 10-year period to reflect the recognition that much can change in an airport operating environment over long periods of time (operational procedures, activity profiles, fleet mix, airfield redesign, etc.).

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 annually.

The purpose of field validation, which occurs after each annual database update and typically lasts approximately 2 months, 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 (i.e., construction activity, air shows, other special events, etc.) and whether mitigations are underway, is considered. 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 (2020). Figure 1 provides a summary of the annual database update process, which typically begins in January and ends in September.

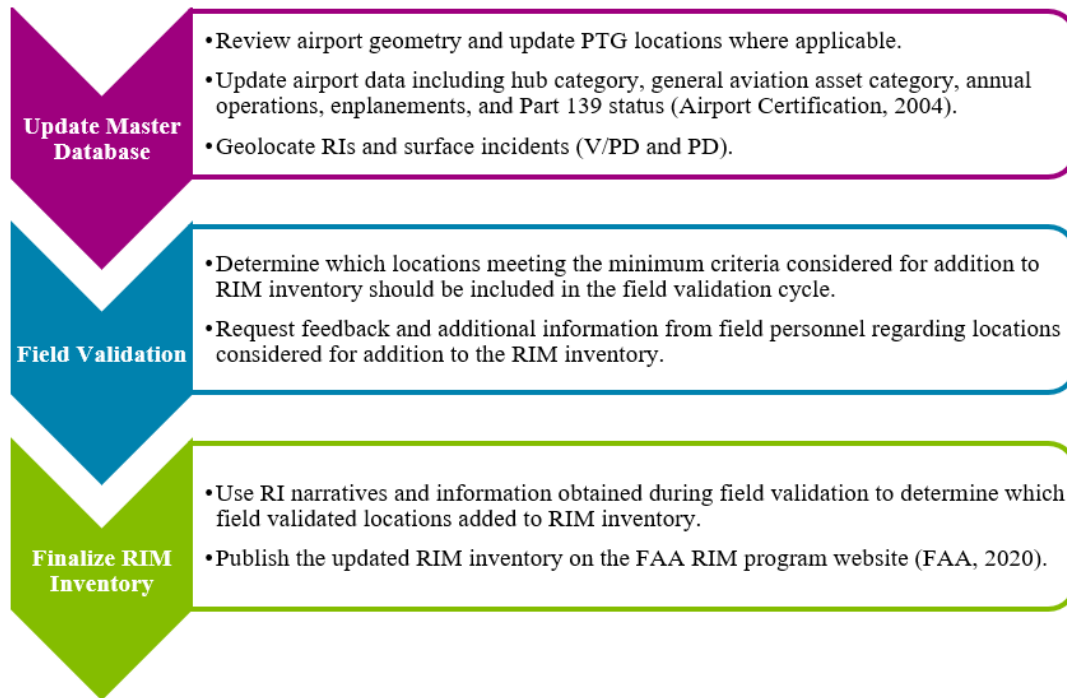


Figure 1. The RIM Database Update Process

Incursion incidence at RIM locations has been statistically analyzed to assess differences between RIM locations that have been mitigated and locations that have not. Analysis of incursion data through 2019 indicates a median annual incursion rate at non-mitigated locations of 0.72 and a median annual incursion rate of 0.14 incursions at mitigated locations. These estimates were calculated to be statistically significant using a confidence level of 95%. Details regarding the method of analysis and statistical techniques deployed are described in the referenced memorandum.

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 tool. RI and GIS data are updated in the tool annually. FAA users update information (mitigation progress, etc.) related to specific RIM locations as necessary.

2.1 The FY2015–FY2020 Program Summary

The RIM database has undergone six annual updates since the completion of the PTG study, which was initiated in FY2012 and completed in FY2015. These updates added a total of 7,826 RIs and 185 PTG locations to the database. The updates, with the exception of the FY2015 update, involved the previous CY’s RI data. The FY2015 update included CY2014 RIs as well as incursions from October, November, and December 2013, which were not included in the original study. Six field validation cycles coincided with these annual database updates. These cycles were completed in

July 2015, December 2016, July 2017, July 2018, July 2019, and July 2020. These validation cycles added 97 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. 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 that were mitigated per fiscal year. This figure represents additions since the initial FY12 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 2020.

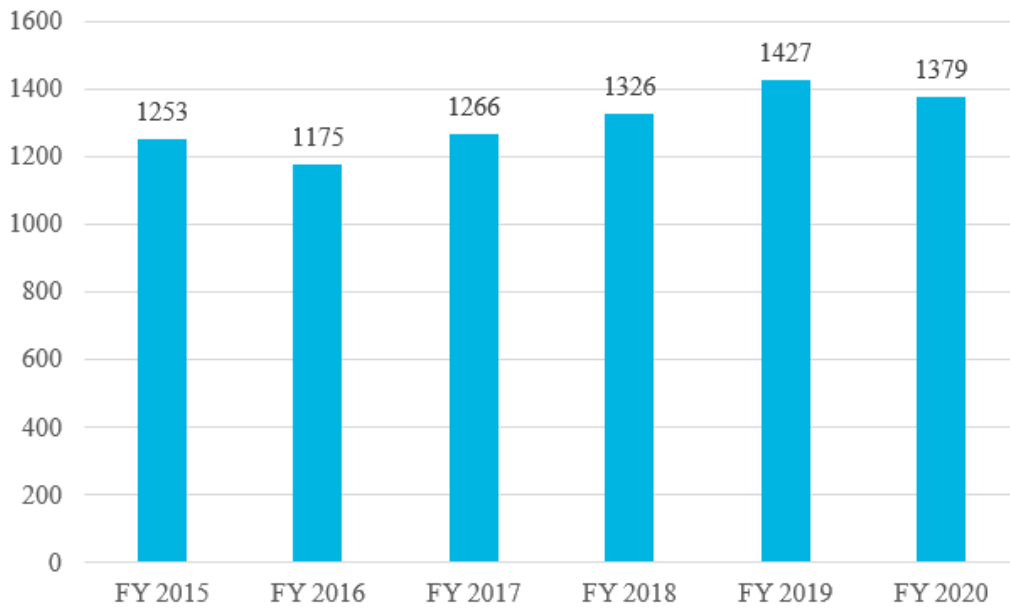


Figure 2. The RIs Added to RIM Database With Each Update

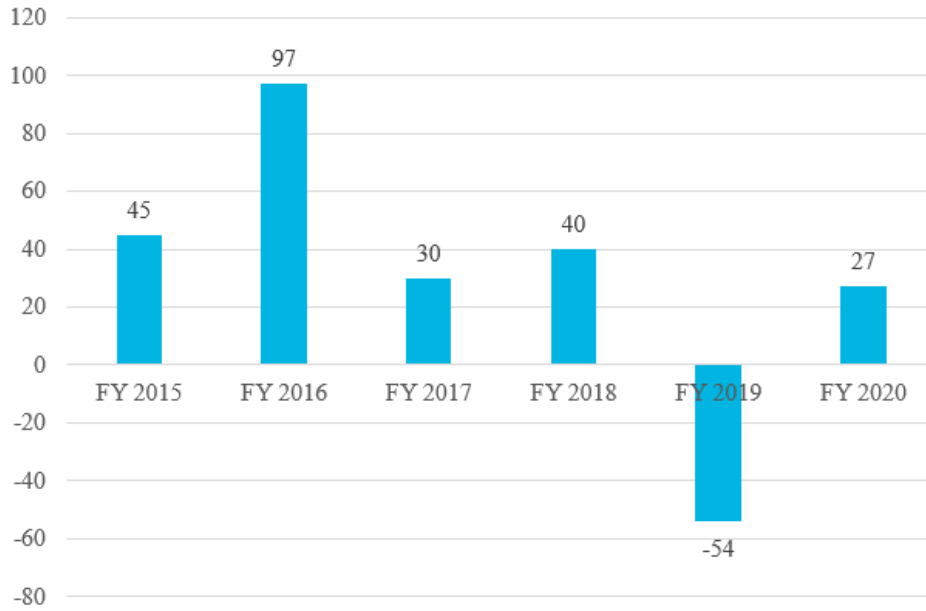


Figure 3. The PTG Locations Added to RIM Database With Each Update

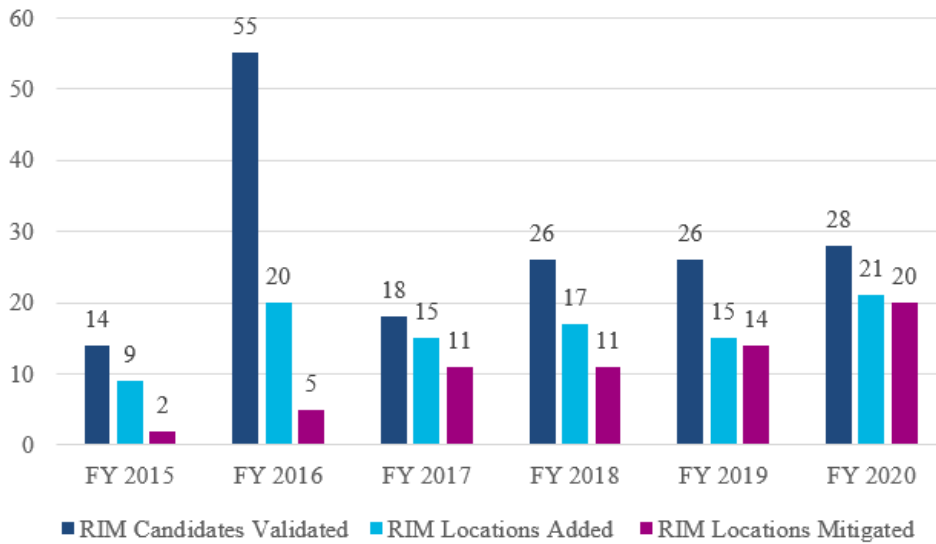


Figure 4. The RIM Locations Added/Mitigated Per FY

2.2 The FY2020 Program Update

The FY2020 RIM database update was completed in September 2020. With this update, 1,379 RIs from CY2019 were analyzed and georeferenced. This increased the overall number of RIs in the database to 12,925. These incursions occurred at 520 towered airports between FY2008 and the

end of CY2019. Due to the mitigation of nonstandard geometry characteristics at various locations, the count of PTG locations decreased by 54 in FY2019. For example, if an airport project eliminated nonstandard geometry characteristics at a PTG location, it was removed from the PTG count.

Analysis of RI counts identified 54 PTG locations that met the minimum criteria for entry into the RIM inventory. Of these locations, 28 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, 21 PTG locations were added to the RIM inventory in FY2020. Table 1 lists these 21 locations and provides relevant details such as location, peak year RI counts, and cumulative RI counts during the past 10 years. Due to CY2019 RI counts, two locations (indicated by an asterisk in table 1) returned to the RIM inventory in FY2020 for additional mitigation action.

Table 1. The FY2020 New RIM Locations: Summary Data

Airport Name	Airport Identifier	Location Description	Peak Year RI Count	Cumulative ¹ RI Count
Centennial Airport, Denver, Colorado*	APA	Hot Spot 4: Hold bar on TWY B8 at intersection with RWY 17L/35R	8	29
Aurora Municipal Airport, Chicago/Aurora, Illinois	ARR	Hold bar on TWY A3 at intersection with RWY 9/27	3	4
Boeing Field King County International Airport, Seattle, Washington	BFI	Hot Spot 1: Hold bar on TWY Z parallel to approach end of RWY 14R	3	4
Rocky Mountain Metropolitan Airport, Denver, Colorado	BJC	Hold bar on RWY 3 at intersection with RWY 12R/30L (south of runway)	3	5
Boise Air Terminal/ Gowen Field, Boise, Idaho	BOI	Intersection of TWYs F, B3 and RWY 10R/28L	3	4
Akron-Canton Regional Airport, Akron, Ohio	CAK	Hot Spot 1: Intersection of TWYs H, J and RWY 1/19 (west of runway)	3	4
Jacksonville Executive at Craig Airport, Jacksonville, Florida	CRG	Hold bar at intersection of TWYs C and E and approach ends of RWYs 23 and 32	3	4
Columbus Airport, Columbus, Georgia	CSG	Hot Spot 1: Convergence of TWYs A, C, and D at the intersection of RWYs 13/31 and 6/24	4	4
Dallas Love Field Airport, Dallas, Texas*	DAL	Hot Spot 2: Hold bar on TWY C parallel to approach end of RWY 13R	6	24
Flying Cloud Airport, Minneapolis, Minnesota	FCM	Hot Spot 6: Approach runway ends of RWY 10L and 10R	2	10
Grand Canyon National Park Airport, Grand Canyon, Arizona	GCN	Hot Spot 1: Hold bars on TWYs A and B at approach end of RWY 21	5	13
Henderson Executive Airport, Las Vegas, Nevada	HND	Hot Spot 2: Hold bar on TWY E at intersection with RWY 17R/35L	3	5

Table 1. The FY2020 New RIM Locations: Summary Data (Continued)

Airport Name	Airport Identifier	Location Description	Peak Year RI Count	Cumulative ¹ RI Count
Hayward Executive Airport, Hayward, California	HWD	Hold bar on TWY Z1 parallel to approach end of RWY 28L	3	7
Mc Allen Miller International Airport, Texas	MFE	Hot Spot 1: Hold bar on TWY A at approach end of RWY 14	4	10
Miami International Airport, Miami, Florida	MIA	TWY L1 between approach ends of RWYs 8L and 8R	3	3
Merrill Field Airport, Anchorage, Alaska	MRI	Hold bar on TWY K north of approach end of RWY 25	3	10
Miami-Opa Locka Executive Airport, Miami, Florida	OPF	Hold bar on TWYs T1 and T2 at approach end of RWY 12	3	6
Chicago O'Hare International Airport, Chicago, Illinois	ORD	Hot Spot 1: Intersection of TWYs B, G, A1, and RWYs 4L/22R and 9R/27L	6	10
Palm Beach International Airport, West Palm Beach, Florida	PBI	Hold bar on TWY R parallel to approach end of RWY 10R	3	3
Zamperini Field, Torrance, California	TOA	Hot Spot 1: Hold bar on TWY H at RWY 29L approach	3	8
Tyler Pounds Regional Airport, Tyler, Texas	TYR	Hold bar on TWY F at approach end of RWY 22	5	7

* RIM locations mitigated previously but then returned to RIM inventory in FY2020 for additional mitigation.

¹ Incursion count to date from the previous 10 calendar years of available RI data (2010- 2019).

RWY–Runway

TWY–Taxiway

2.3 The RIM Inventory

At the end of FY2020, the RIM inventory consisted of 134 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 include:

- Daniel K. Inouye International Airport (HNL), Honolulu, Hawaii–8 RIM locations
- Chino Airport (CNO), Chino, California–5 RIM locations
- Montgomery-Gibbs Executive Airport (MYF), San Diego, California–5 RIM locations

The FAA categorizes airports with the greatest impact on system performance (having 1% of passenger enplanements or 0.75% 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	8
McCarran International Airport, Las Vegas, Nevada	LAS	1
Los Angeles International Airport, Los Angeles, California	LAX	2
Memphis International Airport, Memphis, Tennessee	MEM	1
Miami International Airport, Miami, Florida	MIA	2
Chicago O’Hare International Airport, Chicago, Illinois	ORD	1
Phoenix Sky Harbor International Airport, Phoenix, Arizona	PHX	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 FY2020 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, etc.) coordinate to determine the most appropriate mitigation strategies for the location. Upon selecting mitigation strategies, the project advances to the planning (and possibly environmental) and then design phases. Project details, such as funding sources, project timeline, and construction specifics, are determined during this time. If the mitigation is a capital improvement, the project then advances to the construction phase, during which the mitigation strategies are implemented. The 134 active RIM locations are in various stages of mitigation. Figure 5 provides a breakdown of RIM locations by mitigation milestone. As shown, 106 (79%) active RIM locations have initiated mitigation activities and are in the planning, design, or construction phases. Note that 11 of the 28 RIM locations with no project identified entered the RIM inventory in the fourth quarter of FY2020.

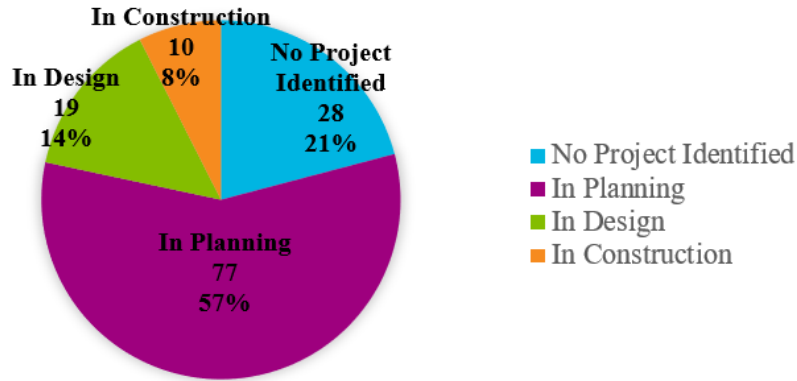


Figure 5. Status of Active RIM Locations

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 recommended taxiway layouts. 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
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), Notice to Airman (NOTAMs), and airport diagram notations • Discontinue use of runways as taxiways

FAA HQ and regional personnel monitor the mitigation progress for each active RIM location. After implementation of construction and other nonconstruction mitigation actions, FAA field personnel communicate that status to FAA HQ personnel. FAA HQ personnel review mitigation details to confirm the implemented mitigations are satisfactory. If so, the location is mitigated and removed from the RIM inventory. Data collection year to year provides monitoring to ensure the success of the mitigations.

At the end of FY2020, the RIM program mitigated 63 locations. Airports utilized a variety of mitigation strategies to eliminate the problematic geometry characteristics or reduce their effect at these locations. Table 4 shows the mitigated RIM locations by FY.

Table 4. Mitigated RIM Locations by FY

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

Table 4. Mitigated RIM Locations by FY (Continued)

FY	Airport Identifier	Airport Name	Location Description
2017	FXE	Fort Lauderdale Executive Airport, Fort Lauderdale, Florida	Intersection of RWY 13/31 and TWY A
	CRQ	Mc Clellan-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 Airport, 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
	ISM	Kissimmee Gateway Airport, Orlando, Florida	Intersection of RWY 15/33 and TWY B
	BJC	Rocky Mountain Metropolitan Airport, Denver, Colorado	Approach end of RWY 30R
	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

Table 4. Mitigated RIM Locations by FY (Continued)

FY	Airport Identifier	Airport Name	Location Description
2018	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

Table 4. Mitigated RIM Locations by FY (Continued)

FY	Airport Identifier	Airport Name	Location Description
2019	VNY	Van Nuys Airport, Van Nuys, California	Intersection of TWY C/B and approach end of RWY 16L (east of runway)
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
	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, 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	

Table 4. Mitigated RIM Locations by FY (Continued)

FY	Airport Identifier	Airport Name	Location Description
2020	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

RWY-Runway

TWY-Taxiway

The average annual number of RIs between FY2015 and FY2020 at the 63 RIM-mitigated locations decreased from 1.10 prior to mitigation to 0.49 after mitigation. The RIM-mitigated locations experienced a total of 763 RIs prior to mitigation, compared to 40 RIs after mitigation. Because these locations were mitigated relatively recently, within the last 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 B provides summary data for all RIM-mitigated locations.

4. CONCLUSION

In fiscal year (FY) 2015, the Federal Aviation Administration (FAA) launched a 15- to 20-year improvement program known as the Runway Incursion Mitigation (RIM) program. The goal of the RIM program is to identify locations at towered airports that have nonstandard geometry characteristics and a high occurrence of runway incursions (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 FY2020, there were 134 active RIM locations at 79 airports. Of these locations, 106 initiated mitigation activities and were in the planning, design, or construction phases. The RIM program has mitigated 63 locations since its inception. Mitigations eliminated hot spots from the airport diagrams at 15 of these locations. The FAA continues to monitor these locations to ensure the mitigations successfully reduce the number of RIs.

FAA Headquarters (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) 2019 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, except for locations validated this year (2020), which display RI data to date from the previous 10 calendar years of available RI data (2010 - 2019). 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 FY2020. 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 2020

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
APA	Centennial Airport, Denver, Colorado	Approach end of RWY 35R	APA-07	2019*	ANM	Reliever	National	N	11	4
<i>APA</i>	<i>Centennial Airport, Denver, Colorado</i>	<i>Hold bar on TWY B8 at intersection with RWY 17L/35R</i>	<i>APA-HS4</i>	<i>2020* (2016)</i>	<i>ANM</i>	<i>Reliever</i>	<i>National</i>	<i>N</i>	<i>29</i>	<i>8</i>
APA	Centennial Airport, Denver, Colorado	TWY C1 at approach end of RWY 10	APA-HS3	2015	ANM	Reliever	National	N	27	4
APC	Napa County Airport, Napa, California	Approach end of RWY 18R	APC-09	2019	AWP	Reliever	Regional	N	6	4
<i>ARR</i>	<i>Aurora Municipal Airport, Chicago, Illinois</i>	<i>Hold bar on TWY A3 at intersection with RWY 9/27</i>	<i>ARR-03</i>	<i>2020</i>	<i>AGL</i>	<i>Reliever</i>	<i>National</i>	<i>N</i>	<i>4</i>	<i>3</i>
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	13	4

Bold and italic rows are new RIM locations that were added to the inventory in FY2020.

Part 139 = Title 14 Code of Federal Regulations (CFR) Part 139

¹ NPAIS = National Plan of Integrated Airport System

² Airport Certification, 14 C.F.R §139 (2004).

* 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

N = No

NA = Not Applicable

ILS = Instrument Landing System

RWY = Runway

TWY = Taxiway

Y = Yes

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
ATL	Hartsfield-Jackson Atlanta International Airport, Atlanta, Georgia	RWY 8L - 26R / TWY C, D intersections	ATL-HS1	2015	ASO	Large	NA	Y	14	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
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	4	3
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
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	13	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
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	27	5
BOS	General Edward Lawrence Logan International Airport, Boston, Massachusetts	RWY 4R / 14 - 32 intersection	BOS-47	2015	ANE	Large	NA	Y	9	3
BTV	Burlington International Airport, Burlington, Vermont	Intersection of TWY C and RWY 1/19	BTV-HS2	2018	ANE	Small	NA	Y	9	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	9	4
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	4	3
CCR	Buchanan Field Airport, Concord, California	RWY 32R / TWY B intersection	CCR-HS4	2016	AWP	Reliever	National	Y	14	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

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
CLE	Cleveland Hopkins International Airport, Cleveland, Ohio	Five-point intersection of TWYs R, L, A, and RWY 6R/24L	CLE-HS2	2015	AGL	Medium	NA	Y	5	5
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	19	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	20	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-04	2020	ASO	Reliever	Regional	N	4	3
CSG	Columbus Airport, Columbus, Georgia	Convergence of TWYs A, C, and 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 bar on TWY C parallel to approach end of RWY 13R	DAL-HS2	2020* (2014)	ASW	Medium	NA	Y	24	6
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

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
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	35	12
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	20	4
DSM	Des Moines International Airport, Des Moines, Iowa	Intersection of RWY 13/31 and TWY P	DSM-HS2	2015	ACE	Small	NA	Y	9	3
DVT	Phoenix Deer Valley Airport, Phoenix, Arizona	Approach end of RWY 7R	DVT-07	2018	AWP	Reliever	National	N	9	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	43	7
DWH	David Wayne Hooks Memorial Airport, Houston, Texas	RWY 17R approach end	DWH-HS1	2015	ASW	Reliever	Regional	N	25	5
DWH	David Wayne Hooks Memorial Airport, Houston, Texas	Intersection of TWY G and RWY 17L/35R	DWH-HS4	2018	ASW	Reliever	Regional	N	12	5

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
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	3	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	6
FAT	Fresno Yosemite International Airport, Fresno, California	RWY 29R approach end	FAT-21	2016	AWP	Small	NA	Y	10	3
FCM	<i>Flying Cloud Airport, Minneapolis, Minnesota</i>	<i>Approach runway ends of RWY 10L and 10R</i>	<i>FCM-HS6</i>	2020	<i>AGL</i>	<i>Reliever</i>	<i>National</i>	<i>N</i>	<i>10</i>	<i>2</i>
FCM	Flying Cloud Airport, Minneapolis, Minnesota	RWY 28L approach end	FCM-HS1	2015	AGL	Reliever	National	N	19	4
FFZ	Falcon Field Airport, Mesa, Arizona	Hold position bar for RWY 4R/22L on TWY B	FFZ-01	2019	AWP	Reliever	Regional	N	14	3
FFZ	Falcon Field Airport, Mesa, Arizona	Approach end of RWY 22L	FFZ-13	2018	AWP	Reliever	Regional	N	18	3
GCN	<i>Grand Canyon National Park Airport, Grand Canyon, Arizona</i>	<i>Hold bars on TWYs A and B at approach end of RWY 21</i>	<i>GCN-HS1</i>	2020	<i>AWP</i>	<i>Non-Hub Primary</i>	<i>NA</i>	<i>Y</i>	<i>13</i>	<i>5</i>

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
GLS	Scholes International Airport, Galveston, Texas	RWY 18 / TWY E intersection	GLS-04	2015	ASW	Reliever	Regional	N	10	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	12	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	14	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	11	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	TWY E between RWYs 4L/22R & 4R/22L	HNL-01	2017	AWP	Large	NA	Y	11	3
HNL	Daniel K. Inouye International Airport, Honolulu, Hawaii	TWY D between RWYs 4L/22R & 4R/22L	HNL-02	2015	AWP	Large	NA	Y	19	4
HNL	Daniel K. Inouye International Airport, Honolulu, Hawaii	Approach end of RWY 4R	HNL-27	2017	AWP	Large	NA	Y	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
HNL	Daniel K. Inouye International Airport, Honolulu, Hawaii	Hold position bar for RWY 4R/22L on TWY F (south of runway)	HNL-36	2019	AWP	Large	NA	Y	10	4
HNL	Daniel K. Inouye International Airport, Honolulu, Hawaii	RWY 4L and 4R approach ends	HNL-HS1	2015	AWP	Large	NA	Y	9	3
HNL	Daniel K. Inouye International Airport, Honolulu, Hawaii	RWY 8L-26R / TWY E / TWY B	HNL-HS3	2016	AWP	Large	NA	Y	10	3
HNL	Daniel K. Inouye International Airport, Honolulu, Hawaii	RWY 8L approach / TWYs A, V, T, RB and M intersection	HNL-HS4	2015	AWP	Large	NA	Y	19	4
HNL	Daniel K. Inouye International Airport, Honolulu, Hawaii	TWYs E, D, & F between RWYs 4L/22R and 4R/22L	HNL-HS6	2017	AWP	Large	NA	Y	13	3
HOU	William P. Hobby Airport, Houston, Texas	RWY 17 TWY E entrance	HOU-01	2015	ASW	Medium	NA	Y	10	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	17	4
HWD	Hayward Executive Airport, Hayward, California	RWY 28L / TWY A1 intersection	HWD-HS5	2016	AWP	Reliever	National	N	40	13

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
HWD	Hayward Executive Airport, Hayward, California	Hold bar on TWY Z1 parallel to approach end of RWY 28L	HWD-04	2020	<i>AWP</i>	Reliever	National	<i>N</i>	7	3
IDA	Idaho Falls Regional Airport, Idaho Falls, Idaho	RWY 20 / RWY 17 approach ends	IDA-HS4	2016	ANM	Non-Hub Primary	NA	Y	11	4
IWA	Phoenix-Mesa Gateway Airport, Phoenix, Arizona	Approach end of RWY 12C	IWA-04	2015	AWP	Small	NA	Y	11	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	11	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	22	6
LAS	McCarran International Airport, Las Vegas, Nevada	RWY 8L/1L intersection	LAS-HS3	2015	AWP	Large	NA	Y	27	4
LAX	Los Angeles International Airport, Los Angeles, California	RWY 6R-24L / TWY AA intersection	LAX-HS1	2016	AWP	Large	NA	Y	29	6
LAX	Los Angeles International Airport, Los Angeles, California	RWY 7L-25R / 7R-25L / TWY F intersection	LAX-HS3	2016	AWP	Large	NA	Y	33	6
LGB	Long Beach Airport/ Daugherty Field, Long Beach, California	Intersection of TWY B, D, K and RWYs 8L/26R and 12/30	LGB-HS1	2019	AWP	Small	NA	Y	8	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
LVK	Livermore Municipal Airport, Livermore, California	RWY 25R / TWY B intersection	LVK-HS1	2015	AWP	Reliever	Regional	N	37	6
LVK	Livermore Municipal Airport, Livermore, California	RWY 25L / TWY C intersection	LVK-HS2	2015	AWP	Reliever	Regional	N	18	5
MEM	Memphis International Airport, Memphis, Tennessee	RWY 27 / TWY V2 intersection	MEM-01	2020	ASO	Small	NA	Y	3	3
<i>MFE</i>	<i>Mc Allen Miller International Airport, Mc Allen, Texas</i>	<i>Hold bar on TWY A at approach end of RWY 14</i>	<i>MFE-HS1</i>	2015	<i>ASW</i>	<i>Non-Hub Primary</i>	<i>NA</i>	<i>Y</i>	<i>10</i>	<i>4</i>
MHT	Manchester-Boston Regional Airport, Manchester, New Hampshire	RWY 17 / TWY H intersection	MHT-HS1	2015	ANE	Small	NA	Y	15	10
<i>MIA</i>	<i>Miami International Airport, Miami, Florida</i>	<i>TWY L1 between approach ends of RWYs 8L and 8R</i>	<i>MIA-24</i>	2020	<i>ASO</i>	<i>Large</i>	<i>NA</i>	<i>Y</i>	<i>3</i>	<i>3</i>
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	12	8
MRI	Merrill Field Airport, Anchorage, Alaska	RWY 7-25 / TWY C intersection	MRI-13	2015	AAL	Non-Hub Primary	NA	N	11	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
<i>MRI</i>	<i>Merrill Field Airport, Anchorage, Alaska</i>	<i>Hold bar on TWY K north of approach end of RWY 25</i>	<i>MRI-24</i>	2020	<i>AAL</i>	<i>Non-Hub Primary</i>	<i>NA</i>	<i>N</i>	<i>10</i>	<i>3</i>
MRI	Merrill Field Airport, Anchorage, Alaska	RWY 25 / TWY K intersection	MRI-25	2015	AAL	Non-Hub Primary	NA	N	13	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	13	3
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	12	6
MYF	Montgomery-Gibbs Executive Airport, San Diego, California	TWY F between RWYs 10L/28R and 10R/28L	MYF-HS2	2017	AWP	Reliever	Regional	N	11	9
MYF	Montgomery-Gibbs Executive Airport, San Diego, California	RWY 28L / TWY B intersection	MYF-HS3	2015	AWP	Reliever	Regional	N	20	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	22	11

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
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	5	4
<i>OPF</i>	<i>Miami-Opa Locka Executive Airport, Miami, Florida</i>	<i>Hold bar on TWYs T1 and T2 at approach end of RWY 12</i>	<i>OPF-20</i>	2020	<i>ASO</i>	<i>Reliever</i>	<i>National</i>	<i>N</i>	<i>6</i>	<i>3</i>
<i>ORD</i>	<i>Chicago O'Hare International Airport, Chicago, Illinois</i>	<i>Intersection of TWYs B, G, A1, and RWYs 4L/22R and 9R/27L</i>	<i>ORD-HS1</i>	2020	<i>AGL</i>	<i>Large</i>	<i>NA</i>	<i>Y</i>	<i>10</i>	<i>6</i>
<i>PBI</i>	<i>Palm Beach International Airport, West Palm Beach, Florida</i>	<i>Hold bar on TWY R parallel to approach end of RWY 10R</i>	<i>PBI-42</i>	2020	<i>ASO</i>	<i>Medium</i>	<i>NA</i>	<i>N</i>	<i>3</i>	<i>3</i>
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
PHX	Phoenix Sky Harbor International Airport, Phoenix, Arizona	Approach end of RWY 25R	PHX-02	2015	AWP	Large	NA	Y	6	2
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	9	3
PNS	Pensacola International Airport, Pensacola, Florida	Intersections of RWY 8/26, 17/35 and TWYs A, B, and D	PNS-HS1	2018	ASO	Small	NA	Y	18	5
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

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
PRC	Ernest A. Love Field Airport, Prescott, Arizona	RWY 3L approach end	PRC-HS2	2015	AWP	Non-Primary Commercial	Regional	Y	20	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	12	4
PSP	Palm Springs International Airport, Palm Springs, California	RWY 31R / TWY B intersection	PSP-HS3	2015	AWP	Small	NA	Y	13	4
RHV	Reid-Hillview Airport of Santa Clara County, San Jose, California	TWY E between RWY 13L and 13R	RHV-01	2015	AWP	Reliever	Regional	N	16	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	15	3
SAT	San Antonio International Airport, San Antonio, Texas	RWY 4-22 / 13R-31L intersection	SAT-HS1	2015	ASW	Medium	NA	Y	39	10
SAT	San Antonio International Airport, San Antonio, Texas	RWY 13R / TWY K intersection	SAT-05	2015	ASW	Medium	NA	Y	11	6
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

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
SFO	San Francisco International Airport, San Francisco, California	TWY T between RWY 10L-28R / RWY 10R-28L	SFO-HS3	2015	AWP	Large	NA	Y	17	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	6	3
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	33	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	13	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	7	3
SNA	John Wayne-Orange County Airport, Santa Ana, California	TWY L entrance to RWY 20L	SNA-HS1	2015	AWP	Medium	NA	Y	13	3
SNA	John Wayne-Orange County Airport, Santa Ana, California	TWY H between RWY 2L-20R and RWY 2R approach	SNA-HS2	2015	AWP	Medium	NA	Y	13	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
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	14	5
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	20	8
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	13	5
TEB	Teterboro Airport, Teterboro, New Jersey	Intersection of TWY L and RWY 6/24	TEB-HS1	2018	AEA	Reliever	National	Y	7	3
TMB	Miami Executive Airport, Miami, Florida	RWY 31 / TWY E, H intersection	TMB-HS1	2015	ASO	Reliever	National	N	12	3
TOA	Zamperini Field, Torrance, California	Hold bar on TWY H at RWY 29L approach	TOA-HS1	2020	AWP	Reliever	Regional	N	8	3
TUS	Tucson International Airport, Tucson, Arizona	RWY 29R approach end	TUS-03	2015	AWP	Small	NA	Y	14	4

Airport Identifier	Airport Name	Location	Location Identifier	Year Added to RIM	Region	NPAIS ³ Hub Classification	Asset Category	Part 139 ⁴	Cumulative RI	Peak CY Annual RI
TUS	Tucson International Airport, Tucson, Arizona	TWY D between RWY 11L and 11R	TUS-HS2	2015	AWP	Small	NA	Y	49	10
<i>TYR</i>	<i>Tyler Pounds Regional Airport, Tyler, Texas</i>	<i>Hold bar on TWY F at approach end of RWY 22</i>	<i>TYR-15</i>	2020	<i>ASW</i>	<i>Non-Hub Primary</i>	<i>NA</i>	<i>Y</i>	7	5
UAO	Aurora State Airport, Aurora, Oregon	TWY A1 at RWY 17 approach end	UAO-HS1	2018	ANM	General Aviation	National	N	8	5
VGT	North Las Vegas Airport, Las Vegas, Nevada	TWY F / G at RWY 7 approach end	VGT-HS1	2016	AWP	Reliever	NA	Y	52	12
VGT	North Las Vegas Airport, Las Vegas, Nevada	RWY 12R / TWY G	VGT-HS2	2015	AWP	Reliever	NA	Y	30	7

Bold and italic rows are new RIM locations that were added to the inventory in FY2020.

Part 139 = Title 14 Code of Federal Regulations (CFR) Part 139

³ NPAIS = National Plan of Integrated Airport System

⁴ Airport Certification, 14 C.F.R §139 (2004).

APPENDIX B—RUNWAY INCURSION MITIGATION LOCATIONS REMOVED
FROM INVENTORY

Table B-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 2019, RI totals before and after mitigation, and average RIs per year before and after mitigation. Locations mitigated in fiscal year 2020 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 B-1. The RIM-Mitigated Locations Summary

RIM-Mitigated Locations				RI (PD & V/PD) Totals Per Year												RI (PD & V/PD) Totals		Average RIs (PD & V/PD) Per Year			
Region	Identifier	Mitigation Type	Date Complete	2	2	2	2	2	2	2	2	2	2	2	2	2	2	Mitigation		Mitigation	
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Before	After
AAL	JNU-01	TWY/RWY Geometry Reconfiguration	08/05/2020	0	0	1	0	0	3	1	2	2	0	0	1	0	10	N/A ¹	0.78	N/A ²	
AEA	FDK-HS3	Signage, Marking, and/or Lighting	07/10/2015	0	0	0	0	0	0	0	1	4	0	0	0	0	5	0	0.64	0	
AEA	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	6	1	0.61	N/A ²	
AEA	PHL-HS1	Signage, Marking, and/or Lighting; TWY/RWY Geometry Reconfiguration	08/24/2017	1	2	1	1	0	1	0	0	0	1	0	0	0	7	0	0.71	N/A ²	
AEA	TEB-HS1	TWY/RWY Geometry Reconfiguration	11/22/2019	0	0	0	0	1	3	1	1	0	0	1	1	0	8	0	0.66	N/A ²	
AGL	FCM-HS2	TWY/RWY Geometry Reconfiguration	08/27/2020	0	0	2	0	1	0	0	1	0	1	6	0	0	11	N/A ¹	0.85	N/A ²	

¹ Post-mitigation RI data are not yet available for mitigations occurred in CY2020.

² Post-mitigation period is not long enough to provide a meaningful average incursion per year that can reflect the success of mitigation efforts.

RWY = Runway

TWY = Taxiway

RIM-Mitigated Locations				RI (PD & V/PD) Totals Per Year												RI (PD & V/PD) Totals		Average RIs (PD & V/PD) Per Year			
Region	Identifier	Mitigation Type	Date Complete	2	2	2	2	2	2	2	2	2	2	2	2	2	2	Mitigation		Mitigation	
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Before	After
				7	8	9	0	1	2	3	4	5	6	7	8	9					
AGL	HUF-HS1	TWY/RWY Geometry Reconfiguration	12/10/2017	0	0	0	0	0	0	2	0	1	8	0	0	0	11	0	1.08	N/A ²	
AGL	MDW-03	Signage, Marking, and/or Lighting	05/09/2016	0	0	1	0	0	3	0	1	0	0	0	0	1	5	1	0.58	0.27	
AGL	MIC-HS6	TWY/RWY Geometry Reconfiguration	08/25/2020	0	1	1	4	4	1	2	0	0	1	2	1	1	18	N/A ¹	1.39	N/A ²	
AGL	ORD-73	TWY/RWY Geometry Reconfiguration	06/01/2020	0	0	0	0	0	0	1	0	6	0	1	1	1	10	N/A ¹	0.79	N/A ²	
ANE	MHT-HS2	TWY/RWY Geometry Reconfiguration	09/24/2019	2	1	1	0	1	1	0	0	0	0	0	0	0	6	0	0.50	N/A ²	
ANM	APA-HS1	TWY/RWY Geometry Reconfiguration; Other	03/09/2016	0	3	2	2	3	1	2	1	4	0	1	1	2	18	4	2.13	1.05	
ANM	BJC-02	Operational/Procedural	05/23/2018	0	0	0	1	2	1	2	0	1	0	0	2	1	8	2	0.75	N/A ²	
ANM	SEA-26	Operational/Procedural	08/10/2018	0	1	0	1	0	0	0	4	0	0	0	0	1	6	1	0.55	N/A ²	
ANM	SEA-HS1	Signage, Marking, and/or Lighting	04/29/2018	0	1	2	2	0	1	1	1	0	0	0	1	0	8	1	0.76	N/A ²	
ASO	ATL-18	Operational/Procedural	05/29/2020	0	1	0	1	0	3	0	0	0	0	0	2	0	7	N/A ¹	0.55	N/A ²	

RIM-Mitigated Locations				RI (PD & V/PD) Totals Per Year												RI (PD & V/PD) Totals		Average RIs (PD & V/PD) Per Year			
Region	Identifier	Mitigation Type	Date Complete	2	2	2	2	2	2	2	2	2	2	2	2	2	2	Mitigation		Mitigation	
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Before	After	Before
ASO	ATL-HS2	Operational/ Procedural	05/29/2020	2	5	4	3	2	3	2	2	2	3	4	3	2	37	N/A ¹	2.92	N/A ²	
ASO	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	5	0	0.65	0	
ASO	DAB-02	TWY/RWY Geometry Reconfiguration	08/04/2018	0	0	1	0	1	0	3	1	0	0	0	0	0	6	0	0.55	N/A ²	
ASO	FTY-04	TWY/RWY Geometry Reconfiguration	09/01/2019	0	0	0	4	0	0	0	0	0	0	0	0	0	4	0	0.34	N/A ²	
ASO	FXE-08	Signage, Markings, and/or Lighting	02/16/2017	0	1	0	3	0	0	0	0	0	0	0	0	0	4	0	0.43	N/A ²	
ASO	FXE-HS1	Signage, Markings, and/or Lighting	02/16/2017	0	2	1	1	0	3	3	3	4	0	0	0	4	17	4	1.81	N/A ²	
ASO	FXE-HS3	Signage, Markings, and/or Lighting	02/16/2017	0	0	1	0	3	0	5	1	1	2	0	0	1	13	1	1.38	N/A ²	
ASO	ISM-02	Signage, Markings, and/or Lighting	07/31/2018	0	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0.28	N/A ²	
ASO	LOU-01	Signage, Markings, and/or Lighting	05/01/2019	0	0	1	0	3	1	0	0	0	0	0	0	0	5	0	0.43	N/A ²	
ASO	MIA-HS1	TWY/RWY Geometry Reconfiguration; Signage, Marking, and/or Lighting	11/16/2018	0	3	0	0	1	0	0	1	0	0	0	0	0	5	0	0.45	N/A ²	

RIM-Mitigated Locations				RI (PD & V/PD) Totals Per Year												RI (PD & V/PD) Totals		Average RIs (PD & V/PD) Per Year			
Region	Identifier	Mitigation Type	Date Complete	2	2	2	2	2	2	2	2	2	2	2	2	2	2	Mitigation		Mitigation	
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Before	After
ASO	MIA-HS3	TWY/RWY Geometry Reconfiguration	8/16/2019	0	0	0	4	3	0	0	2	0	0	0	1	0	10	0	0.84	N/A ²	
ASO	MQY-HS3	Signage, Marking, and/or Lighting	05/29/2019	0	0	0	0	1	4	2	0	1	0	3	8	2	19	2	1.63	N/A ²	
ASO	ORL-01	TWY/RWY Geometry Reconfiguration	05/06/2020	0	3	0	0	3	0	1	1	0	1	2	3	2	16	N/A ¹	1.27	N/A ²	
ASO	PBI-02	TWY/RWY Geometry Reconfiguration; Signage, Markings, and/or Lighting	09/01/2017	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0	0.30	N/A ²	
ASO	PBI-HS1	Signage, Markings, and/or Lighting	02/03/2017	1	1	1	0	0	2	5	0	0	0	1	0	1	10	2	1.07	N/A ²	
ASO	PDK-HS1	Signage, Markings and/or Lighting	12/31/2019	0	3	4	1	1	0	1	2	1	0	1	1	0	15	N/A ¹	1.22	N/A ²	
ASO	PDK-HS3	Signage, Markings and/or Lighting	12/31/2019	0	0	4	1	1	0	1	0	0	1	1	0	0	9	N/A ¹	0.73	N/A ²	
ASO	SFB-05	TWY/RWY Geometry Reconfiguration	10/15/2018	0	0	1	0	1	2	2	0	1	0	1	0	0	8	0	0.72	N/A ²	
ASO	SFB-HS2	TWY/RWY Geometry Reconfiguration	10/15/2018	0	3	1	0	1	3	0	2	5	2	0	0	0	17	0	1.54	N/A ²	

RIM-Mitigated Locations				RI (PD & V/PD) Totals Per Year												RI (PD & V/PD) Totals		Average RIs (PD & V/PD) Per Year			
Region	Identifier	Mitigation Type	Date Complete	2	2	2	2	2	2	2	2	2	2	2	2	2	2	Mitigation		Mitigation	
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Before	After	Before
ASO	SRQ-HS1	TWY/RWY 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	39	1	3.29	N/A ²	
ASO	TMB-04	TWY/RWY 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	21	0	1.83	N/A ²	
ASW	ABQ-HS1	TWY/RWY Geometry Reconfiguration	05/11/2018	0	1	0	2	1	2	2	2	1	0	0	2	1	12	2	1.13	N/A ²	
ASW	ACT-04	TWY/RWY Geometry Reconfiguration; Operational/Procedural	10/10/2016	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0.11	0	
ASW	ADS-HS1	Operational/Procedural	11/11/2019	0	3	5	4	5	2	3	0	2	2	2	1	1	29	1	2.39	N/A ²	
ASW	ADS-HS4	Operational/Procedural	11/11/2019	0	0	0	1	1	0	9	0	0	0	0	0	0	11	0	0.91	N/A ²	
ASW	ADS-HS8	Operational/Procedural	11/11/2019	1	1	0	1	2	1	0	0	1	0	0	0	0	7	0	0.58	N/A ²	

RIM-Mitigated Locations				RI (PD & V/PD) Totals Per Year												RI (PD & V/PD) Totals		Average RIs (PD & V/PD) Per Year			
Region	Identifier	Mitigation Type	Date Complete	2	2	2	2	2	2	2	2	2	2	2	2	2	2	Mitigation		Mitigation	
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Before	After	Before
ASW	CRP-HS1	TWY/RWY Geometry Reconfiguration	05/26/2016	0	1	6	2	2	2	1	1	0	0	0	0	0	15	0	1.73	0	
ASW	CXO-02	Signage, Markings, and/or Lighting	09/14/2020	0	0	0	0	4	1	0	0	0	0	0	0	0	5	N/A ¹	0.39	N/A ²	
ASW	DAL-33	TWY/RWY Geometry Reconfiguration	10/31/2019	0	0	1	0	3	0	3	2	0	0	0	1	0	10	0	0.83	N/A ²	
ASW	DWH-HS2	Signage, Markings, and/or Lighting; Operational/Procedural; TWY/RWY Geometry Reconfiguration	12/31/2016	1	0	1	1	1	1	7	5	1	9	1	0	1	40	2	4.32	0.67	
ASW	DWH-HS3	Signage, Markings, and/or Lighting	12/31/2016	0	1	0	2	0	1	0	3	7	0	2	3	3	14	8	1.51	2.67	
ASW	MAF-HS2	TWY/RWY Geometry Reconfiguration	01/01/2019	0	1	0	0	6	1	1	0	1	2	1	0	0	13	0	1.15	N/A ²	
ASW	MLU-HS1	TWY/RWY Geometry Reconfiguration	05/04/2018	1	0	0	4	0	0	0	0	0	1	0	0	1	6	1	0.57	N/A ²	
ASW	TUL-HS1	TWY/RWY Geometry Reconfiguration	08/01/2018	0	0	0	0	0	0	3	0	0	0	0	0	0	3	0	0.28	N/A ²	

RIM-Mitigated Locations				RI (PD & V/PD) Totals Per Year												RI (PD & V/PD) Totals		Average RIs (PD & V/PD) Per Year			
Region	Identifier	Mitigation Type	Date Complete	2	2	2	2	2	2	2	2	2	2	2	2	2	2	Mitigation		Mitigation	
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Before	After	Before
AWP	CRQ-03	Signage, Marking, and/or Lighting	03/31/2017	0	1	1	2	0	1	2	0	2	5	1	1	2	14	4	1.47	N/A ²	
AWP	DVT-12	TWY/RWY Geometry Reconfiguration	05/07/2019	0	0	0	1	2	3	0	1	1	3	0	1	0	12	0	1.03	N/A ²	
AWP	IWA-16	TWY/RWY Geometry Reconfiguration	07/16/2020	1	1	3	0	1	1	2	0	0	0	1	3	0	13	N/A ¹	1.02	N/A ²	
AWP	LGB-HS3	TWY/RWY Geometry Reconfiguration	09/15/2020	0	2	3	2	0	0	1	1	1	1	1	0	0	12	N/A ¹	0.93	N/A ²	
AWP	LGB-35	TWY/RWY Geometry Reconfiguration	10/11/2018	0	0	1	1	0	1	4	0	0	0	1	0	0	8	0	0.72	N/A ²	
AWP	PAO-01	Signage, Marking, and/or Lighting	12/31/2019	0	5	0	3	1	2	1	5	4	7	7	4	5	44	N/A ¹	3.59	N/A ²	
AWP	PRC-HS2	TWY/RWY Geometry Reconfiguration	08/31/2018	0	0	2	0	0	3	2	1	2	1	0	1	0	12	0	1.10	N/A ²	
AWP	RNO-11	TWY/RWY Geometry Reconfiguration; Signage, Markings, and/or Lighting	05/31/2016	0	0	0	0	0	0	0	0	5	0	0	0	0	5	0	0.58	0	
AWP	RNO-18	TWY/RWY Geometry Reconfiguration	09/11/2020	0	0	0	0	0	0	0	1	5	1	2	2	2	13	N/A ¹	1.00	N/A ²	

RIM-Mitigated Locations				RI (PD & V/PD) Totals Per Year														RI (PD & V/PD) Totals		Average RIs (PD & V/PD) Per Year	
Region	Identifier	Mitigation Type	Date Complete	2	2	2	2	2	2	2	2	2	2	2	2	2	2	Mitigation		Mitigation	
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Before	After	Before
AWP	RNO-HS2	TWY/RWY Geometry Reconfiguration	07/11/2020	0	0	0	1	0	0	0	2	4	5	3	0	2	17	N/A ¹	1.33	N/A ²	
AWP	SBA-17	Signage, Marking, and/or Lighting	05/18/2016	0	3	1	2	1	1	0	0	0	0	0	1	0	8	1	0.93	0.28	
AWP	SMO-02	TWY/RWY Geometry Reconfiguration	12/22/2017	0	0	0	0	0	3	3	5	3	5	1	1	0	20	1	1.95	N/A ²	
AWP	VNY-02	Signage, Marking, and/or Lighting	03/31/2019	0	1	0	0	0	1	2	3	0	0	2	0	0	9	0	0.78	N/A ²	
																		Total	Total	Average	Average
																		763	40	1.10	0.49