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AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP RESEARCH REPORT 190

Common Performance Metrics for Airport Infrastructure and Operational Planning

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AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

The need for ACRP was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). ACRP carries out applied research on problems that are shared by airport operating agencies and not being adequately addressed by existing federal research programs. ACRP is modeled after the successful National Cooperative Highway Research Program (NCHRP) and Transit Cooperative Research Program (TCRP). ACRP undertakes research and other technical activities in various airport subject areas, including design, construction, legal, maintenance, operations, safety, policy, planning, human resources, and administration. ACRP provides a forum where airport operators can cooperatively address common operational problems.

ACRP was authorized in December 2003 as part of the Vision 100—Century of Aviation Reauthorization Act. The primary participants in the ACRP are (1) an independent governing board, the ACRP Oversight Committee (AOC), appointed by the Secretary of the U.S. Department of Transportation with representation from airport operating agencies, other stakeholders, and relevant industry organizations such as the Airports Council International-North America (ACI-NA), the American Association of Airport Executives (AAAE), the National Association of State Aviation Officials (NASAO), Airlines for America (A4A), and the Airport Consultants Council (ACC) as vital links to the airport community; (2) TRB as program manager and secretariat for the governing board; and (3) the FAA as program sponsor. In October 2005, the FAA executed a contract with the National Academy of Sciences formally initiating the program.

ACRP benefits from the cooperation and participation of airport professionals, air carriers, shippers, state and local government officials, equipment and service suppliers, other airport users, and research organizations. Each of these participants has different interests and responsibilities, and each is an integral part of this cooperative research effort.

Research problem statements for ACRP are solicited periodically but may be submitted to TRB by anyone at any time. It is the responsibility of the AOC to formulate the research program by identifying the highest priority projects and defining funding levels and expected products.

Once selected, each ACRP project is assigned to an expert panel appointed by TRB. Panels include experienced practitioners and research specialists; heavy emphasis is placed on including airport professionals, the intended users of the research products. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, ACRP project panels serve voluntarily without compensation.

Primary emphasis is placed on disseminating ACRP results to the intended users of the research: airport operating agencies, service providers, and academic institutions. ACRP produces a series of research reports for use by airport operators, local agencies, the FAA, and other interested parties; industry associations may arrange for workshops, training aids, field visits, webinars, and other activities to ensure that results are implemented by airport industry practitioners.

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FOREWORD

By Theresia H. Schatz
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ACRP Research Report 190: Common Performance Metrics for Airport Infrastructure and Operational Planning is a reference guide to common performance metrics for airport infrastructure and operational planning. The guidance includes information on how to interpret these performance metrics that can be used for analysis among airports, airlines, and air traffic control. Information is provided on practical application and demonstration of the relationship between common metrics. This reference guide will be useful for airport operators and planners at a variety of airports/airport systems for improved efficiency and decision making. The Microsoft Excel-based Smart Guide, an interactive, easy-to-use reference guide, is available on the TRB website (www.trb.org).

Specific considerations included relevant aspects of NextGen; overall system issues and their impact on airport operations; benchmarking across airports; safety issues in surface movement; airport geometry and its impact on complexity of operations; gate management and ramp tower operations; and federal regulation reporting requirements.

The interaction between airports, airlines, and air traffic systems is evolving and increasing with overlapping projects related to new technologies, integrated operations, and infrastructure development. These include a variety of initiatives, for example: departure queue management, ramp tower operations and utilization, design of Performance Based Navigation (PBN) and other NextGen processes and integration with metroplex airspace, airport participation in the FAA/industry Collaborative Decision Making (CDM) process, and development of operational efficiencies to attract new service. For any initiative, performance and cost-benefit analyses are highly advisable and often used for planning purposes. To support these analyses, metrics are needed to perform accurate and worthwhile comparisons. ACRP Project 03-41 was designed to consider metrics that are currently in use or proposed by airports, air traffic control, and airlines [e.g., departure and arrival delays, passenger throughput, ASV (annual service volume), ADC (average daily capacity)] and to identify sources of information to develop the metrics [e.g., SWIM (system wide information management), gate management, ASPM (aviation system performance metrics), and BTS (Bureau of Transportation Statistics)]. This reference guide will help airports that have difficulty in evaluating the impacts on operations and will help establish an understanding or a uniform set of metrics that can be used for analysis among airports, airlines, and air traffic control.

Under ACRP Project 03-41, research was conducted by Booz Allen Hamilton, led by Barb Bottiger, in association with Embry Riddle Aeronautical University; Jviation, Inc.; Metron Aviation; and RFMarchi Aviation Consulting, Inc. The research was conducted using a three-phased approach that included input gathered from subject matter experts

on the Booz Allen team to develop preliminary drafts of the Reference Guide and initial concept for the Smart Guide. A literature review helped develop and refine a database of performance metrics. An advisory committee who was consulted on the performance metrics database validated the usefulness of the included performance metrics and recommended additional metrics. Benchmarking studies were also conducted to compare performance metrics amongst airports.

CONTENTS

Note: Photographs, figures, and tables in this report may have been converted from color to grayscale for printing. The electronic version of the report (posted on the web at www.trb.org) retains the color versions.

CHAPTER 1

Introduction to the Reference Guide and Smart Guide

The interaction between airports, airlines, and air traffic systems is evolving and increasing with overlapping projects related to new technologies, integrated and efficient operations, and infrastructure development. At present, airports have difficulty in evaluating the impacts of these projects on operations as there is not an established understanding or standard set of metrics that can be used for analysis among airports, airlines, and the Federal Aviation Administration (FAA).

In working to provide guidance on the most appropriate facilities to their stakeholders, airport operators constantly balance trade-offs when making decisions related to infrastructure development and operational planning initiatives. Performance metrics are an important component of the decision-making process and a means to enhance communication. Airports need metrics to measure their performance related to new technologies and procedures, to create organization goals, and to collaborate with airlines and the FAA. This requires airports to develop an increased understanding of the metrics used by the airlines and the FAA.

The purpose of this Reference Guide is to provide guidance on identifying and using performance metrics to evaluate topics—referred to as focus areas herein—where airports, the FAA, and airlines have shared interests.

Relevant Aspects of NextGen—Includes metrics to evaluate proposed NextGen (Next Generation Air Transportation System) procedures, how the procedures would affect airport operations, and what environmental effects would be expected.

Overall System Issues and Their Variability—Includes metrics to evaluate the impacts of system issues such as weather events and proposed changes in aircraft operations/schedules.

Safety Issues in Surface Movement—Includes metrics to measure surface movement safety and collaborate with FAA and the airlines to enhance safety.

Benchmarking across Airports—Includes metrics to compare operational efficiencies of airports and metrics needed to attract new air service.

Airport Geometry Impact on Operations—Includes metrics to measure the potential operational effects of changes in airport geometry including temporary closures for maintenance and proposed airfield improvements.

Gate Management and Ramp Tower Operations—Includes metrics related to gate management and ramp tower operations.

Regulations/Requirements—Includes performance metrics that airports are required to record or report per federal regulations and/or requirements including those administered by state and local agencies.

2 Common Performance Metrics for Airport Infrastructure and Operational Planning

The Reference Guide is accompanied by a Smart Guide, which is an easy-to-use Microsoft Excel-based tool. The Reference Guide introduces performance metrics, provides background information about each focus area, identifies performance metrics applicable to the focus areas, and presents detailed information about data sources and associated metrics. The Smart Guide is a tool that permits rapid access to information about a specific performance metric through search functions. The common component of both the Reference Guide and Smart Guide is the Performance Metrics Database.

The following sections highlight the contents of the Reference Guide, Smart Guide, and Performance Metrics Database and describe how and when to use each one.

1.1 How to Use the Reference Guide

The Reference Guide is structured to assist users in learning about performance metrics, particularly those that address performance in the focus areas. Users may refer to Chapter 2, Introduction to Performance Metrics, for basic information about performance metrics. To delve into the performance metrics associated with each of the focus areas, users may consult Chapter 3, Focus Area Performance Metrics. For information about data sources to derive metrics, users should refer to Chapter 4, Data Sources and Considerations.

The PDF version of the Reference Guide includes hyperlinks (underlined performance metric names) that take the user to the Performance Metrics Database in Appendix B. The user may click on these hyperlinks to access detailed information about the subject performance metric.

Reference Guide Structure

Chapter 1—Introduction to the Reference Guide and Smart Guide; provides background information and instructions on how and when to use the Reference Guide and accompanying Smart Guide.

Chapter 2—Introduction to Performance Metrics; defines performance metrics, explains use of performance metrics, and discusses types of metrics included in the Performance Metric Database.

Chapter 3—Focus Area Performance Metrics; provides background information on each focus area followed by a discussion of the related performance metrics.

Chapter 4—Data Sources and Considerations; reviews the data sources and includes guidance related to accessing the databases and considerations in using the data to support performance metrics.

Bibliography

Acronyms

Appendix A—Smart Guide Instructions.

Appendix B—Performance Metrics Database; provides detailed information about the individual performance metrics including definitions, guidance, and data sources.

Appendix C—List of ASPM Data Modules and their associated reports.

Measuring performance via metrics is a complex topic. Explaining differences, nuances, and commonalities in how the FAA, airports, and airlines apply each and every metric is beyond the scope of this guide. That said, users may review the detailed information in the Performance Metric Database to understand relationships between metrics.

The intent of the Reference Guide is to suggest metrics that may be useful in evaluating performance in the focus areas. The user must carefully select metrics based on their goals and consider perspectives and uses of similar terminology. For example, consider the metric, "Enplaned Passengers, Annual." If the user's goal is to track enplanements for terminal facility design, the total number of annual enplanements is useful. However, if the user is coordinating with the FAA regarding Airport Improvement Program funding, tracking only revenue enplanements is more useful. The FAA uses revenue enplanements to determine the amount of Airport Improvement Program passenger entitlement funds primary airports will receive.

1.2 How to Use the Smart Guide

The Smart Guide is a Microsoft Excel-based tool designed to quickly find information about a specific metric in the Performance Metrics Database. A user may search for a metric via the Smart Guide by keyword(s) or by exploring different metrics within the focus areas. Guidance on the use of the Smart Guide is included in Appendix A.

1.3 How to Use the Performance Metrics Database

The Performance Metrics Database in Appendix B contains detailed information about the performance metrics that are applicable to the focus areas. For each performance metric, the Performance Metrics Database includes the following fields:

Metric Category
Metric Sub-Category
Metric Name
Purpose of Metric & Description
User Information
Data Source
Weblink of Data Sources (if applicable)
Unit of Measurement
Guidance (if applicable)
Citation

The user may navigate to the detailed information about a particular metric by clicking on the performance metric hyperlink in the PDF version of the Reference Guide.

CHAPTER 2

Introduction to Performance Metrics

This chapter introduces users to performance metrics with an emphasis on those included in the Reference Guide and Smart Guide. Beginning with the definition of performance metrics, this chapter goes on to discuss uses and types of performance metrics. This chapter concludes with a discussion of the FAA harmonized performance metrics.[1]

2.1 Definition

Simply put, a performance metric is a standard for measuring performance. Other related terms include performance indicator and performance measure. For example, the International Civil Aviation Organization (ICAO) refers to performance metrics as performance indicators and defines them as "a tool for quantitatively measuring current, past and expected future performance, as well as the degree to which performance objectives are being met and should be met."[2] For the purposes of this Reference Guide, performance metrics are considered synonymous with performance indicators and performance measures.

2.2 Using Performance Metrics

Performance metrics are used to measure the output of a process or procedure.[3] By measuring output, an entity can determine how its performance has changed over time, how its performance compares to another entity's performance, and whether performance goals are being met. Performance metrics can be used to evaluate performance at any level: organizational, departmental, individual, or process. Regardless of level, measuring performance with metrics can be used to drive performance-based actions, enhance decision making, and facilitate communication.

2.2.1 Performance Measurement Systems

Performance may be evaluated using performance metrics via a performance measurement system. The goal of performance measurement systems is to achieve targeted performance levels, often through graphical and numerical information such as a performance dashboard or scorecard.[4] *ACRP Report 19: Developing an Airport Performance-Measurement System* and

[1] U.S. Federal Aviation Administration (FAA). "Operational Metrics." Accessed August 7, 2017. https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/.
[2] International Civil Aviation Organization (ICAO). *Airport Economics Manual,* 3rd ed. Montréal, Canada, 2013. https://www.icao.int/sustainability/Documents/Doc9562_en.pdf, p. APP 1–2.
[3] *ACRP Report 19: Developing an Airport Performance-Measurement System*. Washington, D.C., 2010, p. 17.
[4] Harbour, Jerry L. *The Basics of Performance Measurement*. New York, NY, 2009, p. 84.

ICAO's *Airport Economics Manual* provide guidance on developing airport-wide performance measurement systems.

Performance metrics are an integral component of performance measurement systems. Development of a performance measurement system includes selecting metrics to be measured, evaluated, and reported. Metrics are selected by first identifying key performance indicators (KPIs). KPIs measure the performance of the factors most critical to an organization's success.[5] To identify KPIs and select appropriate metrics, airports may refer to *ACRP Report 19A: Resource Guide to Airport Performance Indicators*, which provides an extensive list of airport performance indicators that support the development of an airport performance measurement system.

2.2.2 Benchmarking

Performance metrics are also used to compare or benchmark performance. Internal benchmarking occurs when an organization compares its performance metrics results over time. External or peer benchmarking occurs when an organization compares its performance to that of another organization. By nature, external benchmarking is more complex than internal benchmarking. In order to compare "apples to apples," the characteristics of the comparison organization must be considered. This is particularly true for airports.

When comparing one airport to another, some of the typical factors that drive different results and should be considered in making comparisons include passenger volume, capacity constraints, mix of international and domestic traffic, mix of local and transfer passengers, mix of passenger carrier service (network, low cost, charter), mix of passenger versus cargo activity, degree of outsourcing, range of services provided by the airport, airport development program status, weather conditions, geographic location, urban versus rural location, physical size of the airport, public transportation access and usage, regulatory environment, local labor conditions, and ownership and governance structure.[6]

More information about external benchmarking is provided in Section 3.4, *Benchmarking across Airports*.

2.2.3 Using the Performance Metrics Database

Thoughtful selection and use of the metrics in the Performance Metrics Database is necessary for multiple reasons. First, not all the metrics are applicable to all airports. Second, only some metrics are applicable to external benchmarking. Third, no one metric is the answer. Fourth, data are needed to derive metrics and thus it is important to consider the sources, parameters, and availability of data.

Depending on the airport's size and operating characteristics, some metrics in the Performance Metrics Database are more appropriate and/or useful than others when evaluating performance. Because not every airport is measuring the same processes or procedures, the performance metrics in the Performance Metrics Database are not universally appropriate and/or useful to all airports. For example, metrics such as Based Aircraft and Average Cost per Gallon Paid for Aviation Gasoline are obviously more useful for general aviation airports while Runway Occupancy Time and Average Gate Departure Delay are more useful and appropriate for congested commercial service airports.

Some metrics in the Performance Metrics Database are not good candidates for external benchmarking. Metrics like Noise Exposure are not useful for external benchmarking because

[5] Parmenter, David. *Key Performance Indicators: Developing, Implementing, and Using Winning KPIs*. Hoboken, NJ, 2015, p. 7.
[6] Wyman, Oliver. *ACI Guide to Airport Performance Measures*, Quebec, Canada, 2012, p. 2.

6 Common Performance Metrics for Airport Infrastructure and Operational Planning

each airport has unique circumstances when it comes to distances to noise sensitive resources. Metrics that are appropriate for external benchmarking are discussed in Section 3.4, *Benchmarking across Airports*.

No one metric in the Performance Metrics Database is intended to address measurement of all of the issues in a focus area. A combination of metrics is likely required to understand the issue. For example, considering Average Out-to-Off taxi time alone might not tell the whole story. It may be important to also consider Runway Usage to understand whether a reduction in Average Out-to-Off taxi time is due to change in runway use and not Wake Recategorization (Wake ReCat).

Data availability and applicability is an important factor when selecting metrics in the Performance Metrics Database. Data-related information including sources and guidance is provided in Chapter 4, Data Sources and Considerations.

The Performance Metrics Database includes a number of metrics for each of the focus areas. To assist the user in selecting metrics within a focus area, the metrics in the Performance Metrics Database are identified as primary and secondary. The identification of metrics as primary and secondary is somewhat subjective and is intended only to assist users in initially selecting metrics.

Primary—Metrics that are most useful in evaluating performance within a focus area.

Secondary—Metrics that may be useful in evaluating a certain aspect of a focus area. Secondary metrics include metrics that the FAA uses to measure system-wide performance in the focus area. While these metrics might not be applicable to a specific airport, they are provided to enhance user knowledge and awareness.

Neither primary metrics nor secondary metrics are necessarily exclusive to one focus area. Also, a metric might be primary for one focus area and secondary for a different focus area.

2.3 Types of Performance Metrics

Performance metrics can be classified in several ways. Understanding these classifications is useful in selecting metrics within a focus area. The classifications most relevant to the Reference Guide are discussed in the following paragraphs.

Performance metrics may be classified as input, output, and outcome.

Input—Measures that describe the resources the airport has, such as the number of gates or jet bridges. While input measures are not in and of themselves measures of performance, they are important in providing context for other performance measures.[7] Input measures may be used as a divisor when calculating a performance metric. For example, the number of gates is used to derive the turns per gate metric. Input measures may also be considered when comparing the performance of airports via external benchmarking. Input measures such as number of runways may be one of the input measures considered when selecting airports for benchmarking.

Output—Measures that quantify the service provided.[8] For airports, examples include number of enplanements and number of operations.

Outcome—Measures that "provide feedback on the quality and efficiency of services or on the intended performance of the organization."[9] Examples of airport outcome metrics include average delay per aircraft and aircraft operations per gate.

[7] *ACRP Report 19: Developing an Airport Performance-Measurement System*. Washington, D.C., 2010, p. 21.
[8] Ibid.
[9] Ibid.

Another way to classify metrics is by past, current, and future performance measures. These classifications align nicely with the ICAO definition of performance metrics provided in Section 2.1.

Past—Measures of past activities over months, quarters, or years. Examples of past airport metrics are annual enplaned passengers and annual operations.

Current—Measures that are monitored in real time or daily. Current aviation metrics include airport arrival rate and airport departure rate.

Future—Measures of expected (planned) future performance. Potential aviation future metrics include calculated capacity and delay with forecasted aircraft operations.

2.4 FAA Harmonized Metrics

The FAA uses a set of harmonized performance metrics to report performance on an agency-wide basis. These metrics show how the FAA is performing in the areas of safety, efficiency, capacity, environment, and cost-effectiveness. Harmonized metrics that apply to airports are included in the Performance Metrics Database. These metrics are included to provide airport personnel with insight about what the FAA measures and how they measure it. Table 1 shows the FAA harmonized metrics that are included in the Performance Metrics Database. Note that the scopes of these metrics are system-wide, such as the entire National Airspace System (NAS) or all of the FAA's 30 Core Airports (e.g., Taxi-In Time is an average of carrier-reported taxi-in times at all Core Airports).

Table 1. FAA harmonized metrics in the Performance Metrics Database.

Performance Area	Metric Name	Scope Included
Safety	Runway Incursions Rate (A&B)	NAS
Efficiency	Taxi-In Time	Core Airports*
	Taxi-Out Time	Core Airports*
	Average Gate Arrival Delay	Core Airports*
	Number of Arrival and Departure Delays	Core Airports*
	Number of Operations	Core Airports*
	NAS On-Time Arrivals	Core Airports*
Capacity	Average Daily Capacity (ADC)	Core Airports* and times of day relevant to the operations
	Average Daily Operations	Core Airports* and times of day relevant to the operations
	Runway Pavement Condition	Paved and open runways in the National Plan of Integrated Airport Systems (NPIAS)
Environment	Noise Exposure	U.S. population
	Emissions Exposure (CO_2 Emissions)	NAS

**Core Airports include Hartsfield-Jackson Atlanta International Airport (ATL), Baltimore/Washington International Thurgood Marshall Airport (BWI), Boston-General Edward Lawrence Logan Airport (BOS), Charlotte Douglas International Airport (CLT), Chicago Midway International Airport (MDW), Chicago O'Hare International Airport (ORD), Dallas/Fort Worth International Airport (DFW), Denver International Airport (DEN), Detroit Metropolitan Wayne County Airport (DTW), Fort Lauderdale-Hollywood International Airport (FLL), Honolulu—Daniel K. Inouye International Airport (HNL), Houston—George Bush Intercontinental Airport (IAH), Las Vegas—McCarran International Airport (LAS), Los Angeles International Airport (LAX), Memphis International Airport (MEM), Miami International Airport (MIA), Minneapolis-St. Paul International Airport (MSP), New York—John F. Kennedy International Airport (JFK), New York—LaGuardia Airport (LGA), Newark Liberty International Airport (EWR), Orlando International Airport (MCO), Philadelphia International Airport (PHL), Phoenix—Sky Harbor International Airport (PHX), Salt Lake City International Airport (SLC), San Diego International Airport (SAN), San Francisco International Airport (SFO), Seattle-Tacoma International Airport (SEA), Tampa International Airport (TPA), Ronald Reagan Washington National Airport (DCA), and Washington Dulles International Airport (IAD).*

Source: "FAA Operational Metrics," https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/.

CHAPTER 3

Focus Area Performance Metrics

Chapter 3 provides guidance on identifying and using performance metrics to evaluate focus areas where airports, the FAA, and airlines have shared interests. The chapter is organized as follows:

Section 3.1 Relevant Aspects of NextGen—Includes metrics to evaluate proposed NextGen (Next Generation Air Transportation System) procedures, how the procedures would affect airport operations, and what environmental effects would be expected.

Section 3.2 Overall System Issues and Their Variability—Includes metrics to evaluate the impacts of system issues, such as weather events and proposed changes in aircraft operations/schedules.

Section 3.3 Safety Issues in Surface Movement—Includes metrics to measure surface movement safety and collaborate with FAA and the airlines to enhance safety.

Section 3.4 Benchmarking across Airports—Includes metrics that compare the operational efficiency of airports and metrics needed to attract new air service.

Section 3.5 Airport Geometry Impact on Operations—Includes metrics to measure the potential operational effects of changes in airport geometry, including temporary closures for maintenance and proposed airfield improvements.

Section 3.6 Gate Management and Ramp Tower Operations—Includes metrics related to gate management and ramp tower operations.

Section 3.7 Regulations/Requirements—Includes performance metrics that airports are required to record or report per federal regulations and/or requirements including those administered by state and local agencies.

Each section begins with a background subsection followed by a subsection about suggested performance metrics for the subject focus area. These sections in the PDF guide include hyperlinks (underlined performance metric names) that take the user to the Performance Metrics Database in Appendix B. The user may click on these hyperlinks to access detailed information about the suggested performance metric.

3.1 Relevant Aspects of NextGen

This section provides guidance on performance metrics that can be used to consider the effects of NextGen.

3.1.1 Background

"The Next Generation Air Transportation System (NextGen) is the FAA-led modernization of America's air transportation system to make flying even safer, more efficient, and more predictable."[10] NextGen includes innovative and transformative portfolios, capabilities, and technologies.

The FAA is collaborating with the aviation industry via the NextGen Advisory Committee (NAC) to implement NextGen. With the assistance of the NAC, the FAA is implementing NextGen capabilities in four high priority areas: Multiple Runway Operations, Performance Based Navigation, Surface Operations and Data Sharing, and Data Communications.

According to the FAA, "The efficiency of parallel runways, particularly those that are closely spaced, has been limited by the interplay of wake vortices with nearby aircraft. Multiple Runway Operations (MRO) capabilities improve access to these runways and can increase basic runway capacity and throughput by reducing the separation between aircraft based on improved wake categorization standards. Improved access will enable more arrivals and/or departures during instrument meteorological conditions, which will increase efficiency and reduce flight delays."[11] The degree of benefits from MRO can and will differ between individual airports based on air traffic control standards (refer to FAA Order JO 7110.65, *Air Traffic Control*) and the airport layout.

Performance Based Navigation (PBN) capabilities capitalize on satellite-based navigation and advanced aircraft equipage that allow for more precise and accurate navigation.[12] These capabilities include Area Navigation (RNAV) and Required Navigational Performance (RNP) approach procedures.

Surface Operations and Data Sharing capabilities link the airport surface to the en route airspace. These capabilities include Terminal Flight Data Management (TFDM), which integrates air traffic control (ATC) tower flight tracking and traffic management tools and serves as the platform for sharing information with airports via Surface Collaborative Decision Making (CDM).[13] TFDM also allows flight operators and air traffic control to communicate about desired schedules and factors that affect the NAS.

Data Communications capabilities replace traditional voice systems with digital communications. These capabilities enable efficiencies and enhance safety by reducing communication time and errors between controllers and pilots.[14]

FAA's NextGen Performance Metrics

The FAA uses performance measurement systems to monitor and report performance of the NAS and at the Core Airports where NextGen improvements have been implemented. Some of

[10] U.S. Federal Aviation Administration (FAA). "NextGen FAQ." Accessed October 2, 2017. https://www.faa.gov/nextgen/faq/#q1.
[11] U.S. Federal Aviation Administration (FAA). "NextGen Priorities—Multiple Runway Operations." Accessed March 21, 2018. https://www.faa.gov/nextgen/snapshots/priorities/?area=mro.
[12] U.S. Federal Aviation Administration (FAA). "NextGen Priorities." Accessed October 17, 2017. https://www.faa.gov/nextgen/snapshots/priorities/?area=pbn.
[13] U.S. Federal Aviation Administration (FAA). *Terminal Flight Data Manager (TFDM) Program Office, TFDM Core for ATCTs Concept of Operations ConOps-PMO-02-TFDM-13-001, Rev. 2.1.* Washington, D.C., 2013. https://faaco.faa.gov/index.cfm/attachment/download/52707.
[14] U.S. Federal Aviation Administration (FAA). *NextGen Priorities Joint Implementation Plan Executive Report, Rolling Plan 2017–2019.* Washington, D.C., 2016. https://www.faa.gov/nextgen/media/NG_Priorities_Joint_Implementation_Plan.pdf. p. 31.

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these performance metrics must be reported to Congress per Section 214 of the *FAA Modernization and Reform Act of 2012*. FAA performance metrics are provided on two websites:

Operational Metrics—https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/. The NAS-wide FAA harmonized metrics described in Section 2.4 are provided on this website.

NextGen Performance Snapshots—https://www.faa.gov/nextgen/snapshots/. This website includes NAS-wide metrics as well as metrics for the Core Airports where NextGen improvements have been implemented. Table 2 shows these metrics.

FAA and Industry NextGen Performance Metrics

The FAA is also collaborating with the aviation industry through the NAC to evaluate NextGen performance improvements. In 2015, the NAC approved high-level performance metrics for the NextGen high priority areas. These performance metrics are shown in Figure 1.

After NAC approved these metrics, they formed the Joint Analysis Team (JAT) to study the benefits from implemented NextGen capabilities. To capture performance benefits, JAT included analyses of other measures beyond the six high-level metrics. These rigorous analyses were conducted using data from pre- and post-implementation. Table 3 highlights the findings and performance metrics from selected JAT studies.

3.1.2 Suggested Metrics—NextGen

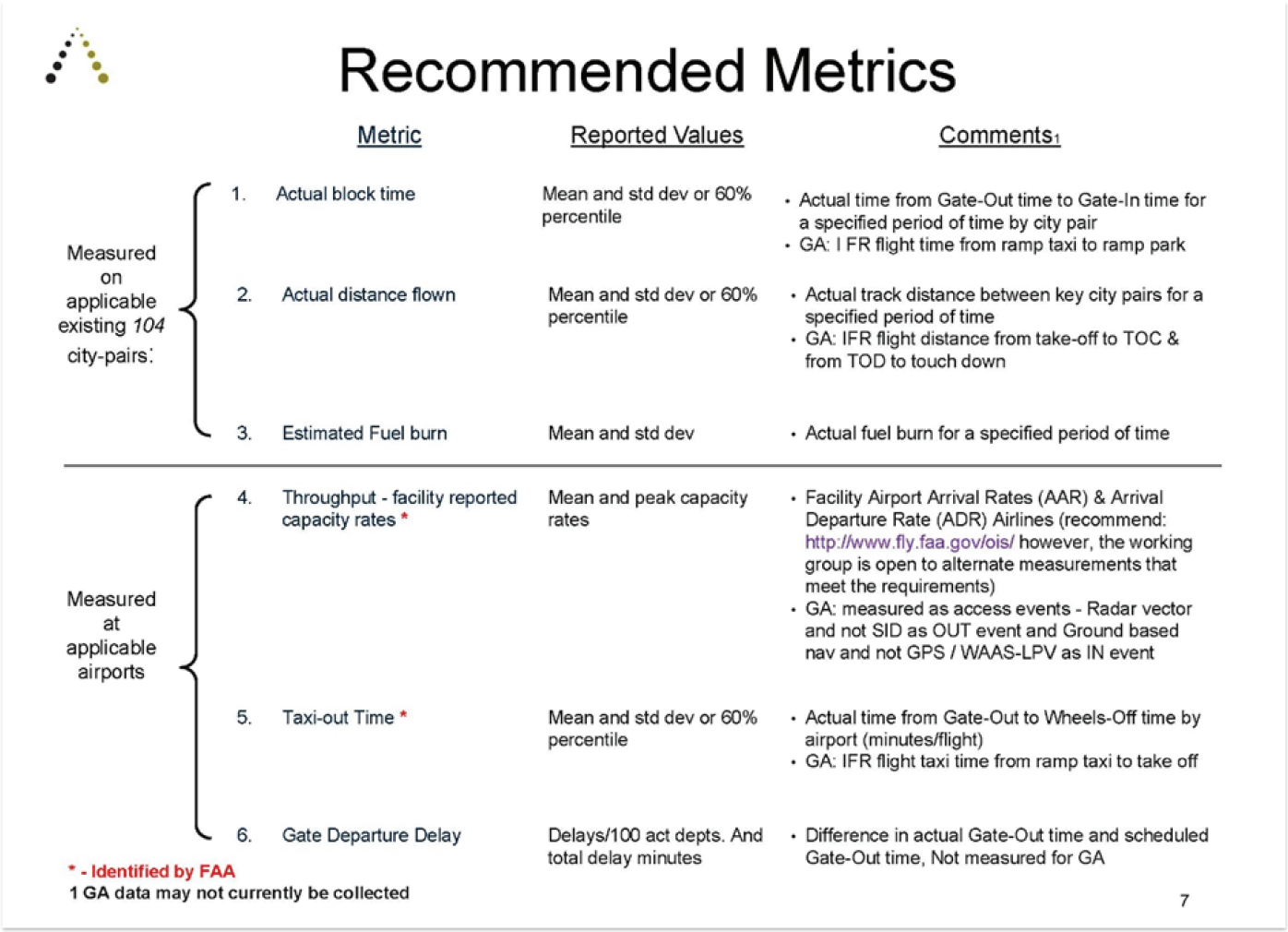
As would be expected, the potential effects of NextGen on airports will vary. For example, large congested airports may benefit from increased throughput while smaller airports may benefit from increased accessibility.

"Many of the benefits of NextGen are associated with retaining near Visual Meteorological Conditions operational capacity irrespective of meteorological constraints or nearby airspace

Table 2. FAA NextGen performance metrics.

Performance Area		Performance Metrics
NAS	Fuel Burn	Average Fuel Burn
		Average Gate Weight
		Average Great Circle Distance
		Departure Mix by Fleet
	Environment	CO_2 Emissions
		NAS-Wide Energy Efficiency
		Noise Exposure
	Access	Localizer Performance with Vertical Guidance & Localizer Performance Access at General Aviation Airports without Instrument Landing System (ILS)
		Percentage of Qualified General Aviation Airports with Localizer Performance with Vertical Guidance or Localizer Performance Access
Core Airports	Efficiency	Average Gate Arrival Delay
		Average Number of Level-offs per Flight
		Distance in Level Flight from Top of Descent to Runway Threshold
		Effective Gate-to-Gate Time
		Taxi-In Time
		Taxi-Out Time
	Capacity	Average Daily Capacity
		Average Hourly Capacity During Instrument Meteorological Conditions (IMC)

Sources: FAA, NextGen Performance-National Airspace System, https://www.faa.gov/nextgen/snapshots/nas/, and NextGen Airports Measuring the Performance of Airports, https://www.faa.gov/nextgen/snapshots/airport/. Accessed 10/02/17.



Source: NextGen Advisory Committee, NACSC Ad Hoc Group: Performance Metrics for Four Priority Areas, June 2016, p.7.

Figure 1. NAC-approved high-level performance metrics.

congestion."[15] Therefore, the following metrics could be useful in considering the potential for NextGen benefits:

Percent visual meteorological conditions (VMC) and **percent instrument meteorological conditions (IMC)** are the percentages of time that airport visibility conditions are VMC and IMC, respectively.

Airport arrival rate (AAR) and **airport departure rate (ADR)** are the ATC facility-determined arrival and departure rates that can be handled given the current weather conditions, traffic mix, and runway configuration. FAA reports AARs and ADRs by runway configuration for VMC, LOW VMC, and IMC. Therefore, AARs and ADRs during IMC could be compared to VMC or Low VMC AARs and ADRs to determine the potential for NextGen benefits.

To identify additional performance metrics for the evaluation of NextGen capabilities, this Reference Guide builds on the findings of *ACRP Report 150: NextGen for Airports Volume 5, Airport Planning and Development*. ACRP Report 150 identified potential effects of NextGen by size of airport. Airports were divided into two groups: (1) medium and large and (2) small airports. The groups aligned with the National Plan of Integrated Airports Systems (NPIAS) classifications. The medium and large group generally included large hub primary commercial

[15] *ACRP Report 150: NextGen for Airports Volume 5, Airport Planning and Development,* p. 49.

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Table 3. JAT findings and performance metrics.

NextGen Capability/ Airport	Findings	Relevant Metrics
Wake ReCat at CLT, ORD, MDW	Fleet mix and overall demand levels are critical drivers of ReCat impact. Busy airports with a higher presence of heavy/C, B757/D, and small/F aircraft are expected to see the greatest impacts. Operational data demonstrates that ReCat achieves changes in separation when expected. Before and after analysis of airborne/taxi times and throughput are inconclusive due to exogenous factors, such as changes in demand, weather, airport construction, etc. Airborne or taxi-out savings can be expected when ReCat-impacted flights operate to an individual runway that is experiencing pressure. As long as pressure remains, savings accrue for all subsequent aircraft. Throughput improvement can be expected when ReCat-impacted flights operate in peak demand. Modeled throughput based on actual separation changes indicates improvement. Throughput improvements are empirically observed at ORD for IMC peak periods when ReCat pairs exist, but these are not sustained enough to justify an increase in called rate.	Percentage of eligible pairs of flights at the airport potentially impacted by Wake ReCat (percentage with decreased separation/percentage with increased separation) Modeled potential change in throughput during peak periods due to ReCat (Operations per hour—arrivals and departures) Estimated total savings ($) in airborne and taxi-out time due to ReCat
Wake ReCat in IND/PHL	Fleet mix and overall demand levels continue to be critical drivers of ReCat impact. Busy airports with a higher presence of heavy, 757, and small aircraft are expected to see the greatest impacts. Airborne or taxi-out savings can be expected when ReCat-impacted flights operate to an individual runway that is experiencing pressure. As long as pressure remains, savings accrue for all subsequent aircraft. Throughput improvement can be expected when ReCat-impacted flights operate in peak demand. Modeled throughput based on actual separation changes indicates improvement.	Percentage of eligible pairs of flights at the airport potentially impacted by ReCat (percentage with decreased separation/percentage with increased separation) Estimated total savings ($) in airborne and taxi-out time due to ReCat
Performance Assessment of Established on RNP (EoR) in Denver	EoR increased utilization of RNP Authorized Required (AR) approaches from 5.8% of arrivals to 6.6% of arrivals into Denver, an increase of 0.8%. Time saved from efficient approaches increased from 211 to 282 hours annually. If an additional waiver is granted, EoR is expected to enable an increase of up to 7.1% of arrivals executing RNP AR approaches. Time saved expected to increase to 360 hours annually. EoR is an important enabler to further future growth of utilization of efficient PBN approaches.	Utilization of RNP AR approaches Time saved

Sources: Joint Analysis Team: Performance Assessment of Wake ReCat, June 2016, pp. 4,5.

Joint Analysis Team: Performance Assessment of Wake ReCat in Indianapolis and Philadelphia and Fuel Analysis for North Texas Metroplex, February 2017, p. 4.

Joint Analysis Team Performance Assessment of North Texas Metroplex and Established on RNP in Denver, October 2016, p. 4.

service and medium hub primary commercial service. The small airport group included small hub commercial service, nonhub primary commercial service, nonprimary commercial service, reliever, and general aviation. While recognizing that a NextGen impact will be unique for each airport, this grouping of airports allowed for a logical method to identify applicable NextGen technology/initiatives and effects.

Operators of busy large and medium airports are likely to be the biggest beneficiaries of NextGen because of the focus on increased system efficiency.[16] The largest benefit of NextGen

[16] Ibid, p. 61.

for small airports is probably increased accessibility in IMC. Typically, small airports are not capacity constrained and therefore throughput is not an issue.

Tables 4 and 5 summarize findings from ACRP Report 150 and provide related performance metrics for large and medium airports and small airports, respectively. Descriptions of the performance metrics follow Table 5.

Airport Operator Equipage is the estimated percentage of the operations at an airport conducted by PBN equipped aircraft (by type) as found on the FAA's PBN Dashboard. PBN equipage is important in considering the benefits of a new PBN approach and the mix of types of equipage that may affect airport operations and throughput. Note that the term "Airport Operator Equipage" refers to the aircraft that are PBN equipped by the airlines and does not refer to airport operator equipment.

Heavy Jets and B757s—Percent is the percentage of operations by heavy jets and B757s at an airport. This metric is useful to determine if an airport is likely to benefit from Wake ReCat.

Lowest Minimums is the lowest visibility minimums available for approaches to an airport. Existing minimums may be compared to anticipated minimums with the proposed PBN procedure to determine the potential for benefit.

PBN Procedures—Number of and Use is the number of PBN procedures and the usage of each PBN procedure at an airport. Airports may be interested in tracking the number of PBN procedures available and how often they are used. The [FAA's] PBN Dashboard (www.faa.gov/nextgen/pbn/dashboard) provides implementation and usage statistics for all major airports in the NAS with published PBN procedures. "The data is captured on a periodic basis and displayed in an easy to interpret format for interested parties."[17]

The following metrics are derived and require detailed analysis:

Maximum Sustainable Throughput is the number of aircraft operations that an airfield can reasonably accommodate in a given period of time when there is a continuous demand for service during that period. Modeling or simulation analysis is required to determine this metric. This metric could be used to determine if a NextGen technology or initiative would be beneficial in terms of increasing throughput at a large or medium airport. Refer to the Performance Metric Database for additional information.

Noise Exposure is the number of people exposed to significant noise. Significant aircraft noise levels are defined as values greater than or equal to day-night average sound level (DNL) 65 decibels (dB). This metric is derived by using the FAA's approved noise model, Aviation Environmental Design Tool. This metric could be used to determine if the number of people within the DNL 65 dB contour would change because of the NextGen technology or initiative. Refer to the Performance Metric Database for additional information.

3.2 Overall System Issues and Their Variability

This section provides guidance on performance metrics that can be used to understand and characterize system issues and their variability.

3.2.1 Background

Airport operations can be influenced by system issues caused by both unplanned and planned events, such as adverse weather and runway construction, respectively. The impacts of these

[17] U.S. Federal Aviation Administration (FAA). "Performance Based Navigation (PBN) Implementation and Usage." Accessed August 5, 2017. https://www.faa.gov/nextgen/pbn/dashboard/.

Table 4. Suggested primary metrics for NextGen at large and medium airports.

NextGen Technology or Initiative	Airport Effects	Primary Performance Metrics to Consider
RNAV Standard Instrument Departures and Standard Terminal Arrivals	May enhance operational throughput if capacity is constrained by terminal airspace; could allow for additional independent arrival and departure routes and de-conflicting airspace.	Airport Operator Equipage Maximum Sustainable Throughput
RNAV and RNP Instrument Approach Procedures	Could increase operational capacity and reduce minimums where ILS approaches are not possible or cause operational constraints; may require obstacle removal and installation or upgrade of approach lights.	Airport Operator Equipage Maximum Sustainable Throughput Noise Exposure Lowest Minimums PBN Procedures - Number of and Use
RNAV-Enabled Departure Separations	Equivalent lateral spacing operations (less divergence off the runway) and established-on-departure operation and unified departure operational spacing (divergence point as nearest waypoint instead of the runway end) could increase departure throughput.	Airport Operator Equipage Maximum Sustainable Throughput Noise Exposure
Surface Operations and Data Sharing	Improved surface operations, such as surface CDM, allow for sharing and responding to real-time movement data for aircraft and vehicles. Improvements to surface safety, efficiency, and flexibility are expected. Associated departure management could require increased apron area, gates, and/or hold pads at space-constrained airports.	Metrics related to surface CDM continue to evolve.
Wake Turbulence ReCat	Could increase maximum arrival and departure throughput where there are a significant number of heavy jets and B757s; capacity increases could be 2–4% at many medium and large airports. Could reduce aircraft emissions due to reduced departure hold time on taxiways.	Heavy Jets and B757 – Percent Maximum Sustainable Throughput
Closely Spaced Parallel Runway Operations	Airports with dual parallel runways and a lateral separation between 2,500 feet and 4,300 feet would have the best opportunity to improve arrival capacity during IMC. Capacity could increase and delay could decrease; potentially capital improvements for capacity could be deferred. Magnitude of capacity increase depends on the number and spacing of parallel runways and how the runways are operated, i.e., segregated operations, mixed operations, independent, or dependent.	Maximum Sustainable Throughput Noise Exposure
Wake Turbulence Avoidance	Could increase capacity for intersecting or closely spaced lateral separations (less than 2,500 feet of separation) but only where there are substantial heavy jet and B757 operations.	Heavy Jets and B757 – Percent Maximum Sustainable Throughput
Reduced Minimum Separation Standard for Arrivals on Parallel Runways in IMC	The NextGen Closely Spaced Parallel Operations program components affect the capacity of parallel runways in IMC. Changes in noise exposure and aircraft emissions could also occur.	Maximum Sustainable Throughput Noise Exposure
Multilateration	Allows air traffic controllers to track aircraft where there is no radar coverage. Can increase throughput at airports subject to procedural separation because of lack of radar coverage. Can also support virtual control towers, surface movement surveillance, and noise monitoring.	Multilateration data could prove useful for detailed capacity analysis

Source: ACRP Report 150, NextGen for Airports Volume 5, Airport Planning and Development, 2017.

Table 5. Suggested primary metrics for NextGen at small airports.

NextGen Technology or Initiative	Airport Effects	Primary Performance Metrics
Improved Landing Systems	RNAV approach procedures could increase access in IMC via reduced minimums where ILS approaches are not possible. May require obstruction mitigation even if minimums are higher than those for existing ground-based procedures. Except in special cases, RNP approaches are not typically applicable at small airports due to limited use and the high cost of deployment (obstacle clearing and airfield lighting requirements).	Lowest Minimums Airport Operator Equipage Percent Visual Meteorological Conditions (VMC) and Percent IMC PBN Procedures—Number of and Use
Airspace Routing PBN	May enhance operational throughput if capacity is constrained by terminal airspace; could allow for dedicated arrival and departure routes to and from small airports.	None
Wake Turbulence Recategorization	Potential to enhance capacity where there are a significant number of heavy jets and B757s and the airport is congested. However, for small airports, increases in capacity are likely marginal and difficult to quantify.	Heavy Jets and B757s—Percent
Dependent Runway Operations	Limited applicability for small airports.	None
Wake Turbulence Avoidance	Could increase capacity for intersecting or closely spaced lateral separate (less than 2,500 feet of separation) but only where there are substantial heavy jet and B757 operations.	Heavy Jets and B757s—Percent
Reduced Minimum Separation Standard for Arrivals on Parallel Runways in IMC	The NextGen Closely Spaced Parallel Operations program components affect the capacity of parallel runways in IMC; limited applicability to small airports.	None
Multilateration	Allows air traffic controllers to track aircraft where there is no radar coverage (remote areas with mountainous terrain). Could enhance safety and increase IMC access and capacity. Can also support virtual control towers and noise monitoring.	None

Source: ACRP Report 150: NextGen for Airports Volume 5, Airport Planning and Development, 2017.

events are often complex and interconnected, involving airports, FAA, and airlines, thus creating the need for a collection of relevant metrics that can be used by airport operators to understand and characterize these issues. This subsection describes how metrics in the Performance Metrics Database can address this need and enhance airport operator understanding of system issues and how they impact airport operations.

3.2.2 Suggested Metrics—Overall System Issues and their Variability

Table 6 and Table 7 show the primary and secondary metrics, respectively, for system issues and their variability. The following subsections explain how the primary metrics and select secondary metrics may be applied. Refer to the Performance Metrics Database to learn more about the remaining secondary metrics.

Unplanned System Issues. Several types of unplanned system issues can disrupt not only airport operations but also FAA and airline operations. Weather is the largest cause of delay in the NAS.[18] However, unanticipated system issues can result from emergencies, airline logistics,

[18] U.S. Federal Aviation Administration (FAA). "FAQ: Weather Delay." Accessed October 15, 2017. https://www.faa.gov/nextgen/programs/weather/faq/.

Table 6. Suggested primary metrics for system issues and their variability.

Primary Metrics	Applicable Airports
Diversions into Airport—Number of Annual	All
Delays with Passengers on Aircraft that Exceed Department of Transportation (DOT) Tarmac Delay Duration Standards Annually (Domestic)	Commercial Service
Delays with Passengers on Aircraft that Exceed DOT Tarmac Delay Duration Standards Annually (International)	Commercial Service
Cancellations	All
Number of Arrival and Departure Delays	FAA's Aviation System Performance Metrics (ASPM) Airports
Number of Late Departures	FAA ASPM Airports
Departure Delay per Flight	FAA ASPM Airports
Arrival Delay per Flight	FAA ASPM Airports
Delayed Gate Departures	FAA ASPM Airports
Average Gate Departure Delay	FAA ASPM Airports
Average Minutes of Delay per Delayed Gate Departure	FAA ASPM Airports
Average Gate Arrival Delay	FAA ASPM Airports
Delayed Gate Arrivals	FAA ASPM Airports
Average Minutes of Delay per Delayed Gate Arrival	FAA ASPM Airports
Number of Delays by Cause	All Towered Airports
Total Time Operations Suspended due to Adverse Weather—Annual	All
Operations Suspended for Adverse Weather—Number of Annual	All
Average Out-to-Off (Taxi-Out Delay)	FAA ASPM Airports
Airport Arrival Rate (AAR)	All Towered Airports
Peak Hour Operations Throughput in IMC	FAA ASPM Airports
Peak Hour Operations Throughput in Marginal Visual Meteorological Conditions	FAA ASPM Airports
Peak Hour Operations Throughput in Visual Meteorological Conditions (VMC)	FAA ASPM Airports
Percent VMC	All
Percent IMC	All
Airport Operations Suspended for Snow/Ice Events—Number of Annual	Airports in Cold Weather Climates
Average Time Airport Operations are Suspended for Snow/Ice Events	Airports in Cold Weather Climates
Vehicle Runway Crossings Per Day	All
Hot Spots—Number	All
Runway Incursion Mitigation Locations	All
Runway Excursions	All
Primary Runway/Taxiway Clearing Time—Average for Snow/Ice	Airports in Cold Weather Climates
Deicing Throughput in Aircraft per Hour	Airports in Cold Weather Climates
Airport Departure Rate (ADR)	Towered Airports
Dedicated Deicing Positions—Number of	Airports in Cold Weather Climates
Average Time to Deice an Aircraft	Airports in Cold Weather Climates
Air Operations Area Violations	All
Annual Security Breaches that Force Rescreening	Commercial Service
Emergency Responses—Annual	All
Peak Period	Commercial Service
Maximum Sustainable Throughput	All
Contact Gate Utilization	Commercial Service

Table 7. Suggested secondary metrics for system issues and their variability.

Secondary Metrics	Applicable Airports
NAS On-Time Arrivals	FAA System-wide Metric
Diversions to Other Airports—Number of Annual	Commercial Service
Percentage of Arriving Flights Delayed	Commercial Service
Percentage of Departing Flights Delayed	Commercial Service
Late Arriving Aircraft	Commercial Service
Terminal Arrival Efficiency Rate (TAER)	FAA ASPM Airports
System Airport Efficiency Rate (SAER)	FAA ASPM Airports

and security events. Often, localized issues propagate throughout the system. For example, storms may cause an initial system disruption, which delays some flights as they alter their flight path to deviate around the weather or are delayed departing and arriving at an airport. If these initial delays become sufficiently significant as to impact FAA Air Traffic Management and ATC workload, the FAA may implement one of several traffic management initiatives, such as a Playbook Reroute or Ground Delay Program, to control and slow the flow of air traffic in the affected region. These traffic management initiatives add further delay and impacts to the system, which can impact airline operations through increased burn due to flying longer Playbook routes and missed connecting flights due to large delays. In response, airlines may tactically adjust their schedules and possibly cancel flights.

Other examples of unplanned system issues include emergencies such as fires, internet outage, or system failure at an FAA facility. These may result in the inability to safely provide services within that airspace, known as ATC Zero. This condition is the most severe of the three designations used by the FAA to describe degraded operations at a given facility. Under these conditions, normal flight operations are suspended and aircraft inbound to airports within the impacted airspace may be required to divert or reroute to another airport. Airports inside the impacted region would have a marked decrease or cessation in arrivals, and airports just outside the area may experience a significant increase in arrival traffic.

Metrics may be used to characterize unplanned system issues and their potential impact on airport operations. One of the results of unplanned system issues is canceled/diverted flights. Therefore, metrics such as **Diversions into Airport—Number of Annual**, **Delays with Passengers on Aircraft that Exceed DOT Tarmac Delay Duration Standards Annually (Domestic)**, **Delays with Passengers on Aircraft that Exceed DOT Tarmac Delay Duration Standards Annually (International)**, and **Cancellations** indicate the overall impacts at an airport, regardless of specific system issue. These types of metrics are considered in planning for unanticipated system issues, such as Airport Irregular Operations Contingency Planning.

Another result of unplanned system issues is delay. System disruptions of any kind can cause both arrival and departure delay at an airport due to the NAS propagation effects. Even in the absence of supporting information on the nature of the disruption(s), several metrics may be available for airport operators that reflect the impact of overall system delays at their airport. Three of these metrics may be obtained from the Bureau of Transportation Statistics (BTS) On-Time Performance Data:

Percent of Arriving Flights Delayed is the percentage of arriving flights delayed by 15 or more minutes.

Percent of Departing Flights Delayed is the percentage of departing flights delayed by 15 or more minutes.

Late Arriving Aircraft is the minutes of delay caused by previous flights arriving late, causing the next flights to depart late. This metric can be compared to the total delay to determine the percentage of airport delays due to the propagation of system disruptions in the NAS.

For a select group of airports referred to as Aviation System Performance Metrics (ASPM) Airports (Figure 2), additional FAA delay data/metrics are available. Refer to the Performance Metrics Database to find detailed information about these metrics.

- Number of Arrival and Departure Delays
- Number of Late Departures
- Departure Delay per Flight
- Arrival Delay per Flight
- Delayed Gate Departures
- Average Gate Departure Delay
- Average Minutes of Delay per Delayed Gate Departure
- Average Gate Arrival Delay
- Delayed Gate Arrivals
- Average Minutes of Delay per Delayed Gate Arrival

1. ABQ - Albuquerque International Sunport	40. MEM - Memphis International*
2. ANC - Ted Stevens Anchorage International	41. MHT - Manchester
3. ATL - Hartsfield–Jackson Atlanta International *	42. MIA - Miami International*
4. AUS - Austin–Bergstrom International	43. MKE - Milwaukee Gnl Mitchell International
5. BDL - Bradley International	44. MSP - Minneapolis/St. Paul International*
6. BHM - Birmingham International	45. MSY - Louis Armstrong New Orleans International
7. BNA - Nashville International	46. OAK - Oakland International
8. BOS - Boston Logan International *	47. OGG - Kahului
9. BUF - Buffalo Niagara International	48. OMA - Omaha Eppley Airfield
10. BUR - Bob Hope (Burbank/Glendale/Pasadena)	49. ONT - Ontario International
11. BWI - Baltimore/Washington International*	50. ORD - Chicago O'Hare International*
12. CLE - Cleveland Hopkins International	51. OXR - Oxnard
13. CLT - Charlotte Douglas International *	52. PBI - Palm Beach International
14. CVG - Cincinnati/Northern Kentucky International	53. PDX - Portland International
15. DAL - Dallas Love Field	54. PHL - Philadelphia International*
16. DAY - Dayton International	55. PHX - Phoenix Sky Harbor International*
17. DCA - Ronald Reagan Washington National*	56. PIT - Pittsburgh International
18. DEN - Denver International *	57. PSP - Palm Springs International
19. DFW - Dallas/Fort Worth International *	58. PVD - Providence Francis Green State
20. DTW - Detroit Metropolitan Wayne County*	59. RDU - Raleigh/Durham International
21. EWR - Newark Liberty International*	60. RFD - Greater Rockford
22. FLL - Fort Lauderdale/Hollywood International*	61. RSW - Southwest Florida International
23. GYY - Gary Chicago International	62. SAN - San Diego International*
24. HNL - Honolulu International*	63. SAT - San Antonio International
25. HOU - Houston Hobby	64. SDF - Louisville International
26. HPN - Westchester County	65. SEA - Seattle/Tacoma International*
27. IAD - Washington Dulles International*	66. SFO - San Francisco International*
28. IAH - George Bush Houston Intercontinental*	67. SJC - Norman Mineta San Jose International
29. IND - Indianapolis International	68. SJU - San Juan Luis Munoz International
30. ISP - Long Island Mac Arthur	69. SLC - Salt Lake City International*
31. JAX - Jacksonville International	70. SMF - Sacramento International Airport
32. JFK - New York John F. Kennedy International*	71. SNA - John Wayne Airport-Orange County
33. LAS - Las Vegas McCarran International*	72. STL - Lambert Saint Louis International
34. LAX - Los Angeles International*	73. SWF - Stewart International
35. LGA - New York LaGuardia*	74. TEB - Teterboro
36. LGB - Long Beach	75. TPA - Tampa International*
37. MCI - Kansas City International	76. TUS - Tucson International
38. MCO - Orlando International*	77. VNY - Van Nuys
39. MDW - Chicago Midway*	
** Denotes a Core 30 airport*	

Source: FAA, ASPM Airports, http://aspmhelp.faa.gov/index.php/ASPM_Airports, accessed 10/15/17.

Figure 2. ASPM airports.

Metrics specific to weather phenomena, emergencies, and security events are discussed in the following sections.

Weather Phenomena. Adverse weather can be caused by several types of common weather phenomena, including low ceilings and visibility, convective storms, strong winds, and winter weather. These types of weather can disrupt airport operations locally and propagate through the NAS.

Weather events cause delays and, in some cases, suspensions of airport operations. Airports can obtain weather-related delay information from the FAA's Operations Network (OPSNET)

data, which is the source for the metric **Number of Delays by Cause**. In addition,**Total Time Operations Suspended Due to Adverse Weather** and **Operations Suspended for Adverse Weather—Number of Annual** provide airport operators a broad view of the time duration and annual number of occurrences, respectively, when airport operations were suspended due to any form of adverse weather. Long duration suspensions are most common for winter weather events where snow and ice constrain airport operations, but numerous suspensions can also occur during convective storms due to lightning at or near the airport as ramp operations are temporarily halted to ensure the safety of surface workers. It may be useful to track suspensions for runways, taxiways, and ramps separately.

Low ceilings and reduced visibility due to adverse weather could result in a deterioration from VMC to Marginal VMC or IMC. Aircraft at busy commercial service and general aviation airports may experience delays if ATC reduces the AAR to accommodate the change in ceilings, visibility, and wind direction/velocity. If available, these airports may consider the FAA metric **AAR** for the runway configuration in use and appropriate metrological conditions as an indication of the airport capacity. Also, arrival demand could be compared to the **Peak Hour Operations Throughput in IMC** or **Peak Hour Operations Throughput in Marginal VMC.** The **Percent VMC** and **IMC** can be considered in determining the percentage of time the airport is subject to VMC and IMC weather conditions. However, it cannot be assumed that the associated AARs will be used when these weather conditions exist. In practice, AARs do not necessarily align with these meteorological conditions because the AARs may be adjusted for other conditions.

Strong or rapidly changing winds and turbulence at or near the airport can also disrupt airport operations. Winds that change speed or direction rapidly with height, known as wind shear, near the airport can create significant speed differentials near the ground and between sequenced arrival aircraft at different altitudes. This causes a challenge for the ATC and may require enforcing minimum separation requirements. Significant turbulence and wind shear may necessitate FAA initiatives such as Miles in Trail to space out air traffic and reduce ATC workload. These initiatives result primarily in arrival delay into the impacted airport, which could be measured using **Arrival Delay per Flight**. Changes in surface wind direction or speed at the airport may cause the FAA to change how the runways are used (runway reconfiguration) to better align aircraft for takeoff and landing. Runway reconfiguration may require requeuing of aircraft for takeoff, which would increase taxi-out delay (**Average Out-to-Off**).

Winter weather events, characterized by frozen precipitation and cold temperatures, pose even more challenges to airports. These events tend to have a longer duration than other types of adverse weather, sometimes lasting several days. Significant delays can occur if snow and ice accumulate on the airfield. For the most disruptive winter weather events with heavy snowfall, such as a blizzard, the airport may be unable to safely maintain the surface and runways and may need to close. **Airport Operations Suspended for Snow/Ice Events—Number of Annual** and **Average Time Airport Operations Are Suspended for Snow/Ice Events** would provide airport operators with information on the annual frequency and duration of winter weather suspensions at their airport. Airlines often proactively cancel flights through airports predicted to be impacted by a significant winter weather event. Therefore, the **Cancellations** metric may be a useful metric for airport operators to track during winter weather events. Snowy or icy runway conditions could also cause runway excursions. Thus, airport operators may monitor **Runway Excursions** from pavement by aircraft during winter weather events to assess winter weather impacts.

Winter weather events require the removal of snow and ice from pavement for aircraft to operate safely, closing airfield pavements while they are cleared or treated. **Primary Runway/Taxiway Clearing Time—Average for Snow/Ice** is likely an important metric for airport operators, airlines, and the FAA.

Winter weather events also require aircraft deicing. **Deicing Throughput in Aircraft per Hour** is important to the entity conducting aircraft deicing (airport, airline, or consortium) using dedicated deicing aprons. Deicing throughput is also important to ATC because of its relation to **Average Out-to-Off** (the average departure taxi time) and **ADR** (the number of departures an airport can support) per unit of time. Other metrics of interest for deicing operations using dedicated aprons include **Dedicated Deicing Positions—Number of** and **Average Time to Deice an Aircraft**.

Emergency and Safety Issues. Airport operations can be disrupted by unanticipated safety and emergency issues that arise within and on the surface of an airport. The incorrect presence of an aircraft, vehicle, or person on the protected runway area, or runway incursion, creates a safety risk and can significantly impact airport operations if sufficiently severe.[19] A severe runway incursion or accident would likely result in the closure of the affected runway, leading to delays, surface congestion, and possibly diversions. Airport operators can assess the potential for incursions by considering metrics such as **Vehicle Runway Crossings per Day, Hot Spots—Number, Runway Incursion Mitigation (RIM) Locations—Number**. **Vehicle Runway Crossings per Day** is the number of times vehicles cross a runway in a given day. **Hot Spot—Number** is the number of locations on an airfield that the FAA identified as hot spots where heightened attention by pilots and drivers is necessary. **RIM Locations—Number** is the number of locations on an airfield that the FAA identified as locations that have a history of runway incursions.

Runway excursions (undershoots, overruns, etc.) can also disrupt airport operations, especially at smaller airports. Excursions could be associated with pavement conditions, but other factors may drive the occurrence such as aircraft weight exceeding the maximum for conditions, aircraft engine malfunction, inappropriate pilot technique, or change in decision to take off or land at excessive speed.[20] The airport may need to dispatch emergency responders as a result of a runway excursion. Excursions may also result in damage to airport infrastructures, such as runway lights and directional signs. Airport operators can track **Runway Excursions** and monitor trends and causes to assess potential mitigation and related risk for future events.

A security breach in or around the airport could disrupt airport operations, potentially leading to an airport closure. An airport may track **Air Operations Area Violations** to consider the risk for security issues. Unexpected disruption to the flow of passengers through an airport terminal can also influence airport operations. **Security Breaches that Force Rescreening—Annual** would reflect the contribution of unanticipated secondary security screening due to breaches to the overall wait times.

Emergency responses may also temporarily disrupt airport operations. Thus, **Emergency Responses—Annual** may be a useful planning metric, particularly if types of emergency responses, hazardous materials, medical fires, and aircraft accidents/excursions are tracked separately.

Metrics—Planned System Issues. Some system issues that impact airport operations are due to planned activities by FAA, airlines, or airports, such as implementing NextGen procedures, changing flight schedule, or constructing airport improvements. Performance metrics may be helpful in assessing potential impacts and planning to accommodate these issues.

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[19] Airbus. *Flight Operations Briefing Note—Preventing Runway Incursions*. France, 2004. http://www.smartcockpit.com/docs/Preventing_Runway_Incursions.pdf.

[20] International Air Transport Association (IATA). *Runway Safety Accident Analysis Report, 2010–2014*, 1st ed. Montréal, Canada, 2015. https://www.iata.org/whatwedo/safety/runway-safety/Documents/RSAR-1st-2015-final-version.pdf.

NextGen Implementation. FAA is implementing numerous NextGen procedures and technologies. Refer to Section 3.1 Relevant Aspects of NextGen for metrics related to NextGen.

Airline Schedule Change. Airlines regularly make planned schedule changes months in advance to account for seasonal demand and to increase profitability. While airport operators may be aware that these changes occur, they may not have access to the schedule change details until changes are implemented. For example, airlines may redistribute flights across the day to reduce or increase high volume time windows, or schedule peaks. The **Peak Period** metric would enable airport operators to evaluate changes in the time window during which they typically experience higher volume.

Airlines may also change the number of flights scheduled through given airports based on profitability to their operation, including adding new service to an airport not previously operated. Airport operators can use the **Maximum Sustainable Throughput** to evaluate changes in the number of flights through their airport due to airline schedule changes. Airlines adding new service to an airport would also increase these metrics, as well as influence gate utilization at the airport. Airport operators could use the **Contact Gate Utilization** metric for each airline to assess expanded gate usage by a given airline.

Airport Construction. Infrastructure improvements such as runway and taxiway rehabilitation or reconstruction can temporarily reduce capacity and increase delays and taxi times. This is particularly problematic at a busy airport where the demand is close to the capacity of the airport. Detailed capacity analysis to determine the **Maximum Sustainable Throughput,** particularly in IMC, may be warranted to understand the magnitude of potential problems and identify potential mitigation.

3.3 Safety Issues in Surface Movement

This section provides guidance on performance metrics that can be used to consider surface movement safety.

3.3.1 Background

Aviation stakeholders, including the FAA, airlines, and airports, are committed to enhancing aviation safety. Aviation safety is a broad topic that has many aspects, for example, regulating minimum aircraft standards, certifying airports and pilots, controlling aircraft, and providing emergency response. While all aspects of aviation safety are important, this section of the Reference Guide is focused on airfield and surface movement safety because of the inherent shared interest/influence of airports, the FAA, and airlines.

3.3.2 Suggested Metrics—Safety Issues in Surface Movement

Table 8 and Table 9 show the primary and secondary metrics, respectively, for airfield and surface movement safety. The following subsections explain how the primary metrics and selected secondary metrics may be applied. Refer to the Performance Metrics Database to learn more about the secondary metrics.

Safety Risk Assessment and Safety Risk Management Systems

Generally, performance metrics may be used to identify/measure airfield and surface movement safety trends, failures, and successes. As such, performance metrics are an integral component of Safety Risk Management and a Safety Management System (SMS). SMSs aid airports in

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Table 8. Suggested primary metrics for airfield and surface movement safety.

Primary Metrics	Applicable Airports
Runway Incursions Vehicle/Pedestrian	All
Hot Spots—Number	All
Runway Incursion Mitigation Locations—Number	All
Wildlife/Bird Strikes	All
Pavement Condition Index by Runway	All
Vehicle Runway Crossings per Day	All
Navigational Aid (NAVAID) Availability	General Aviation
Runway Excursions	All
Surface Incidents	All
Annual Part 139 Inspection Results	Part 139 Certificated Airports
Emergency Responses—Annual	Part 139 Certificated Airports

Table 9. Suggested secondary metrics for airfield and surface movement safety.

Secondary Metrics	Applicable Airports
Runway Incursions	All
Runway Incursions Rate (A&B)	FAA System-Wide
Air Operations Area Violations	All
Runway Pavement Condition	All
Aircraft Rescue and Firefighting (ARFF) Index	Part 139 Certificated Airports
ARFF Equipment vs. ARFF Index Requirements	Part 139 Certificated Airports
ARFF Responses within Mandated Response Times (%)	Part 139 Certificated Airports
Snow Removal Resources Identified in FAA-Approved Snow and Ice Control Plan	Airports in Cold Weather Climates
Primary Runway/Taxiway Clearing Time—Average for Snow/Ice	Airports in Cold Weather Climates

proactively detecting and correcting safety problems via a systematic risk-based manner before they result in aircraft accidents or incidents.[21] The FAA is in the process of requiring SMSs at some Part 139 certificated airports.[22] Also, the FAA uses SMSs internally in decision making that may affect airports. Airports may find the metrics described in this section useful in developing and implementing an SMS.

Runway Safety

Runway safety is likely the primary concern when evaluating surface movement and airfield safety. The FAA identified runway incursions and excursions as one of the top airport risks based on a study of nearly 17,000 accidents and incidents.[23] The FAA is working to increase airfield safety and reduce incursions, "[t]hrough infrastructure improvements—like lighting, signage, marking, and configuration changes—and new technologies—such as Runway Status Lights and Airport Surface Detection Equipment, Model X."[24] The FAA is also "committed to reducing RE [Runway Excursions] risk through analysis, awareness, and action."[25]

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[21] U.S. Federal Aviation Administration (FAA). "Safety Management Systems (SMS) for Airports." Accessed October 14, 2017. https://www.faa.gov/airports/airport_safety/safety_management_systems/.

[22] U.S. Federal Aviation Administration (FAA). "Fact Sheet—Office of Airports Safety Management System Efforts." July 12, 2016. https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=20554. p. 1.

[23] U.S. Federal Aviation Administration (FAA). *National Runway Safety Plan (2015–2017).* Washington, D.C. Accessed 2017. https://www.faa.gov/airports/runway_safety/publications/media/2015_ATO_Safety_National_Runway_Safety_Plan.pdf, p. 47.

[24] U.S. Federal Aviation Administration. "Reducing Runway Incursions: Guidance for Airports." Last modified February 12, 2018. https://www.faa.gov/airports/airport_safety/call_to_action/.

[25] U.S. Federal Aviation Administration (FAA). "Runway Safety—Runway Excursions." Last modified July 10, 2014. https://www.faa.gov/airports/runway_safety/excursion/.

The FAA tracks runway incursions and defines them as occurrences "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."[26] Runway incursions are classified by severity:

"a. **Accident**. An incursion that results in a collision. For the purposes of tracking incursion performance, an accident will be treated as a Category A runway incursion.
b. **Category A**. A serious incident in which a collision was narrowly avoided.
c. **Category B**. An incident in which separation decreases and there is a significant potential for collision, which may result in a time-critical corrective/evasive response to avoid a collision.
d. **Category C**. An incident characterized by ample time and/or distance to avoid a collision.
e. **Category D**. An incident that meets the definition of a runway incursion, such as the incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and takeoff of aircraft, but with no immediate safety consequences.
f. **Category E**. An incident in which insufficient or conflicting evidence of the event precludes assigning another category."[27]

Congress requires the FAA to report the **Runway Incursions Rate (A&B)**, which is the total of the Category A and B incursions per million operations in the entire NAS in a fiscal year.

Surface events including runway incursions and surface incidents are aggregated by cause:

"a. **Operational Incident.** A runway incursion attributed to ATCT [Air Traffic Control Tower] action or inaction.
b. **Pilot Deviation.** A runway incursion caused by a pilot or other person operating an aircraft under its own power (see FAA Order 8020.11, Aircraft Accident and Incident Notification, Investigation and Reporting, for the official definition).
c. **Vehicle or Pedestrian Deviation (VPD).** A runway incursion caused by a vehicle driver or pedestrian.
d. **Other.** Runway incursions which cannot clearly be attributed to a mistake or incorrect action by an air traffic controller, pilot, driver, or pedestrian will be classified as 'other.' These events would include incursions caused by equipment failure or other factors."[28]

The VPD incursions may be particularly interesting to airports because airport and/or tenant-operated vehicles may be involved. Airports may find it useful to track the metric **Runway Incursions Vehicle/Pedestrian,** which is the number of annual VPD incursions.

Runway incursion risk factors applicable to airports include airport geometry, wildlife/bird strikes, and foreign object debris (FOD). Vehicle runway crossings and navigational aid (NAVAID) availability could be other factors that airports consider in identifying incursion risk.

FAA analysis of aviation accidents and incidents revealed that airport geometry can be a runway incursion risk factor.[29] The FAA has identified airfield locations where airport geometry is a risk factor. These locations are referred to as hot spots and RIM locations. Hot spots are "location[s] on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary."[30] Current hot spots descriptions are provided in the FAA Airport/Facility Directory. The metric **Hot Spots—Number** may be useful in evaluating the safety of airport geometry.

The FAA's RIM Program is focused "on reducing runway incursions by addressing risks at specific locations at the airport that have a history of runway incursions."[31] The current inventory

[26] U.S. Federal Aviation Administration (FAA). Order 7050.1B: Runway Safety Program. Washington, D.C., 2013. https://www.faa.gov/documentLibrary/media/Order/FAA_Order_7050.1B.pdf. p. 3.
[27] Ibid, p. B-1.
[28] Ibid, p. A-1.
[29] U.S. Federal Aviation Administration (FAA). *National Runway Safety Plan (2015–2017),* p. 47.
[30] U.S. Federal Aviation Administration (FAA). "Runway Safety: Hot Spots List." Last modified May 2, 2016. https://www.faa.gov/airports/runway_safety/hotspots/hotspots_list/.
[31] U.S. Federal Aviation Administration (FAA). "FAA Implements New Airport Safety Program." Accessed October 14, 2017. https://www.faa.gov/news/updates/?newsId=83046.

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of RIM locations is based on 2007–2016 data and includes "airport locations where three or more peak annual runway incursions have occurred in a given calendar year or averaged at least one runway incursion per year when the location was added to the inventory."[32] The metric **RIM Locations—Number** is the number of RIM airport locations on the RIM inventory. The RIM inventory may be found on the FAA Office of Airports *Runway Incursion Mitigation (RIM) Program* web page.

The presence of animals such as deer or birds on or near the airport surface can also contribute to runway incursions. The metric **Wildlife/Bird Strikes**, which involves the number of reported bird/wildlife strikes at the airport, may be useful in evaluating trends and risks associated with wildlife and birds. Also, for Part 139 Certificated Airports, wildlife strikes may trigger a requirement to prepare a wildlife hazard assessment.

Foreign object debris on movement areas is a safety risk. Pieces of concrete can break loose from distressed airfield pavement and become foreign object debris (e.g., spalling or fatigued corners cracking off). The **Pavement Condition Index (PCI), by Runway** may be useful in analyzing risk for pavement to become foreign object debris. The PCI is a numerical rating of the surface condition of a pavement based on an objective measurement of the type, severity, and quantity of distress.

Vehicle Runway Crossings per Day may be a useful metric when evaluating safety risks and the need for infrastructure improvements such as new service roads.

Safety risk could increase if NAVAIDs are out of service. Airports are responsible for monitoring and maintaining non-federal NAVAIDs at their airport. Therefore, airports, likely general aviation airports, would find the metric **NAVAID availability**, the percentage of operating hours that installed non-federal NAVAIDs are available, useful in identifying safety risks.

Runway Excursions is the number of annual veer-offs or overruns off the runway surface.[33] The FAA is developing a system to collect and classify runway excursions.[34] Factors that can contribute to runway excursions include runway contamination, adverse weather conditions, mechanical failure, pilot error, and unstable approaches.[35] Of these factors, airports have the most influence on runway contamination because they are responsible for snow and ice removal.

Movement Area and Airfield Safety

Metrics related to the safety of the entire movement area and airfield include **Surface Incidents**, **Part 139 Inspection Results** and **Emergency Responses**. Also, metrics related to ARFF requirements and winter operations are related to movement area and airfield safety. Airports could consider these metrics when evaluating safety throughout the movement area.

Surface Incidents are the annual number "[u]nauthorized or unapproved movement within the designated movement area (excluding runway incursions) or an occurrence in that same area associated with the operation of an aircraft that affects or could affect the safety of flight."[36] Part 139 Certificated Airports are required to track and record any accidents or incidents in the movement areas and safety areas involving air carrier aircraft, a ground vehicle, or a pedestrian. An airport could track all potential deviations on the airport surface movement area by combining the **Surface Incidents** with **Runway Incursions** and **Runway Excursions**.

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[32] U.S. Federal Aviation Administration (FAA). "Runway Incursion Mitigation (RIM) Program." Last modified May 15, 2018. https://www.faa.gov/airports/special_programs/rim/.
[33] U.S. Federal Aviation Administration (FAA). *Order 7050.1B, Runway Safety Program,* p. A-1.
[34] U.S. Federal Aviation Administration (FAA). *National Runway Safety Plan, 2015–2017*, p. 13.
[35] U.S. Federal Aviation Administration (FAA). "Runway Excursions Support Tool." Accessed September 2017. https://runwayexcursions.faa.gov/content.html?id=c
[36] U.S. Federal Aviation Administration (FAA). *Order 7050.1B, Runway Safety Program,* p. 3.

Annual Part 139 Inspection Results is the number of deficiencies identified in the FAA's annual Part 139 inspection of the airport. This metric includes deficiencies related to the movement area, aircraft rescue and firefighting equipment and personnel preparedness, fueling facilities, and nighttime lighting and marking. Assessment of these deficiencies would enable airport operators to evaluate the types of safety issues at their airport and guide and prioritize mitigation strategies.

Emergency Responses—Annual is the annual number of emergency responses. The annual number of emergency responses may be a useful measure of airport safety and safety trends. Airports may track the number of emergency responses by type: hazardous materials, medical emergencies, fires, and aircraft incidents and/or by location: airside and landside.

ARFF Requirements

ARFF (Aircraft Rescue and Firefighting) Index is an alphabet letter (A, B, C, D, or E) that is tied to federal requirements for ARFF equipment in terms of number and agent/water capacities. It is determined by considering the length of the longest air carrier aircraft and its average daily departures. Part 139 Certificated Airports use the ARFF Index to determine equipment needs and plan ARFF facilities.

ARFF Equipment versus ARFF Index Requirements is the number of ARFF equipment as compared to that required per the ARFF Index. Many airports possess equipment in excess of the number required by the ARFF Index to accommodate equipment downtime.

ARFF Responses within Mandated Response Times (%) is the percentage of ARFF responses within the mandated response time for Part 139 Certificated Airports. The first ARFF vehicle must be able to reach the midpoint of the farthest runway used for Part 139 operations within three minutes, and all other vehicles necessary to deal with the emergency must arrive within four minutes. To maintain Part 139 Certification, airports must be able to demonstrate these can meet the mandated response times. There have been various proposals to shorten these times. Infrastructure changes at an airport could extend response distances, so it is useful for airports to track response times with existing facilities.

Winter Operations

Snow Removal Resources Identified in FAA-Approved Snow and Ice Control Plan is the number of pieces of snow removal equipment (by type) in an FAA-approved snow and ice control (removal) plan for a Part 139 Certificated Airport. Airports may use Advisory Circular (AC) No: 150/5200-30D, *Airport Field Condition Assessments and Winter Operations Safety*, in concert with AC No. 150/5220-20A, *Airport Snow and Ice Control Equipment*, to determine the minimum equipment requirements and clearing times for priority airport operations areas.

Primary Runway/Taxiway Clearing Time—Average for Snow/Ice is the average time, in minutes, to clear primary runways and related taxiways of snow/ice accumulation. It may also be useful to measure clearing time for the "Priority 1" area defined in FAA AC 150/5200-30D. Priority 1 area is defined as "those that directly contribute to safety and the re-establishment of aircraft operations at a minimum acceptable level of service. Priority 1 will generally consist of the primary runway(s) with taxiway turnoffs and associated taxiways leading to the terminal, portions of the terminal ramp, portions of the cargo ramp, Airport Rescue and Firefighting (ARFF) station ramps and access roads, mutual aid access points (including gates), emergency service roads, access to essential NAVAID, and centralized deicing facilities."[37]

[37] U.S. Federal Aviation Administration (FAA). *Advisory Circular 150/5200-30D: Airport Field Condition Assessments and Winter Operations Safety Advisory Circular, Change 1*. Washington, D.C., 2017. https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_150_5200-30D_with_chg1.pdf, pp. 1–3.

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3.4 Benchmarking across Airports

This section provides guidance on performance metrics that can be used to measure and benchmark airport performance.

3.4.1 Background

Measuring and benchmarking airport performance is a key to successful and efficient management of airports, as it involves understanding airport operations, identifying and adopting best practices to improve airport operational performance, and the ability to attract new air services. Typically, airport managers use benchmarking in two ways:

Internal benchmarking—When they compare their own airport performance over time to identify trends and areas that require improvement, and

External benchmarking—Benchmarking across different airports to measure their performance against comparable airports.

There are different challenges with internal and external benchmarking. Since there are more data available for airport managers to conduct internal benchmarking, they may perform more comprehensive assessments of airport performance. However, internal benchmarking will provide little help with identifying industry trends. External benchmarking, on the other hand, is more challenging due to limited data availability (only public data sources can be used) and difficulties with selecting comparable airports. This Reference Guide focuses on external benchmarking, although metrics that are more suitable for internal benchmarking are also discussed.

"If you've seen one airport, you've seen one airport." This popular airport industry saying speaks to the fact that airports operate in very different environments in terms of traffic patterns, commercial activities, location constraints, governance and ownership structure, etc. Consequently, individual airports will find different sets of performance metrics to be relevant and useful to their particular circumstances and data availability. For example, airports located in regions subject to the impacts of severe snow and ice are likely to be concerned about **Average Time to Deice an Aircraft**, whereas airports in the Sunshine State would not have any use for such metrics.

Even among airports with similar characteristics, airport managers may not agree which metrics are the most important and how many metrics the airport should track. A smaller but closely monitored set of metrics may be more effective than a larger set of metrics without a clear focus. Furthermore, airports operate in very dynamic environments, thus the relative importance of the metrics will likely evolve over time as new issues arise. For example, concession revenues were not as important to the airports twenty years ago as they are today.

The following sections describe how to use the primary and secondary metrics listed in Table 10 and Table 11 to select peer airports and to benchmark performance against those peer airports.

3.4.2 Suggested Metrics—Airport Benchmarking

Metrics to Select Comparable Airports

The first step in conducting external benchmarking is to identify the proper metrics that can be used to select the appropriate group of peer airports. The observed performances of airports are often affected by their geographical locations, traffic volume and traffic mix (international versus domestic, origin and destination versus connecting), capacity and congestion level, technical characteristics of airport infrastructure and facilities, as well as outsourcing, ownership,

Table 10. Suggested primary metrics for airport benchmarking.

Primary Metrics	Applicable Airports
Annual Aircraft Operations	All
Average Taxi-Out Delay	All
Destinations—Nonstop—Annual	Commercial
Average Airfare	Commercial
Airline Cost per Enplanement	Commercial
Airline Cost per Operation	Commercial
Average Load Factor	Commercial
Airport Cost per Enplanement	Commercial
Cargo Tons	Commercial
Enplaned Passengers—Annual	Commercial
Origination and Destination Passengers—Annual	Commercial
International Passengers to Total Passengers %	Commercial
Air Carrier Concentration	Commercial
Connecting Passengers—Annual	Commercial
Airport Concession Revenue per Enplaned Passenger	Commercial
Non-Aeronautical Operating Revenue as % of Total Operating Revenue	Commercial
Contact Gate Usage—Turns per Day	Commercial
Average Gate Departure Delay	Commercial
Baggage Delivery Time	Commercial
Wait Times at Security Checkpoints	Commercial
Average Number of Seats per Airline Departure Operation	Commercial
Minimum Flight Connecting Times	Commercial
Based Aircraft	GA
Critical Aircraft	All
NPIAS Classification	All
Instrument Approaches—Number of	GA
Average Annual T-Hangar Space Rental Cost	GA
Average Annual Tie-Down Space Rental Cost	GA
Average Cost per Gallon Paid by General Aviation for Jet Fuel	GA
Average Cost per Gallon Paid for Aviation Gasoline	GA

Table 11. Suggested secondary metrics for airport benchmarking.

Secondary Metrics	Applicable Airports
Runway/Taxiway Maintenance Cost	All
Airline Cost per Terminal Square Foot	Commercial
Airline Costs per Gate	Commercial
Landed Weight (1000 Lbs.)	Commercial
Domestic Passenger Flights—Number of	Commercial
International Passenger Flights—Number of	Commercial
Domestic Flights—Number of All Cargo	Commercial
International Cargo Flights—Number of	Commercial
Domestic Landed Weight—All-Cargo Aircraft	Commercial
International Landed Weight—All-Cargo Aircraft	Commercial
International Arriving Passengers	Commercial
Connecting Passengers—Annual	Commercial
Herfindahl-Hirschman Index (HHI)	Commercial
Maintenance Cost per Square Foot of Terminal	Commercial
Number of Security Lanes Staffed at Peak	Commercial
Total Number of Security Lanes Available	Commercial
Federal Inspection Service (FIS) Lanes Staffed at Peak	Commercial
FIS Service Volumes/Throughput	Commercial
Total FIS Lanes Available	Commercial
Escalators, Moving Walkways, Baggage Claim Equipment and Elevators—Percent of Time in Service	Commercial
Number of Operations	Core Airports

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and governance structure. The metrics used to identify peer airports need to reflect these characteristics. The following metrics can be used to identify peer commercial airports:

Enplaned Passengers—Annual reflects the traffic volume.
International Passengers to Total Passengers % serves as an indicator for passenger traffic mix.
Percentage of **Connecting Passengers—Annual** and **Origination and Destination passengers—Annual** are indicators for passenger traffic mix.
Percentage of passenger and cargo operations of **Annual Aircraft Operations** indicates the extent of noncommercial operations at an airport.
Cargo Tons—Annual reflects the importance of cargo operations.
Air Carrier Concentration indicates the level of airline competition at an airport.
Destinations—Nonstop—Annual indicates the connectivity of the airport.
NPIAS Classification is the classification of the airport in the FAA NPIAS.
Critical Aircraft is the most demanding aircraft type, or grouping of aircraft that make regular use of the airport.
Average Number of Seats per Airline Departure Operation reflects the average size of aircraft that serves an airport.

The following metrics can be used to identify peer general aviation airports:

Based Aircraft indicates the extent of infrastructure at the airport.
Critical Aircraft is the most demanding aircraft type, or grouping of aircraft, that makes regular use of the airport.
Annual Aircraft Operations reflects the traffic volume.
NPIAS Classification is the classification of the airport in the FAA NPIAS. Nonprimary airports are divided into categories based on existing activity measures: national, regional, local, basic, and unclassified.[38]
Instrument Approaches—Number of is the number of instrument approaches available at the airport.

Most of these metrics are either directly available or can easily be calculated with the data from BTS and FAA. In addition, configuration of the runway(s), number of gates, weather conditions, and ownership form may also be used to select the peer airports. It should be noted that these are just examples. The most meaningful benchmarking would involve airports that are very similar across all of the dimensions of airport characteristics.

Metrics to Benchmark against Peer Airports

The metrics classified in the benchmarking focus area have two main purposes: (1) to measure and compare the operational efficiency of an airport against its peer airports and (2) to evaluate how attractive an airport is to airlines and other users compared to its peer airports. These metrics are not mutually exclusive; some of the metrics may be applicable to both.

Metrics for Benchmarking Operational Efficiency. An efficient airport would be characterized by high utilization of its resources, including infrastructure, facilities, purchased materials, and human resources. Consequently, the airport would be expected to have lower operating expenses than comparable airports, fast turnaround, and competitive costs to airlines and other users on a per-unit basis. Primary metrics that can be used to measure and compare airport operational efficiency are included in the Performance Metrics Database. Secondary metrics

[38] U.S. Federal Aviation Administration (FAA). "National Plan of Integrated Airport Systems (NPIAS) Report: 2017–2021 NPIAS Report." Last modified October 21, 2016. http://www.faa.gov/airports/planning_capacity/npias/reports/index.cfm?sect=2007, p. 6.

that can be used to help explain the observed efficiency performance are also included in the Performance Metrics Database. The selection of specific metrics will depend on the goals and objectives of a specific benchmarking program. The following are several examples of primary metrics for operational efficiency:

Baggage Delivery Time depends on how efficiently the baggage handling system is designed and operated. It should be noted, however, that airlines are often responsible for operating the baggage handling systems, and there could be substantial differences in the baggage delivery distance from gates.

Contact Gate Usage—Turns per Day is a commonly used indicator of gate utilization and efficiency, which includes the associated facilities, equipment, and personnel. Airlines are actively involved in gate/apron operations.

Wait Time at Security Checkpoints depends on **Number of Security Lanes Available** and **Number of Security Lanes Staffed during Peak**. Both are secondary metrics that can be used to help explain the observed waiting time.

Minimum Flight Connection Times reflects the combined efforts of the airline and airport in transferring both baggage and passengers from one flight to another. It depends on the terminal layout as well as the effectiveness and efficiency of the escalators, moving walkways, elevators, baggage handling equipment, and operation in moving people and baggage within the airport. **Escalators, Moving Walkways, Baggage Claim Equipment and Elevators—Percent of Time in Service** is considered a secondary metric and can be used to identify the potential problem points.

Airline Cost per Enplanement (or Airline Cost per Operation) is an indirect indicator of airport operational efficiency. The more efficient an airport is, the lower its operating expenses on a unit basis are, and thus the lower its charges are to the airlines. **Average Number of Seats per Airline Departure Operation** could be used as a secondary metric to help explain the observed differences in airline cost per operation among peer airports.

Airport Cost per Enplanement is a direct indicator of airport operational efficiency. An efficient airport is expected to have lower operating expenses.

Metrics that Are Important for Attracting Air Services

The ability to attract and retain air services is critical for the financial health of airports. Many factors affect the attractiveness of an airport to airlines; some are operational, and some are financial. The following are examples of primary metrics that are potentially important for evaluating and comparing the attractiveness of an airport to airlines:

Airline Cost per Enplanement (or Airline Cost per Operation) is one of the most commonly used metrics when airlines compare costs of operating at different airports.

Contact Gate Usage—Turns per Day serves as an indicator of average turnaround time at the airport, which is important to airlines, especially low-cost airlines.

Average Airfare has dual implications. On the one hand, lower airfares would be attractive to passengers, thus higher demand. On the other hand, low airfares may indicate high competition among incumbent airlines, resulting in a low yield for airlines and, consequently, less attractive to new air services.

Air Carrier Concentration indicates how competitive the market is among the incumbent airlines, which may deter or encourage new air services.

Airport Concession Revenue per Enplaned Passenger provides an indication of how much an airport would rely on fees and charges imposed on airlines. It may also serve as an indicator for potential revenues for an airline through revenue sharing.

Non-Aeronautical Operating Revenue as % of Total Operating Revenue is similar to **Airport Concession Revenue per Enplanement.** It indicates how much an airport would rely

on fees and charges imposed on airlines, which would determine the cost for an airline to operate at the airport.

Average Gate Departure Delay and **Average Taxi-Out Delay** reflect the congestion levels and efficiency levels at the airport. Longer delays would cost airlines both financially and in terms of goodwill.

Average Load Factor serves as an indicator of the performance of flights at an airport, although it is more a performance metric for airlines rather than for airports.

Metrics that Are Important for General Aviation Airports

The ability for general aviation airports to generate revenues typically is limited to fuel flowage fees, hangar rentals, tie-down space rentals, and leased office space. In light of that, the following selected primary metrics are important for general aviation airports:

Based Aircraft provides an estimate of operational demands and potential revenue-generated opportunities. More based aircraft means more demand for hangar rental, refueling, etc. It is important to track based aircraft by type.

Average Annual T-Hangar Space Rental Cost indicates how competitive an airport with its T-hangar rental rates. Lower T-hangar rental rates than the rates at other general aviation airports in the same area may attract aircraft owners. However, lower rates may mean lower potential revenues for the airport.

Average Annual Tie-Down Space Rental Cost is similar to **T-Hangar Space Rental Cost**. It indicates how competitive an airport is with its tie-down rental costs by comparing them with other airports in the area.

Average Cost per Gallon Paid by General Aviation for Jet Fuel indicates how attractive an airport is as a refueling stop for business jets and other turbine powered aircraft. Attractive jet fuel prices may bring new business and more revenues.

Average Cost per Gallon Paid for Aviation Gasoline is similar to the jet fuel metrics. It indicates how competitive an airport is with its AvGas prices.

Practical Considerations for External Benchmarking. When considering benchmarking against an airport located in a geographical area with different weather patterns, it is important to understand that the quantitative assessment of the differences in the performance metrics may not be possible. It is difficult to normalize the airport performance metrics by weather patterns that can be extremely dissimilar. In that case, a qualitative analysis of selected metrics will allow for an understanding of the differences and/or similarities in airport performance. Also, benchmarking an airport against a group of airports using metrics aggregated for all airports in the group will smooth the weather differences out and may allow meaningful quantitative benchmarking.

When considering benchmarking against an airport that is larger or smaller, before comparing the performance metrics, the metrics should be normalized by the number of departures, number of arrivals, number of enplanements, or any other meaningful way. Properly normalized metrics will indicate true differences in airport performance metrics.

Finally, benchmarking against different airports for different metrics may be appropriate.

Select Internal Benchmarking Metrics

Airports sometimes select internal benchmarking metrics based on what another airport is measuring. Some of these internal benchmarking performance metrics are particularly important in airport planning. The performance metrics provided in Table 12 are a sampling of these types of internal benchmarking performance metrics.

Table 12. Selected internal benchmarking performance metrics.

Metrics	Applicable Airports
Inter-Terminal Transportation—Wait Times at Peak Periods	Commercial
Baggage Claim Utilization	Commercial
Baggage Claim Availability	Commercial
Originating Passengers/Square Foot Ticketing Check-in Space	Commercial
Number of Days Jet Fuel Supply On Site	GA
Number of Days Avgas Supply On Site	GA
Average Daily Jet Fuel Pumped	GA
Average Daily Avgas Pumped	GA

3.5 Airport Geometry Impact on Operations

This section provides guidance on performance metrics that can be used to consider the impacts of airport geometry on airport operations.

3.5.1 Background

Airport geometry is designed to promote safe and efficient aircraft operations. The FAA recommends that civil airports be designed in accordance with AC 150/5300-13A, *Airport Design*.

"In general, use of this AC [AC 150/5300-13A] is not mandatory. The standards and recommendations contained in this AC may be used by certificated airports to satisfy specific requirements of Title 14 Code of Federal Regulations (CFR) Part 139, Certification of Airports, subparts C (Airport Certification Manual) and D (Operations). Use of this AC is mandatory for all projects funded with federal grant monies through the Airport Improvement Program (AIP) and/or with revenue from the Passenger Facility Charges (PFC) Program."[39]

These standards and recommendations for airport geometry prescribe pavement dimensions and separations based on aircraft characteristics and visibility minimums. Thus, when designing the geometry of airfield components, airport planners identify the existing and future design aircraft and visibility minimums. The design aircraft is also referred to as the critical aircraft. Critical aircraft is defined in FAA AC 150/5700-17, *Critical Aircraft and Regular Use Determination*.

The critical aircraft is the most demanding aircraft type, or grouping of aircraft with similar characteristics, that makes regular use of the airport. Regular use is 500 annual operations, including both itinerant and local operations but excluding touch-and-go operations. An operation is either a takeoff or landing.[40]

Different types of aircraft may be the critical aircraft for different aspects of airport design.[41] For example, the critical aircraft for the Aircraft Approach Category, which is based on aircraft approach speed, may be different than the critical aircraft for the Airplane Design Group (ADG), which is based on the aircraft physical characteristics (wingspan and tail height), and the critical aircraft for the Taxiway Design Group, which is based on the aircraft undercarriage dimensions. Also, when an airport has multiple runways, critical aircraft are identified for each runway.[42]

[39] U.S. Federal Aviation Administration (FAA). *AC 150/5300-13A: Airport Design*. 2012, p. i.
[40] U.S. Federal Aviation Administration (FAA). *AC 150/5000-17: Critical Aircraft and Regular Use Determination*, Washington, D.C., p. 1-1.
[41] Ibid, p. 3-1.
[42] U.S. Federal Aviation Administration (FAA). *AC 150/5300-13A: Airport Design*, p. 12.

Table 13. Suggested primary metrics for airport geometry impact on operations.

Primary Metrics	Applicable Airports
Critical Aircraft	All
Lowest Minimums	All
Maximum Sustainable Throughput	Airports with Sustained Periods of High Demand
Annual Service Volume	All
Practical Hourly Capacity	All
Runway Occupancy Time	All
Taxi-In Time	ASPM Airports
Taxi-Out Time	ASPM Airports
Taxi Time—Deicing Pad to Departure Runway	Airports in Cold Weather Climates
Average Time to Deice an Aircraft	Airports in Cold Weather Climates
Taxi Time—Gate to Deicing Pad	Airports in Cold Weather Climates
Hot Spots—Number	All
Runway Incursion Mitigation Locations—Number	All
Taxi Time—Gate to Runway End, Peak vs. Unimpeded	ASPM Airports
Average Taxi-Out Delay	ASPM Airports
Average Taxi-In Delay	ASPM Airports
Airfield Throughput during Peak Periods within Hour	ASPM Airports
Modifications to Standards for Group VI Aircraft	All

Visibility minimums are also considered in designing airport geometry. For example, runway design standards are based on the Runway Design Code. The runway design code is made up of three components: the Aircraft Approach Category, ADG, and a component that relates to visibility minimums. The visibility minimum component of the runway design code indicates the visibility as lower than ¼ mile, lower than ½ mile but not lower than ¼ mile, lower than ¾ mile but not lower than ½ mile, lower than 1 mile but not lower than ¾ mile, or not lower than 1 mile.

3.5.2 Suggested Metrics—Airport Geometry Impact on Operations

Given the importance of critical aircraft and visibility minimum in designing airfield geometry, the metrics **Critical Aircraft** and **Lowest Minimums** are two of the primary metrics in the Performance Metrics Database.

Additional metrics apply to airfield geometry and associated complexities that influence operations. Table 13 and Table 14 show the primary and secondary metrics, respectively, for airport geometry impacts on operations. The following subsections explain how the primary metrics may be applied. Refer to the Performance Metrics Database to learn more about the secondary metrics.

Performance metrics related to airfield geometry can be obtained through modeling airfield operations or by analyzing available data.

Table 14. Suggested secondary metrics for airport geometry impact on operations.

Secondary Metrics	Applicable Airports
Average Annual Delay	All
Runway Configuration Use	All
Runway Queue for Maximum Throughput Conditions	Busy Airports
Pavement Usage (number of passes over segments)	All
Operations—Traffic Counts per FAA ATCT	Towered Airports
Annual Aircraft Operations	All
Average On-to-In (taxi time for arrivals)	ASPM Airports
Average Out-to-Off (taxi time for departures)	ASPM Airports
Total Number of Runway Crossing by Aircraft to Access Runway Ends	All

Modeling Airfield Geometry

Airport geometry can affect airfield operations and airport capacity and delay. Parallel runway separation can influence capacity in instrument metrological conditions. The location and orientation of taxiway exits from the runway and the taxiway system to and from the runway can influence the runway occupancy time and taxi time. The size, layout, and location of a dedicated deicing pad can restrict aircraft flow to a level lower than the ADR and cause departure delay.

Analysis can be conducted to determine the impacts of airfield geometry on capacity and delay. For example, the FAA conducted high-level assessments of airport runway capacity at the nation's busiest airports to communicate essential airport system capacity information.[43] For this assessment, capacity was defined as "the hourly throughput that an airport's runways are able to sustain during periods of high demand, represented as the range between the ATC Facility Reported Rate and a model-estimated rate."[44] Future improvements, including planned runway improvements, were assessed using MITRE's *runway*Simulator model. Non-runway constraints, such as taxiway and gate congestion, were not assessed. The Airport Capacity Profiles for the studied airports include current ATC Facility Reported Hourly Rates and current and future Model-Estimated Hourly Rates for visual, marginal, and instrument weather conditions.

In 2015, the FAA published the results of another capacity assessment, *FACT 3*: *Airport Capacity Needs in the National Airspace System*. Planned improvement that would affect runway capacity, including NextGen techniques, technologies, and procedures, were assessed. *FACT 3* used two modeling techniques to conduct the analysis: annual service volume and NAS-wide modeling tools. The annual service volume analysis was conducted using the Runway Delay Simulation Model and resulted in demand–delay curves. The curves were used to estimate delay at a given level of annual demand.[45] For the NAS-wide analysis, the MITRE's *runway*Simulator model was used to generate airport capacity curves. These curves along with airspace, taxiway performance, and airport gate use data were input into MITRE's *systemwide*Modeler. The results from both models were used to estimate delay and the percentage of hours when a given level of delay would occur. This information was then used to identify airports that would be considered capacity constrained.[46]

As can be seen from these examples, in metrics such as **Maximum Sustainable Throughput**, **Annual Service Volume**, and **Practical Hourly Capacity,** analysis of proposed changes to airport geometry can be conducted to determine the impact on airport capacity and delay. Various levels of methods, ranging from table lookups to airfield simulation models are available to evaluate capacity and delay. Detailed simulation is likely required to evaluate taxi times (**Taxi Time—Deicing Pad to Departure Runway**, **Taxi Time—Gate to Deicing Pad**), **Runway Occupancy Times**, runway departure queues, and the effects of runway crossing, bypass taxiways hold pads, and remote deicing on capacity and delay. Metrics such as **Average Time to Deice an Aircraft** may be useful input data for modeling. Guidance on conducting capacity and delay analysis is provided *ACRP Report 79: Evaluating Airfield Capacity* and *ACRP Report 104: Defining and Measuring Aircraft Delay*.

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[43] U.S. Federal Aviation Administration (FAA). "Airport Capacity Profiles." July 2014. https://www.faa.gov/airports/planning_capacity/profiles/, p.1.

[44] U.S. Federal Aviation Administration (FAA). Airport Capacity Profiles, July 2014, p. 1.

[45] U.S. Federal Aviation Administration (FAA). *FACT 3: Airport Capacity Needs in the National Airspace System*. Washington, D.C., 2015. https://www.faa.gov/airports/planning_capacity/media/FACT3-Airport-Capacity-Needs-in-the-NAS.pdf, p. 10.

[46] U.S. Federal Aviation Administration (FAA). *FACT 3: Airport Capacity Needs in the National Airspace System.* January 2015, pp. B-4—B-6.

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Analyzing Historical Data

Reviewing historical data can reveal important information on the impact of airfield geometry complexity on operations. For example, based on the history of the potential risk of collision or runway incursion on an airport movement area, the FAA identified hot spots where heightened attention by pilots and drivers is necessary. Thus, the **Hot Spot—Number** metric is included in the Performance Metrics Database. Similarly, the FAA reviewed national runway incursion data and identified locations that have a history of runway incursions. The associated metric **RIM Locations—Number** is also included in the Performance Metrics Database.

Analysis of historical data allows airport planners to identify capacity limitations due to airport geometry. Increased data and metric availability have facilitated the ability to analyze historical data. For example, ASDE-X data can be used to obtain **Runway Occupancy Time**. The runway occupancy time is considered when contemplating taxiway improvements, including high-speed taxiways. Also, metrics and data available through ASPM can be useful in evaluating the efficiency of airfield geometry. Metrics such as **Taxi-In Time**, **Taxi-Out Time**, **Average Taxi-Out Delay**, **Average Taxi-In Delay**, **Taxi Time—Gate to Runway End**, **Peak vs. Unimpeded**, and **Airfield Throughput during Peak Periods** can be useful in evaluating the impact of airfield geometry on taxi times.

For airports for which ADSE-X or multilateral systems are available, data on **Pavement Usage** may be available for collection and analysis.

Group VI Aircraft and Airfield Geometry

Group VI aircraft operations add complexity to airfield operations primarily because of Modification of Standards for Group VI Aircraft and increased wake vortex-related separation requirements.

At the beginning of the 21st century, FAA Airplane Design Group VI (ADG VI) aircraft, such as the Airbus 380 and Boeing 747-8, entered airline passenger fleets, joining the relatively few oversized cargo aircraft then operating. These ADG VI aircraft have tail heights from 66 feet up to (but not including) 80 feet and wingspans from 214 feet up to (but not including) 262 feet. Their introduction required the application of the "critical aircraft" classification used by FAA and ICAO airfield design geometric standards to be addressed at several airports. These standards included substantial increases in geometric separations between runways, taxiways, taxilanes, and holding aprons, along with obstacle-free areas and pavement widths. Due to the longer wheelbases and landing gear width, new Taxiway Design Group standards for taxiway turn radii and shoulder fillets have been established by FAA.

To reduce the impact of these standards on existing facilities, the FAA allows for the development of aircraft-specific FAA-approved operations plans using **Modifications of Standards** for Group VI Aircraft for A380s/B747-8s/New Large Aircraft. Several dozen airports have thus far formulated these approved plans which use the process defined in FAA Order 5300.1F. These often limit speeds or use of certain taxiways/taxilanes when an ADG VI aircraft is operating and require the use of expanded paved shoulder in lieu of full-strength pavement widths.

Beyond the airfield geometric standards, these ADG VI aircraft can reduce runway capacity and increase occupancy times due to the increased ATC wake vortex-related separations between arriving and departing aircraft in this ATC category.

Future types of aircraft may "straddle" the ADG V and ADG VI criteria and reduce the impacts on airfield operations. The first, planned to enter service by 2020, is the Boeing 777X series (777-8/777-9) of aircraft that will have folding wings. These aircraft that will require ADG VI standards on the runway, but meet ADG V criteria on the taxiway system and at gates/aircraft stands.

3.6 Gate Management and Ramp Tower Operations

This section provides guidance on performance metrics that can be used to evaluate gate management and ramp tower operations.

3.6.1 Background

Gate management includes the actions taken by some entity at the airport responsible for assigning gate space to an aircraft. Ramp tower operations include gate management and those activities assigned to a ramp control facility. Ramp control is best defined using the definition contained in ACRP Research Report 167:

> "Ramp control can be defined as the activities undertaken by a non-FAA entity at an airport that:
>
> Provides guidance and direction to all aircraft moving within the control entity's area of jurisdiction:
>
> - For departing aircraft, typical instructions include providing pushback and disconnect point, and coordination with air traffic control (ATC).
> - For arriving aircraft, instructions include providing gate and ramp entrance information, if appropriate.
>
> Sequences departing aircraft to the designated transition point (spot) on the ground and issuing traffic advisories, as necessary.
>
> Coordinates arriving and departing aircraft hand-offs with ATC, including situations when aircraft enter the ramp but are unable to clear active taxiways.
>
> Resolves conflicts with aircraft that are arriving, departing, or under tow within their area of jurisdiction."

At airports with formal gate management and/or ramp tower operations, activities are currently managed by either the airport or airline personnel or by personnel contracted by the airport or airline to provide those services. Although formal ramp control facilities are currently in operation at less than 30 airports in the U.S., the need for ramp management and/or a ramp tower operation could change at any time. Some of the events that can affect the decision to engage in ramp control include the following:

- Need to mitigate a current safety issue or one that may be created with growth.
- Increases in airport demand or the addition of new flight operators.
- Short-term or long-term construction projects. These can include temporary runway or taxiway closures for maintenance or construction of new terminals, deicing facilities, gates, runways, or taxiways.
- Administrative decisions that affect operations at the airport (e.g., changes to or expansion of common-use gates).
- Changes in airfield operations due to the implementation of evolving FAA NextGen technologies (e.g., surface management or TFDM).[47]

3.6.2 Suggested Metrics—Gate Management and Ramp Control

Metrics may provide a basis for a cost and benefit analysis for either establishing ramp control or expanding the number of gates. Additionally, metrics are essential in conducting safety management analysis. Metrics may also be useful when developing internal ramp control procedures as well as coordinating letters of agreement with the local air traffic control tower.

Each airport faces different challenges managing movement of aircraft and vehicles on the ramp. Ramp accidents and incidents can indicate a need for ramp control. Ramp congestion can be a function of a variety of factors from demand/capacity imbalances, terminal complexity,

[47] *ACRP Research Report 167: Guidebook for Developing Ramp Control Facilities*. Washington, D.C., 2017.

the presence of large aircraft affecting adjacent gates, or a high number of irregular operations. The metrics discussed in this database can be used to assess the severity of ramp control issues and provide benchmarking for mitigating these issues, including assessing the performance of active ramp control.

Table 15 and Table 16 show the primary and secondary metrics, respectively, for gate management and ramp tower operations. The following subsections explain how the primary metrics may be applied. Refer to the Performance Metrics Database to learn more about the secondary metrics.

Number of Accidents/Incidents per Ramp—Annual is a useful metric in considering the need for ramp control. This metric could be tracked by who is involved or lead to a better understanding of the safety problems, including the following:

- Number of aircraft-and-aircraft accidents/incidents per ramp area per year
- Number of aircraft-and-vehicle accidents/incidents per ramp area per year
- Number of aircraft-and-ground personnel accidents/incidents per ramp area per year
- Number of aircraft-and-equipment accidents/incidents per ramp area per year
- Number of accidents/incidents where gate adjacency was a causal factor
- Number of accidents/incidents where wingtip clearance was a causal factor
- Number of accidents/incidents where insufficient coordination was a causal factor
- Number of accidents/incidents where infringement on the movement area was a causal factor

Table 15. Suggested primary metrics for gate management and ramp tower operations.

Primary Metrics	Applicable Airports
Number of Accidents/Incidents per Ramp—Annual	Commercial Service
Serious Number Injuries/Fatalities of Employees and Passengers on Aircraft Aprons	Commercial Service
Airport Arrival Rate (AAR)	Commercial Service
Airport Departure Rate (ADR)	Commercial Service
Average Daily Capacity (ADC)	Commercial Service
Peak Hour Operations Throughput in IMC	Commercial Service
Peak Hour Operations Throughput in Marginal VMC	Commercial Service
Peak Hour Operations Throughput in VMC	Commercial Service
Peak Period	Commercial Service
Maximum Sustainable Throughput	Commercial Service
Airfield Throughput during Peak Periods within Hour	Commercial Service
Average Gate Arrival Delay	Commercial Service
Average Gate Departure Delay	Commercial Service
Average Minutes of Delay per Delayed Gate Arrival	Commercial Service
Average Minutes of Delay per Delayed Gate Departure	Commercial Service
Average Taxi-In Delay	Commercial Service
Average Taxi-Out Delay	Commercial Service
Taxi Time—Gate to Runway End, Peak vs. Unimpeded	Commercial Service
Contact Gates—Number of	Commercial Service
Air Carrier Concentration	Commercial Service
Usable Contact Gate in Service	Commercial Service
Number of Jet Bridges on Airport	Commercial Service
Aircraft Remote Parking—Remain Overnight Positions	Commercial Service
Enplanements per Gate	Commercial Service
Contact Gate Usage—Turns per Day	Commercial Service
Contact Gate Utilization	Commercial Service
Dedicated Deicing Positions—Number of	Commercial Service
Deicing Throughput in Aircraft per Hour	Commercial Service

Table 16. Suggested secondary metrics for gate management and ramp tower operations.

Secondary Metrics	Applicable Airports
Delays with Passengers on Aircraft that Exceed DOT Tarmac Delay Duration Standards Annually (Domestic)	Commercial Service
Delays with Passengers on Aircraft that Exceed DOT Tarmac Delay Duration Standards Annually (International)	Commercial Service
Carbon Footprint	Commercial Service
Emissions Exposure (CO_2 Emissions)	Commercial Service
Average Daily Operations	Commercial Service
Average Daily Operations—Military	Commercial Service
Charter Flights—Number of Annual	Commercial Service
Cancellations	Commercial Service
Runway Queue for Maximum Throughput Conditions	Commercial Service
Diversions into Airport—Number of Annual	Commercial Service

Serious Number Injuries/Fatalities of Employees and Passengers on Aircraft Aprons would be another metric to consider in determining the need for ramp control.

Analyzing demand, capacity, and delay metrics can assist in identifying challenges or constraints related to ramp operations and strategies at a given airport. Evaluation of the metrics can also give airport operators and stakeholders insight into the need for assistance with ramp operations to meet current and future demand levels. Additionally, analysis of metrics in these categories can assist the user in the development of irregular operations plans, in stakeholder communications efforts, and in assessment of airport performance.

Metrics such as **Airport Arrival Rate**, **Airport Departure Rate**, and **Average Daily Capacity** provide a measure of demand for the movement of aircraft in a given time period, be it hourly or daily. These metrics can also help reveal temporary arrival or departure imbalances.

Peak hour metrics including **Peak Hour Operations Throughput in IMC**, **Peak Hour Operations Throughput in Marginal VMC**, **Peak Hour Operations Throughput in VMC**, **Peak Period**, **Maximum Sustainable Throughput,** and **Airfield Throughput During Peak Periods** can be used to assess the volume of traffic that must be addressed at the most congested times. When considered in concert with the delay metrics, the threshold in which congestion becomes a problem can be revealed.

Delay metrics can be useful in identifying inefficiencies within the current ramp operation procedures and protocols. These inefficiencies could be related to peak operational periods which require additional staffing or mitigated protocols to meet the demand during these peak times. Delay metrics could potentially identify certain locations on the ramp surface area that continually contribute to delay in aircraft entering and navigating through the ramp area and/or exiting the ramp area. Key delay metrics include **Average Gate Arrival Delay**, **Average Gate Departure Delay**, **Average Gate Arrival Delay per Delayed Flight**, **Average Gate Departure Delay per Delayed Flight**, **Average Taxi-In Delay**, **Average Taxi-Out Delay**, and **Taxi Time—Gate to Runway End, Peak vs. Unimpeded**.

Gate related facilities and use may also be considered when evaluating the need for ramp control or additional gates. Related metrics include **Contact Gates—Number of** (broken down by common use, preferential use, and exclusive use), **Air Carrier Concentration**, **Usable Contact Gate in Service**, **Number of Jet Bridges on Airport**, **Aircraft Remote Parking—Remain Overnight Positions**, **Enplanements per Gate**, **Contact Gate Usage**, **Turns per Day**, and **Contact Gate Utilization**.

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Finally, for airports in cold weather climates, metrics related to deicing facilities, **Dedicated Deicing Positions—Number of,** and throughput, **Deicing Throughput**, may influence the performance of an existing ramp control.

3.7 Regulations/Requirements

This section provides guidance on performance metrics that airports are required to track/report per federal laws and regulations.

3.7.1 Background

A number of metrics are tracked by the FAA, airlines, and airports to comply with federal, state, and local regulations/requirements. Many of these metrics, such as departure and arrival delays, are reported by airlines or are tracked by the FAA's own data tracking systems. However, there are some metrics that primarily concern airport operators.

This section highlights planning and operational metrics that airports are required to track/report per federal laws and regulations. Examples of applicable federal laws and regulations include the Clean Water Act; 49 U.S.C. § 47107—*Project Grant Application Approval Conditioned on Assurances about Airport Operations*; Title 14 CFR Part 139—Certification of Airports; Title 14 CFR Part 158—PFCs; and FAA Order 1050.1—*Environmental Impacts: Policies and Procedures*. By no means is this a comprehensive, all-inclusive list of required metrics, and users should be aware that there may be additional requirements per federal regulations/requirements. Also, this Reference Guide does not attempt to address all the metric requirements per state and local laws and regulations due to the large number and variability of such laws and regulations and their applicability to only those airports in the associated jurisdictions.

3.7.2 Suggested Metrics—Regulations/Requirements

Table 17 shows the primary metrics related to federal regulations and requirements. The following subsections explain how the primary metrics may be applied.

Environmental

Airports may be subject to numerous environmental-related laws and regulations. Examples include the National Environmental Policy Act (NEPA), the Clean Water Act, and the Clean Air Act. Related metrics in the Performance Metrics Database include the following:

Noise Exposure is the number of people exposed to significant noise. Significant aircraft noise levels are defined as values greater than or equal to DNL 65 dB. In accordance with NEPA, proposed changes in airspace design or airport infrastructure may require analysis of environmental impacts including noise exposure. Noise impacts are measured in part by determining the number of people that will be exposed to significant aircraft noise. Also, airports that participate in the 14 CFR Part 150 Airport Noise Compatibility Planning Program must develop noise exposure maps and "provide estimates of the number of people residing within the Ldn [DNL] 65, 70, and 75 dB contours."[48] Therefore, the **Noise Exposure** metric should be considered in planning for airport improvements, operational changes, and NextGen procedures and when participating in the 14 CFR Part 150 Airport Noise Compatibility Program.

[48] "Part 150: Airport Noise Compatibility Planning." U.S. Code of Federal Regulations, title 14 (2004). Part B(f)(4).

Table 17. Suggested primary metrics federal regulations/requirements.

Primary Metrics	Applicable Airports
Noise Exposure	All
Amount of Deicing or Anti-Icing Agent (by type) Applied to Aircraft—per Season	Airports in Cold Climates
Amount of Deicing or Anti-Icing Agent Applied to Airfield (by type)—per Season	Airports in Cold Climates
Deicing % Fluid Recovered	Airports in Cold Climates
Criteria Pollutant Emissions	All
ARFF Index	Part 139 Certified
ARFF Equipment vs. ARFF Index Requirements	Part 139 Certified
ARFF Responses within Mandated Response Times (%)	Part 139 Certified
Annual Part 139 Inspection Results	Part 139 Certified
Pavement Classification Number—by Runway	Part 139 Certified
Snow Removal Resources Identified in FAA-Approved Snow and Ice Control Plan	Part 139 Certified
Runway Incursions	Part 139 Certified
Runway Incursions Vehicle/Pedestrian	Part 139 Certified
Surface Incidents	Part 139 Certified
Pavement Condition Index—by Runway	AIP/PFC Funding
Debt Service Coverage Ratio	AIP/PFC Funding
Airport Concession Revenue per Enplaned Passenger	AIP/PFC Funding
Non-Aeronautical Operating Revenue as % of Total Operating Revenue	AIP/PFC Funding
Enplaned Passengers—Annual	AIP/PFC Funding—more than 25,000 enplanements
Landed Weight	AIP/PFC Funding—more than 25,000 enplanements
Annual Aircraft Operations	AIP/PFC Funding—more than 25,000 enplanements
Airline Cost per Enplanement	AIP/PFC Funding—more than 25,000 enplanements
Contact Gates—Number of	AIP/PFC Funding—medium or large hub airports where one or two air carriers control more than 50 percent of the passenger boardings
Contact Gate Utilization	AIP/PFC Funding—medium or large hub airports where one or two air carriers control more than 50 percent of the passenger boardings

Amount of Deicing or Anti-Icing Agent (by type) Applied to Aircraft—per Season, **Amount of Deicing or Anti-Icing Agent Applied to Airfield (by type)—per Season** and **Deicing % Fluid Recovered** are metrics related to water quality and stormwater regulations. Airports are required to obtain stormwater discharge permits, which may include requirements relating to the amount of deicing agents used and collected. The Environmental Protection Agency (EPA) promulgated the Airport Deicing Effluent Guidelines (40 CFR Part 449). "The requirements generally apply to wastewater associated with the deicing of airfield pavement at commercial airports. The rule also established New Source Performance Standards for wastewater discharges associated with aircraft deicing for a subset of new airports. These requirements are incorporated into NPDES (National Pollutant Discharge Elimination System) permits."[49] "New airports with 10,000 annual departures located in cold climate zones are required to collect 60 percent of aircraft deicing fluid after deicing. Airports that discharge the collected aircraft deicing fluid directly to waters of the U.S. must also meet numeric discharge requirements for chemical oxygen demand. The rule does not establish uniform, national requirements for aircraft deicing discharges at existing airports. Such requirements will continue to be established in general permits, or for individual permits on a site-specific, best professional judgment basis."[50] Airports may also be required to notify state/local agencies of discharges and/or disposal of collected deicing agents.

[49] U.S. Environmental Protection Agency (EPA). "Airport Deicing Effluent Guidelines." Washington, D.C., Accessed 2017. https://www.epa.gov/eg/airport-deicing-effluent-guidelines.

[50] U.S. Environmental Protection Agency (EPA). *Fact Sheet: Effluent Guidelines for Airport Deicing Discharges*. Washington, D.C., 2012. https://www.epa.gov/sites/production/files/2015-06/documents/airport-deicing-fact-sheet_final-rule_april-2012.pdf, p.1.

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Criteria Pollutant Emissions are the quantities of criteria pollutants [carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM), sulfur dioxide (SO_2), and lead (Pb)] that would be emitted due to a proposed project. The EPA regulates these pollutants under the Clean Air Act, and aircraft criteria pollutant emissions are inputs to state and regional state implementation plans that are required under the Clean Air Act. In addition, under NEPA, an analysis of a proposed project's impact on attainment and maintenance of the National Ambient Air Quality Standards for criteria air pollutants is included in environmental assessments, environmental impact statements, and if appropriate, categorical exclusions. Therefore, particularly for airport improvement projects, it is important to consider how emissions of criteria pollutants may be affected.

Part 139 Certified Airports

The FAA is required to issue airport operating certificates to airports that

- "Serve scheduled and unscheduled air carrier aircraft with more than 30 seats;
- Serve scheduled air carrier operations in aircraft with more than 9 seats but less than 31 seats; and
- The FAA Administrator requires to have a certificate."[51]

Airports must agree to operational and safety standards to obtain a Part 139 Certificate. These include requirements for providing aircraft rescue and firefighting services and snow and ice control and for allowing the FAA to conduct inspections and reporting incidents. Some requirements vary by size of airport and the type of aircraft operations. Related operation and planning metrics in the Performance Metric Database include the following:

ARFF Index is an alphabet letter (A, B, C, D, or E) that is tied to federal requirements for ARFF equipment in terms of number and agent/water capacities. It is determined by considering the length of the longest air carrier aircraft and its average daily departures. Part 139 Certificated Airports use the **ARFF Index** to determine equipment needs and plan ARFF facilities.

ARFF Equipment versus ARFF Index Requirements is the number of ARFF equipment as compared to that required per the **ARFF Index**. Many airports possess equipment in excess of the number required by the **ARFF Index** to accommodate equipment downtime.

ARFF Responses within Mandated Response Times (%) is the percentage of ARFF responses within the mandated response time for Part 139 Certificated Airports. The first ARFF vehicle must be able to reach the midpoint of the farthest runway used for Part 139 operations within three minutes, and all other vehicles necessary to deal with the emergency must arrive within four minutes. To maintain Part 139 Certification, airports must be able to demonstrate these can meet the mandated response times. There have been various proposals to shorten these times. Also, airports may be considering infrastructure changes that could extend response distances, and so it is useful for airports to track response times with existing facilities.

Annual Part 139 Inspection Results is the number of deficiencies identified by the FAA during the annual Part 139 inspection of the airport. Airports, of course, focus on correcting any identified deficiencies.

Pavement Classification Number, by Runway "is a number that expresses the load-carrying capacity of a pavement for unrestricted operations."[52] Pavement classification number data must be reported for all public-use paved runways at Part 14 CFR 139 Certificated Airports.

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[51] "Part 139: Certification of Airports, Subpart D: Operations." U.S. Code of Federal Regulations, title 14 (2018).

[52] U.S. Federal Aviation Administration (FAA). *Advisory Circular 150/5335-5C: Standardized Method of Reporting Airport Pavement Strength—PNC*. Washington, D.C., 2014. https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5335-5c.pdf, p. i.

Snow Removal Resources Identified in FAA-Approved Snow and Ice Control Plan is the number of pieces of snow removal equipment (by type) in FAA-approved snow and ice control (removal) plan for a Part 139 Certificated Airport. Airports may use AC No: 150/5200-30D—*Airport Field Condition Assessments and Winter Operations Safety*, in concert with AC No. 150/5220-20A—*Airport Snow and Ice Control Equipment*, to determine the minimum equipment requirements and clearing times for priority airport operations areas.

Runway Incursions, **Runway Incursions Vehicle/Pedestrian**, **and Surface Incidents** are related to the Part 139 requirement to record any accidents or incidents in the movement areas and safety areas involving air carrier aircraft, a ground vehicle, or a pedestrian.

Airport Improvement Program and Passenger Facility Charges

Airports that receive federal funds through the AIP or use funds generated through PFC must comply with associated assurances and requirements.[53] There are several metrics in the Performance Metrics Database that are related to airport obligations under the AIP and PFC programs.

Pavement Maintenance Plan. **Pavement Condition Index (PCI)—by Runway** is a numerical rating of the surface condition of pavement based on an objective measurement of the type, severity, and quantity of distress. "PCI values range from 100 for a pavement with no defects to 0 for a pavement with no remaining functional life."[54] The PCI rating system may be used to track pavement conditions as part of a pavement management plan. A pavement management plan is required under assurances for both AIP and PFC funding.

Financial and Operational Activity Reporting. Commercial service airports that have received AIP funding must file annual financial statements in accordance with Section 111 of the Federal Aviation Administration Authorization Act of 1994. Airports provide the required data on FAA Form 5100-127 through the Certification Activity Tracking System. FAA Form 5100-127—Operating and Financial Summary includes airport revenues and expenses. Airports with more than 25,000 enplanements in the preceding calendar year must also report information about operations, such as the number of annual operations, enplanements, and total landing weight. FAA Form 5100-127 information is publicly available and thus useful for external benchmarking. The following financial and operational metrics in the Performance Metrics Database are related to the data reported on Form 5100-127:

Debt Service Coverage Ratio is typically defined as net operating income (earnings before interest and taxes) divided by total debt service. Using that definition, data from the Form 5100-127 may be used to calculate the debt service coverage ratio.

Airport Concession Revenue per Enplaned Passenger is the gross revenue to the airport per enplanement for spending on terminal retail.

Non-Aeronautical Operating Revenue as % of Total Operating Revenue is the total annual non-aeronautical operating revenue as a percentage of total annual operating revenue.

Enplaned Passengers, Annual is the annual number of passengers boarding a plane at the airport.

Landed Weight is the total of maximum gross landing weight of aircraft landings at the airport for domestic, international, and cargo carriers in pounds.

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[53] U.S. Federal Aviation Administration (FAA). "Airport Improvement Program (AIP) Grant Assurances." Washington, D.C., Accessed 2017. https://www.faa.gov/airports/aip/grant_assurances/, and U.S. Federal Aviation Administration (FAA). "Passenger Facility Charge (PFC) Program." Last modified March 22, 2018. https://www.faa.gov/airports/pfc/.

[54] U.S. Federal Aviation Administration (FAA). *Advisory Circular 150/5320-6F: Airport Pavement Design and Evaluation*. Washington, D.C., 2016. https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5320-6F.pdf, p. 5-1.

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Annual Aircraft Operations is the total number of annual takeoffs and landings by passenger, cargo, and noncommercial (general aviation and military) aircraft.

Airline Cost per Enplanement is the average of the amount airlines pay per enplanement to the airport for use of the airfield.

Competition Plan. The Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (Public Law 106-181), Section 155, required the submission of a competition plan by covered airports for an AIP grant to be issued. Covered airports are medium or large hub airports where one or two air carriers control more than 50 percent of the passenger boardings. Once the plan and initial two updates are approved by FAA, updates are only required when certain triggering events occur. The following metrics in the Performance Metrics Database are related to data that must be included in the competition plan. Note that some competition plans are publicly available.

Contact Gates—Number of is the number of gates directly adjacent to the terminal or concourse building and accessible from the building. When a competition plan is required, the plan must identify the number of contact gates available at the airport by lease arrangement (exclusive, preferential, or common-use) and how those gates are allocated.

Contact Gate Utilization is the number of departures per contact gate. For competition plans, gate utilization is reported (departures/gate) per week and month for each gate.

CHAPTER 4

Data Sources and Considerations

This chapter provides an overview of the data sources related to metrics and includes information related to accessing the databases and considerations in using the data and interpreting the results.

Various sources of data exist from FAA and U.S.DOT that provide information on air traffic operations and performance that could be used by airport operators. Other facility-related and operational data may be available directly from the airport operator and/or airlines.

FAA/U.S.DOT operational data describe overall traffic volume and operations, delays, airline schedules, and weather conditions. The sources for operational data include (1) the FAA Operations and Performance Data, (2) BTS, and (3) the FAA System Wide Information Management (SWIM) system. Apart from these, there are other systems/programs, such as the Performance Data Analysis and Reporting System and National Offload Program, that have archived high fidelity air traffic data (i.e., Geospatial data—latitude, longitude, altitude, and timestamp associated with flight tracks).

The FAA Operations and Performance Data are available through a web-based portal (https://aspm.faa.gov) and include the following databases:

1. Aviation System Performance Metrics (ASPM)
2. Operations Network (OPSNET)
3. CountOps
4. Traffic Flow Management System Counts (TFMSC)
5. Airline Service Quality Performance (ASQP)
6. Flight Schedule Data System (FSDS)
7. Terminal Area Forecast (TAF)

The CountOps, TFMSC, FSDS, and ASQP are standalone databases that are also used to compile the ASPM database. The OPSNET database has daily air traffic operations and delay data for all FAA facilities. The TAF is the official FAA forecast of aviation activity for U.S. airports.

BTS aviation data are available through the BTS website, which provides access to traffic, passenger flow, employment, financial condition, and on-time performance data filed by airlines each month with the U.S.DOT's BTS (Office of Airline Information), as described in 14 CFR Part 234 of U.S.DOT's regulations.

SWIM is an FAA information-sharing platform designed to facilitate an increased common situational awareness and a greater sharing of air traffic management system information.

There are many factors to consider when using these databases, including the ability to access the data. Some data are available to the public while others are restricted and require a login. A summary of the various considerations including access associated with each of these data

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sources is provided in the next section. The details of the contents and method of access for each of these data sources are provided in the subsequent sections.

4.1 Considerations for Choosing Data Source

Several factors need to be considered while choosing a data source for performing analysis. These include (1) data element or class of information (e.g., delay, traffic counts), (2) availability at airports, (3) latency in availability, (4) access, and (5) uses. A summary of these considerations with respect to each of the data sources is provided in Table 18.

Table 18. Summary of considerations for choosing a data source.

Data Source	Considerations
Aviation System Performance Metrics (ASPM)	"The Aviation System Performance Metrics (ASPM) online access system provides data on flights to and from the ASPM airports (currently 77); and all flights by the ASPM carriers, including flights by those carriers to international and domestic non-ASPM airports. All IFR [Instrument Flight Rules] and some VFR [Visual Flight Rules] flights are included." "The ASPM database is compiled piece by piece beginning with basic flight plan and other message data for flights captured by the Traffic Flow Management System (TFMS), enhanced with next-day OOOI [Out, Wheels Off, Wheels On, and Gate In] data, updated with published schedule data, and further updated and enhanced with BTS Aviation System Quality and Performance records which include OOOI data, final schedule data, and carrier-reported delay causes for the largest U.S. carriers."[1] **Data Elements:** Airport delay, traffic count, taxi-in and taxi-out time and delay statistics, meteorological condition, efficiency. **Availability:** Data available for 77 U.S. airports. **Latency:** Preliminary data are available to registered users on a next-day basis. It can take up to 6–8 weeks after the end of each calendar month to finalize the data. **Access:** Data are accessed through a web-based portal (https://aspm.faa.gov). Public Access: Airport Analysis, City Pair Analysis, and Taxi Time databases are open to the public. May only view final data. Other Access: A login is required to access all other databases and preliminary flight information. An FAA sponsor is required to obtain website access credentials. To request a login, go to https://aspm.faa.gov/Control/Users/sysMailTo.asp. **Uses:** FAA uses ASPM data to closely monitor airport efficiency and other aspects of system performance. **Issues:** Taxi times are estimated when OOOI data are not available.
Operations Network (OPSNET)	"The Operations Network (OPSNET) is the official source of NAS air traffic operations and delay data. The data collected through OPSNET is used to analyze the performance of the FAA's air traffic control facilities."[2] **Data Elements:** Daily NAS air traffic operations and delay count data. **Availability:** Data from all ATC facilities with the exception of flight service stations. **Latency:** OPSNET operations and delay data are available to the public 20 days after the end of each month. **Access:** Data are accessed through a web-based portal (https://aspm.faa.gov). Public Access: OPSNET operations and delay data are available to the public 20 days after the end of each month. Other Access: To access next-day OPSNET data, users require a login. To request a login, go to https://aspm.faa.gov/Control/Users/sysMailTo.asp. **Uses:** OPSNET is used to analyze the performance of ATC facilities.
CountOps	CountOps is an FAA automated system that provides hourly counts of air traffic activity at Terminal Radar Approach Controls (TRACON), towers, and airports.[3] **Data Elements:** Hourly counts of air traffic activity at TRACONs, towers, and airports. **Availability:** CountOps contains information on IFR and VFR arrivals and departures by the hour for more than 2,000 towers and airports."Daily totals for official OPSNET facilities align to OPSNET counts of operations." "CountOps does not include operations for Honolulu International Airport (HNL) or TRACON (Honolulu Control Facility–HCF)."[4] **Latency:** Next-day data are available to registered users. **Access:** No public access. Public access is through the OPSNET. A login is required to access next-day data. An FAA sponsor is required to obtain website access credentials. **Uses:** CountOps is used by FAA to monitor and assess the performance of ATC facilities.

Table 18. (Continued).

Data Source	Considerations
Traffic Flow Management System Counts (TFMSC)	"Traffic Flow Management System Counts (TFMSC) is designed to provide information on traffic counts by airport or by city pair for various data groupings such as aircraft type or by hour of the day. It includes data for flights that fly under Instrument Flight Rules (IFR) and are captured by the FAA's en route computers. Most VFR and some non-en route IFR traffic is excluded."[5] **Data Elements:** Traffic counts by airport or by city pair for various data groupings such as aircraft type or by hour of the day. **Availability:** "While TFMSC reliably captures the vast majority of IFR traffic and some VFR traffic, it has several limitations and challenges. First, due to limited radar coverage and incomplete messaging, TFMSC may exclude certain flights that do not enter the en route airspace and other low-altitude flights. In addition, of the 35,000 location identifiers reported over time, only the top few thousand, accounting for over 95% of traffic, are reliable. The others are waypoints or other references to locations not associated with an airport."[6] **Latency:** Data are available within 31 days after the end of the month. **Access:** Data are accessed through a web-based portal (https://aspm.faa.gov). Public Access: Airport and Distributed OPSNET reports are available to the public, no username or password needed. The public can only view the final data. Other Access: To access TFMSC data, users require a login. To request a login, go to https://aspm.faa.gov/Control/Users/sysMailTo.asp. An FAA sponsor is required to obtain website access credentials. With a username and password, a user can view Airport, City Pair and Distributed OPSNET. May also access "next-day" data. **Uses:** To perform NAS-wide traffic count analysis and to construct ASPM records. Also, TFMSC completed flight plan data can be used to document aeronautical activity when making an existing critical aircraft determination.[7]
Airline Service Quality Performance (ASQP)	"The Airline Service Quality Performance System (ASQP) provides information about airline on-time performance, flight delays, and cancellations. It is based on data filed by airlines each month with the Department of Transportation's Bureau of Transportation Statistics (Office of Airline Information), as described in 14 CFR Part 234 of DOT's regulations."[8] **Data Elements:** Airline on-time performance, flight delays, and cancellations. **Availability:** Data for carriers that handle at least 1% of total domestic scheduled service passenger revenues. The data also include voluntary reporting by carriers. **Latency:** ASQP data are available within 60 days after the end of the month. **Access:** Data are accessed through a web-based portal (https://aspm.faa.gov). Public Access: "Unregistered users can view Operations by Airport data."[9] May only view final data. Other Access: "A login is required to access other parts of ASQP."[9] To request a login, go to https://aspm.faa.gov/Control/Users/sysMailTo.asp. An FAA sponsor is required to obtain website access credentials. With a username and password, a user can view Operations by Airport, Operations by City Pair and Cancellations. May also access "next-day data." **Uses:** ASQP data are used to perform analysis of aircraft operator delays and cancellation, including casual analysis.
Flight Schedule Data System (FSDS)	**Data Elements:** Contains flight schedule data by air carrier and airport. **Availability:** Schedules for all aircraft operators. **Latency:** The database is updated every fifteen days. **Access:** The FSDS system is not available to the public and is limited to FAA and FAA contractors. **Uses:** Flight schedule data are used by the FAA for forecasting traffic demand and investment analysis.
Terminal Area Forecast (TAF)	"The Terminal Area Forecast (TAF) system is the official forecast of aviation activity at FAA facilities. These forecasts are prepared to meet the budget and planning needs of FAA and provide information for use by state and local authorities, the aviation industry, and the public."[10] **Data Elements:** Contains official forecast of aviation activity at FAA facilities. **Availability:** Covers all FAA facilities. **Latency:** Published once a year. **Access:** Available to the public. Data are accessed through a web-based portal (https://aspm.faa.gov). The historical data and forecasts are located on an FAA internet server and may be queried without additional software using any web browser. **Uses:** Used for the budget and planning needs of FAA and provide information for use by state and local authorities, the aviation industry, and the public.

(continued on next page)

Table 18. (Continued).

Data Source	Considerations
Bureau of Transportation Statistics (BTS)	**Data Elements:** Contains air carrier financial reports, air carrier statistics, and summary data. **Availability:** Includes traffic, passenger flow, employment, financial condition, and on-time performance data filed by airlines each month with the BTS Office of Airline Information. Information about airline accounting and reporting directives is available on the following website: https://www.bts.gov/topics/airlines-and-airports/accounting-and-reporting-directives-airline-service-quality-performance. **Latency:** Data are available within 60 days after the end of the month. **Access:** Publicly available through https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. **Uses:** Used to perform air carrier related analysis, such as on-time performance, fuel burn consumption, estimate ticket prices, and air carrier productivity analysis.
System Wide Information Management (SWIM)	SWIM provides access to FAA flight, weather, and aeronautical information using a modern standards-based data exchange interface. **Data Elements:** Flight and flow data, aeronautical data and weather data. **Availability:** Covers all FAA facilities. **Latency:** Near real time. **Access:** To be requested from FAA; user needs dedicated IT (Information Technology) infrastructure. Can also be accessed through third-party providers. Information on getting access to SWIM data is available on the FAA website: https://www.faa.gov/nextgen/programs/swim/products/getConnected/#ecbrief. **Uses:** Build database archives to support the development of decision support tools and to perform analysis.

Sources:

1 *FAA Aviation System Performance Metrics (ASPM), http://aspmhelp.faa.gov/index.php/Aviation_Performance_Metrics_%28APM%29, accessed 12/20/17.*
2 *FAA Operations Network (OPSNET) http://aspmhelp.faa.gov/index.php/Operations_Network_%28OPSNET%29, accessed 12/20/2017.*
3 *FAA CountOps Reports, http://aspmhelp.faa.gov/index.php/CountOps_Reports, accessed 12/20/2017.*
4 *FAA CountOps Reports, http://aspmhelp.faa.gov/index.php/CountOps_Reports, accessed 12/20/2017.*
5 *FAA TFMSC, http://aspmhelp.faa.gov/index.php/TFMSC, accessed 12/20/2017.*
6 *FAA TFMSC, http://aspmhelp.faa.gov/index.php/TFMSC, accessed 12/20/2017).*
7 *FAA, AC 150/5000-17, Critical Aircraft and Regular Use Determination, 6/20/2017, p 2-1.*
8 *FAA, Airline Service Quality Performance (ASQP), http://aspmhelp.faa.gov/index.php/ASQP, accessed 12/20/2017.*
9 *FAA, Airline Service Quality Performance (ASQP), http://aspmhelp.faa.gov/index.php/ASQP, accessed 12/20/2017.*
10 *FAA TAF System Overview, http://aspmhelp.faa.gov/index.php/TAF_SystemOverview, accessed 12/20/17.*

4.2 FAA Operations and Performance Data Portal

The FAA operations and performance data portal can be accessed through https://aspm.faa.gov. The web page is shown in Figure 3. Depending on the level of access, the user can view, query, and generate reports across the various database access systems available through the data portal.

As noted on the home page, the general public can access some sections of the web portal without a login, including Airport Analysis, City Pair Analysis, and Taxi Times. However, certain availability and access constraints exist, such as:

1. **ASPM:** Airport Analysis, City Pair Analysis, and Taxi Time data will be available within 60 days after the end of the month (e.g., August data will be available no later than November 1). A login is required to access all other databases and preliminary flight information.

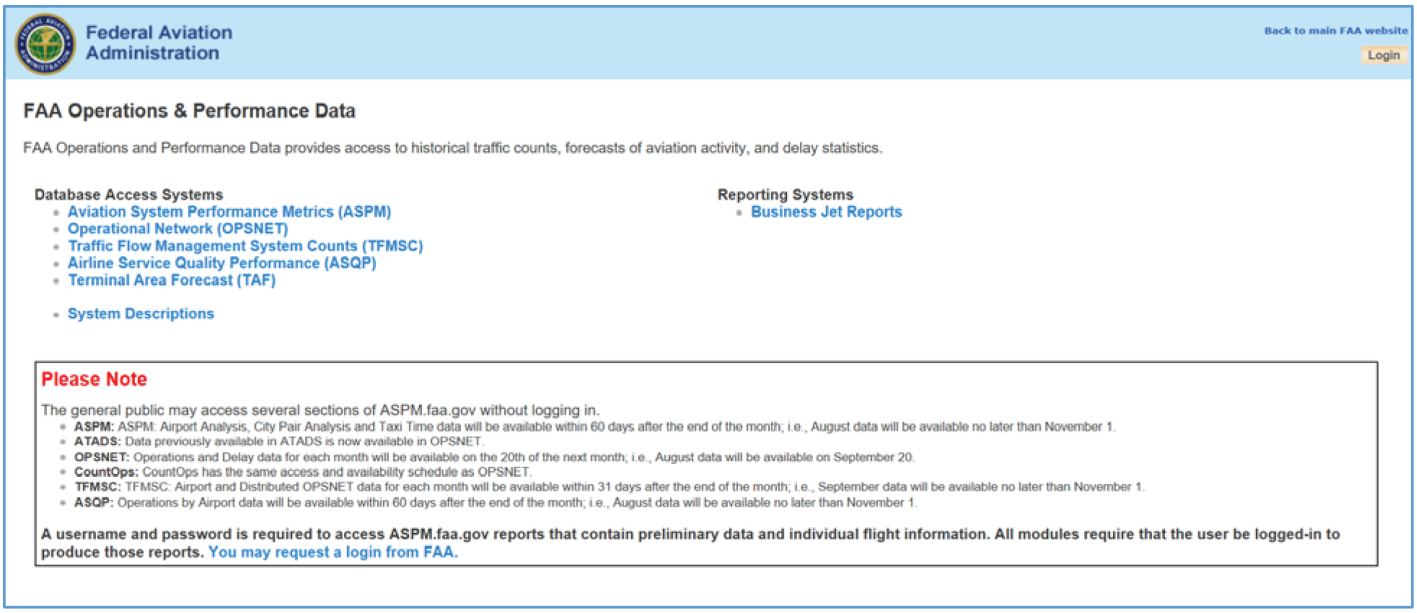

Figure 3. FAA operations and performance data home page.

2. **OPSNET:** Operations and Delay count data for each month will be available on the 20th of the next month (e.g., August data will be available on September 20). A login is required to access next-day OPSNET data.
3. **CountOps:** CountOps has the same access and availability schedule as OPSNET.
4. **TFMSC:** Airport and Distributed OPSNET data for each month will be available within 31 days after the end of the month (e.g., September data will be available no later than November 1). A login is required to access TFMSC data.
5. **ASQP:** Operations by Airport data will be available within 60 days after the end of the month (e.g., August data will be available no later than November 1). Operations by Airport data is publicly available. A login is required to access other ASQP data.

Complete access to all the databases and reports can be requested through https://aspm.faa.gov/Control/Users/sysMailT o.asp.

4.2.1 Guidance on Navigating the FAA Operations and Performance Data Portal

The home page of the FAA Operations and Performance data portal shows a list of database access systems available to the user. The user may access a specific system by clicking on it to view the various available databases. For instance, clicking the ASPM link will bring a user to the ASPM web data system which provides the general public access to the Airport Analysis, City Pair Analysis, and Taxi Times database modules, as shown in Figure 4. Details on the ASPM data will be provided in the next section.

The user can query data under each module by first selecting the module of interest, which will open the Airport Analysis page (see Figure 5). On this page, the user can specify the query parameters of interest, including the desired output format (see Figure 6), historical date range (see Figure 7), airports (see Figure 8), grouping field (see Figure 9), and other scoping filters (see Figure 10). After setting the query parameters, the user executes the query by clicking the "Run" button at the far right.

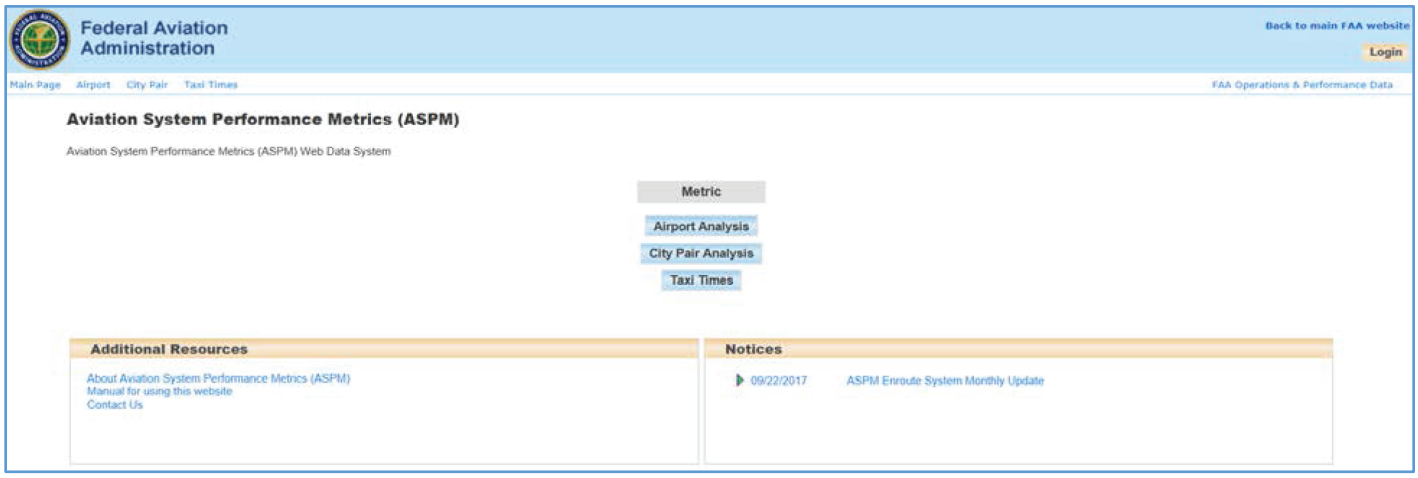

Figure 4. Databases under ASPM available to the general public without a login.

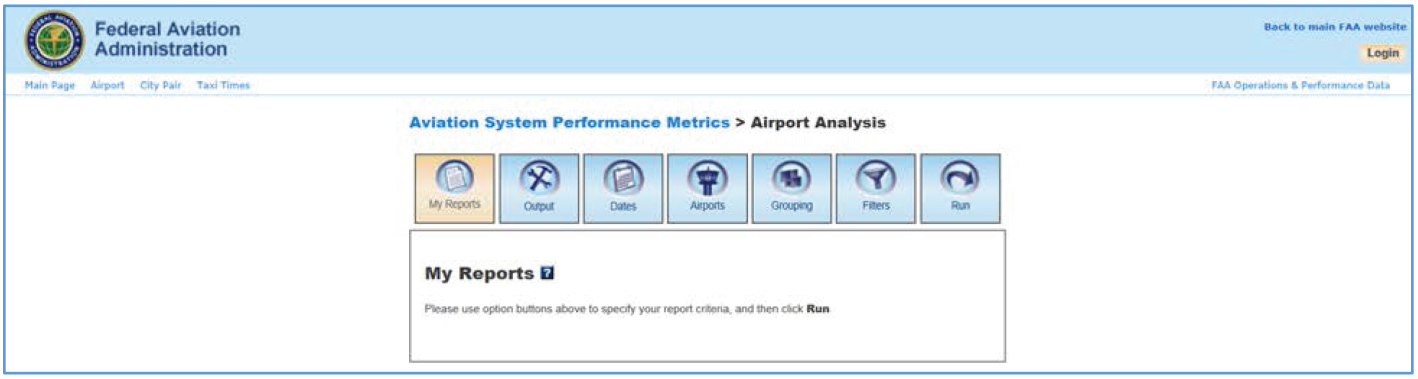

Figure 5. Option buttons layout within each database module.

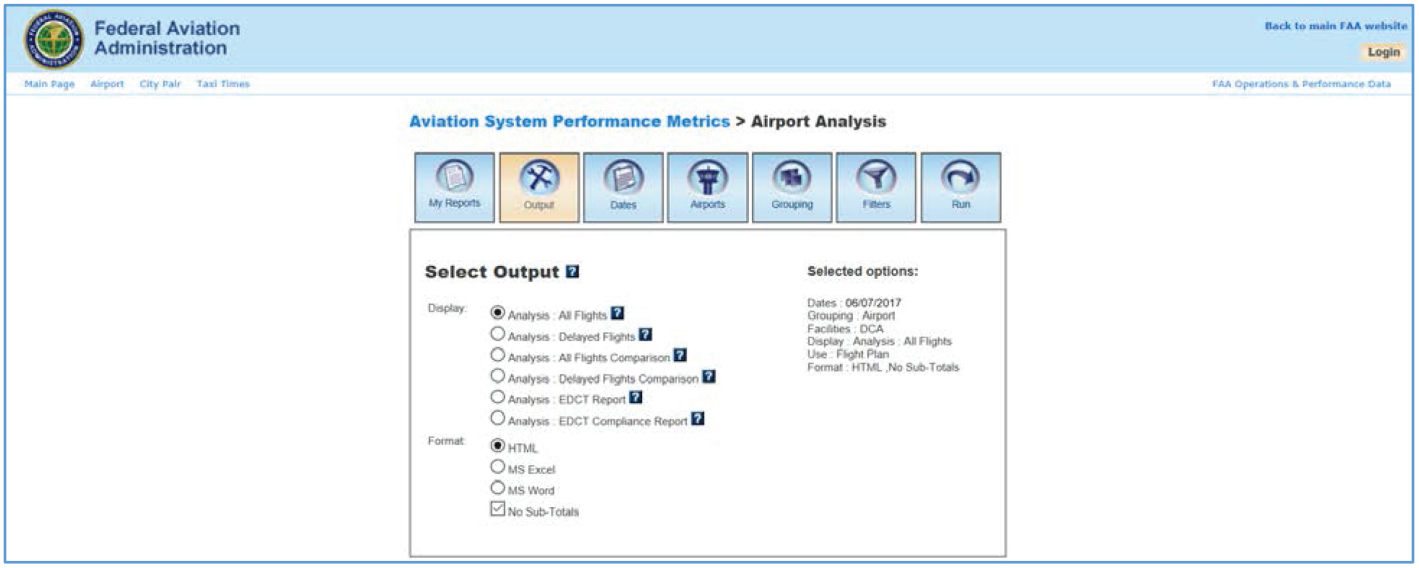

Figure 6. Output button allows the user to specify the type of analysis and the output format of the query.

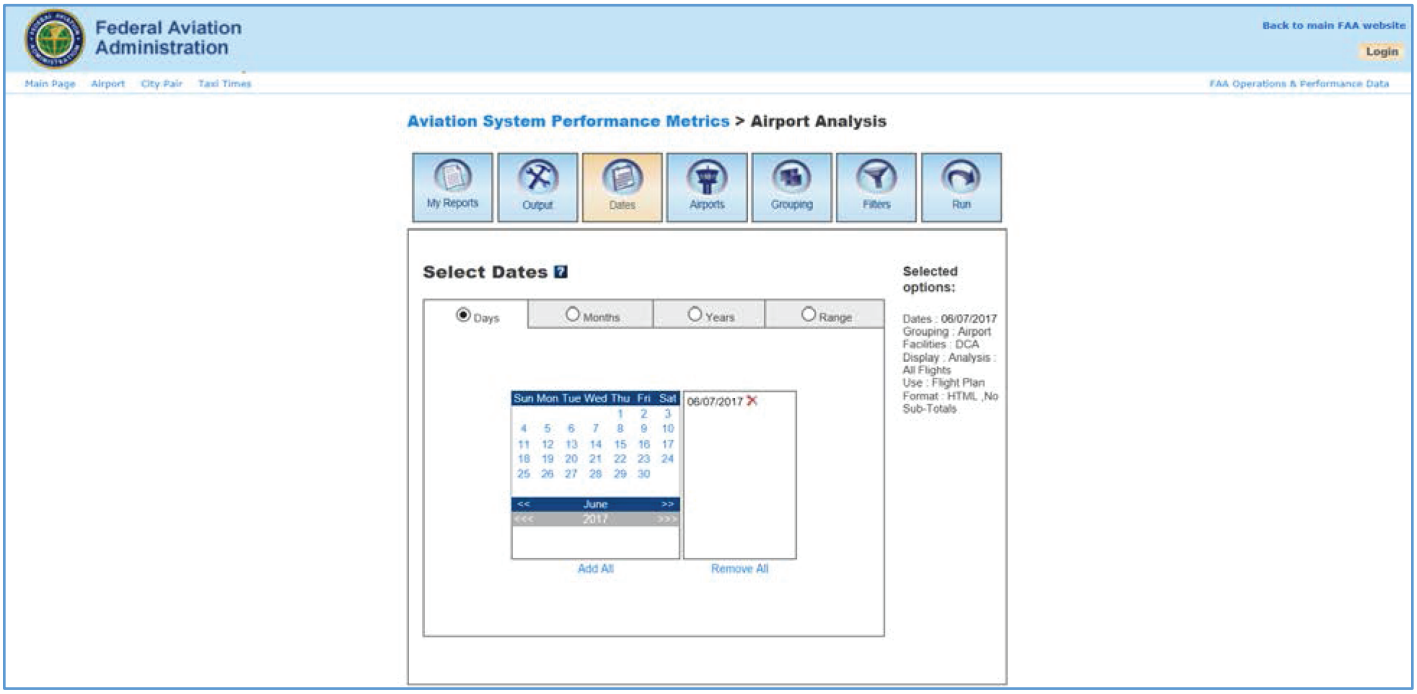

Figure 7. Date button allows the user to specify the time frame for the query.

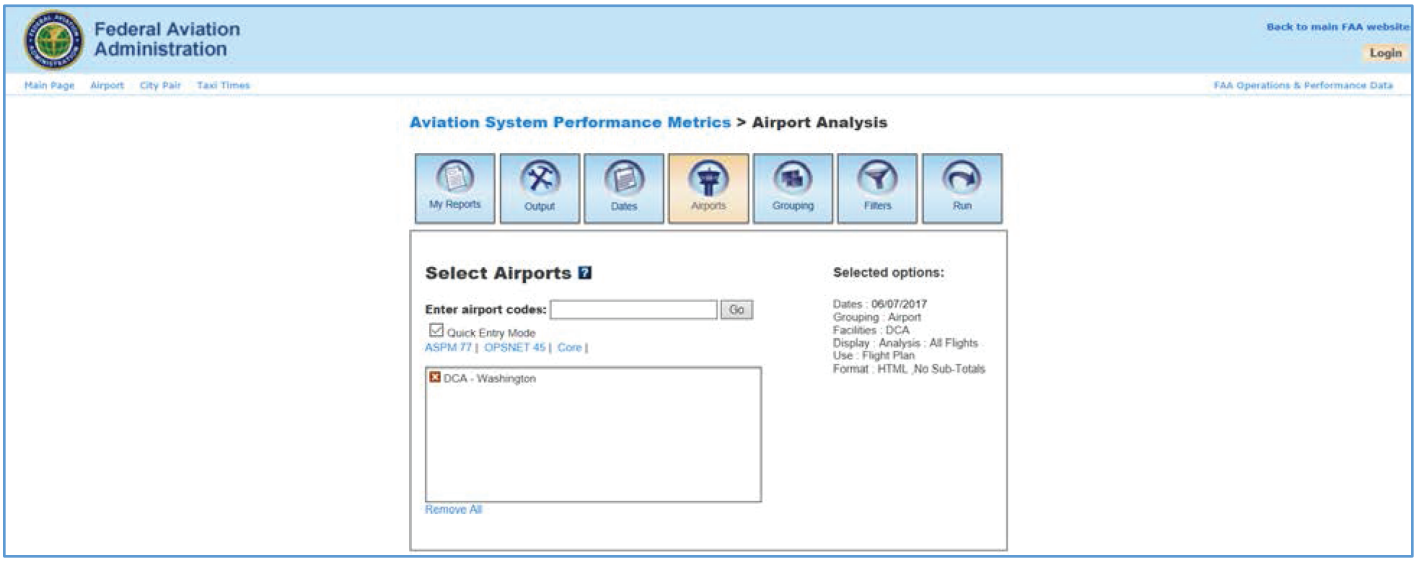

Figure 8. Airports button allows the user to specify the airports for the query.

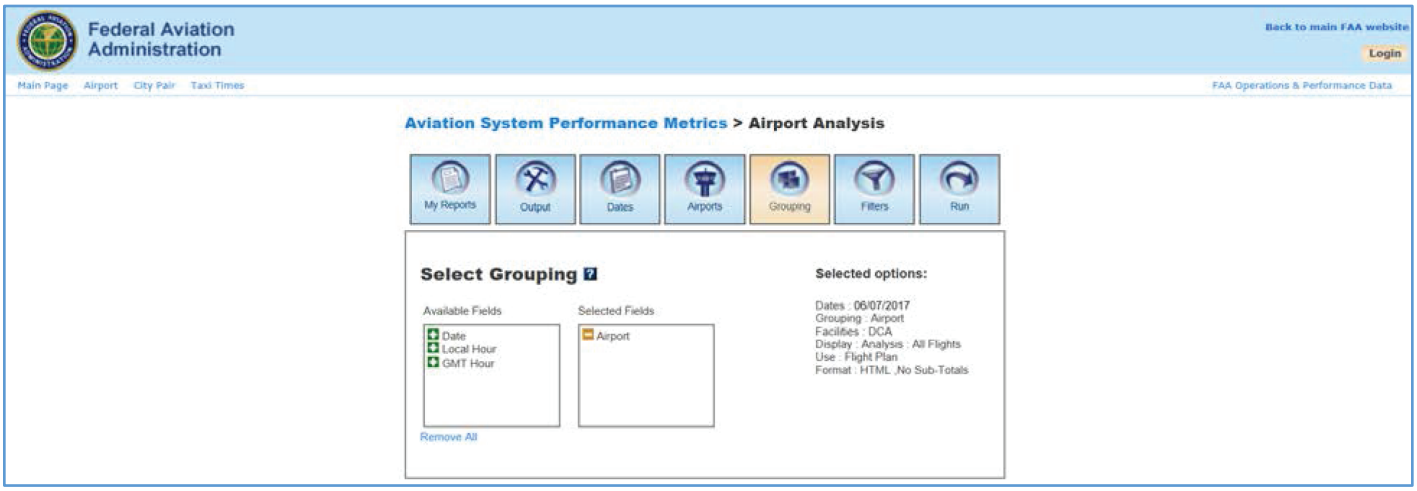

Figure 9. Grouping button allows the user to specify the fields to group for the query.

4.2.2 Aviation System Performance Metrics (ASPM)

The ASPM online access system provides data and reports associated with airport operations for 77 U.S. airports. The data from TFMS, ASQP, OOOI data, CountOps, and FSDS are synthesized to produce various tables, analyses, and reports. An overview of the ASPM databases is shown in Figure 11.

Details about the ASPM databases and the user manual are made available by FAA through the following websites:

ASPM overview: http://aspmhelp.faa.gov/index.php/Aviation_Performance_Metrics_%28APM%29
ASPM user manual: http://aspmhelp.faa.gov/index.php/ASPM_Manual

The ASPM databases are grouped into modules based on their scope and purpose. The ASPM data has five main module groups: **Metric**, **Efficiency**, **Enroute**, **Dashboards**, **and Other**. The database modules under each group can be queried (as described in the previous section) to generate several pre-structured analysis tables/reports which have data and computed metrics used for performing analysis.

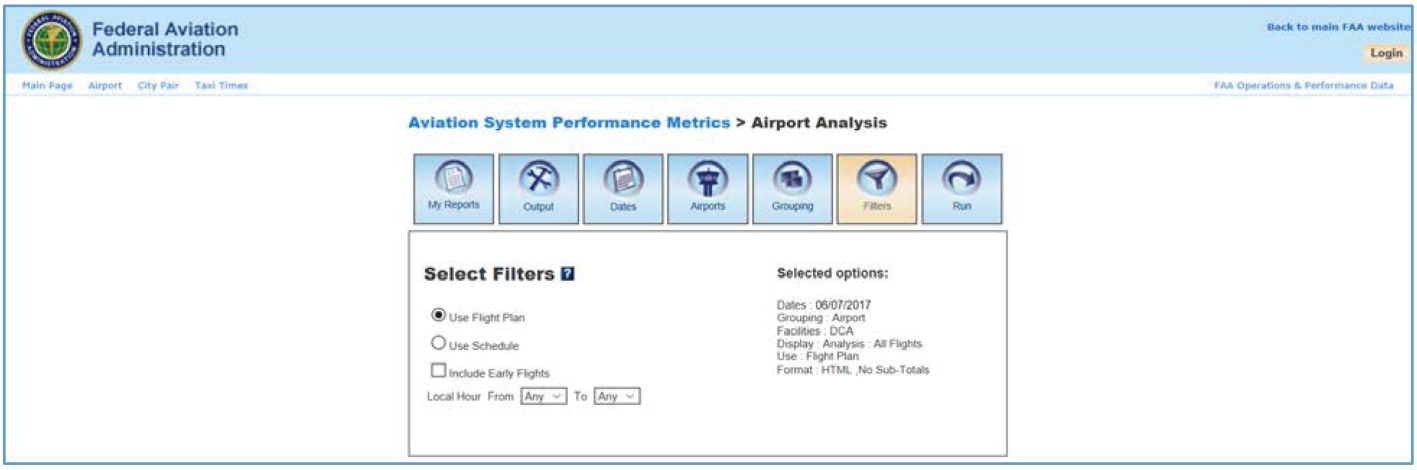

Figure 10. Filter button allows the user to specify the scope of the data for the query.

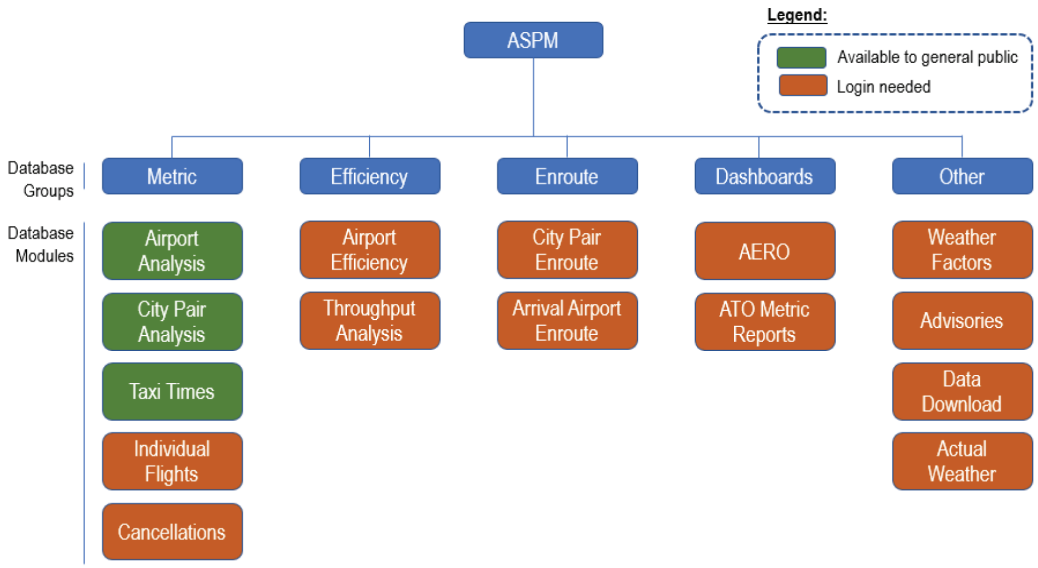

Figure 11. Overview of ASPM databases.

It is important to note that differences exist between ASPM flight records within the **Efficiency** and **Metrics** groupings. ASPM **Efficiency** flights are intended to capture all traffic handled by controllers at the ASPM77 airports, whereas the **Metric** flights only include complete records of itinerant flights to ensure the metrics computed are accurate. Neither **Efficiency** nor **Metrics** flights includes canceled flights.

Also, when using/presenting ASPM data, it is important to document the date when the data was pulled. It can take six to eight weeks after the end of each calendar month for data to be finalized on the ASPM servers, and so the results of the analysis can vary depending on when the data is pulled. Keeping track of that date can help explain potential difference arising from changes made to the data on the ASPM servers as part of the finalizing process.

4.2.3 Operations Network (OPSNET)

The OPSNET data is the official source for FAA's facilities traffic count and delay data. A login is required to access the next-day data. Without a login, users can access the official count released to the public after the 20th day of every month. The overview of OPSNET and the user guide can be accessed through the following URL: http://aspmhelp.faa.gov/index.php/OPSNET_Manual.

A summary of the reports as provided in the OPSNET manual is as follows:

1. **Airport Operations**—Reports Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) itinerant operations (arrivals and departures) and local operations at the airport as reported by ATC towers. It does not include overflights.
2. **Tower Operations**—Reports IFR and VFR itinerant operations (arrivals and departures), IFR and VFR overflights, and local operations worked by the tower.
3. **Terminal Radar Approach Control (TRACON) Operations**—Reports IFR and VFR itinerant operations and overflights worked by the TRACON.
4. **Total Terminal Operations**—Reports total operations worked by any facility based on the functions at the facility. If a facility has a tower and a TRACON present, the Total Terminal Operations would be a sum of the tower operations and the TRACON operations for that facility.

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5. **Center Aircraft Handled**—Reports domestic and oceanic departures and overflights and total aircraft handled by Air Route Traffic Control Centers and Center Radar Approach Control.
6. **Facility Information**—Provides information about each ATC facility, such as facility name and type, region, state, hours of operation, etc.
7. **Delays**—Provides information about the reportable delays provided daily through FAA's Air Traffic OPSNET.

4.2.4 CountOps

CountOps provides hourly counts of air traffic activity at TRACONs, towers, and airports. It includes counts for more than 2,000 towers and airports. The overview of CountOps and the user guide can be accessed through the following URL: http://aspmhelp.faa.gov/index.php/CountOps_Reports.

A summary of the reports as provided in the CountOps manual is as follows:

1. **Detail Report**—Displays information about tower or TRACON operations sorted according to the desired filter options.
2. **Tower Summary Report**—Displays information about the number of tower operations sorted by type of operation.
3. **TRACON Summary Report**—Displays information about the number of TRACON operations sorted by type of operation.
4. **Airport Summary Report**—Displays information about the number of IFR and VFR itinerant and local operations by airport identified by CountOps.
5. **Custom Report**—Allows users to develop a customized summary report of tower or TRACON operations by specifying field filters and desired groupings.
6. **CountOps/OPSNET Tower Comparison Report**—Compares CountOps tower operations to tower operations displayed in OPSNET. The purpose of this report is to validate the CountOps data and ASPM procedures for loading and tabulating CountOps data as the system is continually developed and refined.
7. **Runway Usage Report**—Displays information on the number of departures, arrivals, and total operations by runway end at specified airports.
8. **Runway Validation Report**—Displays information on actual runway usage relative to the specified runway configuration in place at that time.

4.2.5 Traffic Flow Management System Counts (TFMSC)

TFMSC provides traffic counts by airport or by city pair for various data groupings such as aircraft type or by hour of the day. The overview of TFMSC and the user guide can be accessed through the following URL: http://aspmhelp.faa.gov/index.php/TFMSC.

The TFMSC database lets users view data from three perspectives: Airport, City Pair, and Distributed OPSNET. The Airports view displays traffic counts of arrivals and departures by airport for the 2000 largest airports in the NAS. The City Pair view displays traffic counts for all flights by city pair, and the Distributed OPSNET displays OPSNET traffic counts prorated by TFMS aircraft user class (i.e., Air Carrier, Air Taxi, General Aviation, and Military).

The TFMSC preliminary next-day TFMS data and enhanced five-day data are not reported in the TFMSC data access system but are used to construct ASPM records. TFMS reliably captures IFR traffic and some VFR traffic. However, due to limited radar coverage and incomplete messaging, TFMS may not capture certain flights that do not enter the en route airspace or

remain at low-altitude. TFMSC is good for getting counts by aircraft user class and to get seat counts, however, for more accurate traffic count at FAA facilities, the user must use OPSNET.

4.2.6 Airline Service Quality Performance (ASQP)

The ASQP data provides information about airline on-time performance, flight delays, and cancellations and includes data for airlines that handle at least 1% of total domestic scheduled service passenger revenues with the DOT's BTS. ASQP is updated 25 days after the end of the month and is available to the public within 60 days after the end of the month. Historical archives are available beginning June 2003. The overview of ASQP and the user guide can be accessed through the following URL: http://aspmhelp.faa.gov/index.php/Airline_Service_Quality_Performance_(ASQP).

4.2.7 Flight Schedule Data System

The FSDS contains flight schedule data by air carrier and airport. Access to the FSDS system is limited to employees of the FAA's Aviation Policy, Planning, and Environment office or contractors performing analysis directly for this office. The overview of FSDS and the user guide can be accessed through the following URL: http://aspmhelp.faa.gov/index.php/Flight_Schedule_Data_System_%28FSDS%29.

4.2.8 Terminal Area Forecast (TAF)

The TAF is the official FAA forecast of aviation activity for U.S. airports. The TAF is published every year and contains 30 years of forecast information typically used for the budget and planning needs of the FAA and to provide information for use by state and local authorities, the aviation industry, and the public. The TAF data can be accessed through the following URL: https://www.faa.gov/data_research/aviation/taf/.

4.3 Bureau of Transportation Statistics (BTS) Data

The BTS data include traffic, passenger flow, employment, financial condition, and on-time performance data filed by airlines each month with the BTS Office of Airline Information. Information about airline accounting and reporting directives is available on the following website: https://www.bts.gov/topics/airlines-and-airports/accounting-and-reporting-directives-airline-service-quality-performance

All BTS data is publicly available and can be accessed through the following URL: https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0.

A summary of the databases related to commercial aviation as shown on the BTS website are provided in Table 19.

4.3.1 Guidance on Navigating the BTS Aviation Data Library

A user wishing to analyze BTS data has two primary options for data inspection. The first option is to download the data and then process the data using external tools. The second option is to use the analysis features built into the BTS website. The steps involved to download the data are as follows:

1. Go to BTS aviation library using the link https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0 (see Figure 12).

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Table 19. Summary of BTS databases.

Database Name	Description
Air Carrier Financial Reports (Form 41 Financial Data)	Form 41 Financial Data consists of financial information on large U.S.-certified air carriers. Includes balance sheet, cash flow, employment, income statement, fuel cost and consumption, aircraft operating expenses, and operating expenses.
Air Carrier Statistics (Form 41 Traffic)—U.S. Carriers	Monthly data reported by certificated U.S. air carriers on passengers, freight, and mail transported. Includes aircraft type, service class, available capacity and seats, and aircraft hours ramp-to-ramp and airborne.
Air Carrier Summary Data (Form 41 and 298C Summary Data)	Summary data of the nonstop segment and on-flight market data reported by air carriers on Form 41 and Form 298C.
Airline On-Time Performance Data	Monthly data reported by U.S.-certified air carriers. Includes scheduled and actual arrival and departure times for flights.
Airline Origin and Destination Survey	Origin and Destination Survey is a 10% sample of airline tickets from reporting carriers. Data includes origin, destination, and other itinerary details of passengers transported.
American Travel Survey 1995	National data on the nature and characteristics of long-distance personal travel, from a household survey conducted by BTS approximately every five years.
Aviation Support Tables	Provides comprehensive information about U.S. and foreign air carriers, carrier entities, worldwide airport locations, and other geographic data. These data also include information on various aircraft types, their manufacturer, and model names.
Commodity Flow Survey	Data on shipments by domestic establishments in manufacturing, wholesale, mining, and selected other industries. The commodity flow survey is conducted every five years as part of the Economic Census by the U.S. Census Bureau in partnership with BTS.
Intermodal Passenger Connectivity	The Intermodal Passenger Connectivity database is a nationwide data table of passenger transportation terminals, with data on the availability of connections among the various scheduled public transportation modes at each facility. In addition to geographic data for each terminal, the data elements describe the availability of rail, air, bus, transit, and ferry services. This data has been collected from various public sources to provide the only nationwide measurement of the degree of connectivity available in the national passenger transportation system.
Small Air Carrier Statistics (Form 298C Traffic Data)	Data on small carrier flights performed in scheduled or nonscheduled and charter service.
Air Carrier Employees	Number of employees for each of the major, national, and regional domestic air carriers.
Aviation Accident Database and Synopses	Searchable archive of unsafe civil aviation incidents within the U.S., its territories and possessions, and in international waters. Includes aircraft type, operations, environmental conditions, contributing factors, and consequences.
Aviation Accident Statistics	Summary of annual accident, injury, and fatality statistics. Data are available for scheduled and nonscheduled operations of commercial air carriers, commuter planes, air taxis, and general aviation planes.
Aviation Safety Reporting System (ASRS)	ASRS is a collection of datasets vital to aviation safety. The National Aeronautics and Space Administration (NASA) maintains ASRS for the FAA.
BTS Omnibus Survey	Monthly survey conducted by BTS to collect information from U.S. households on issues related to safety, mobility, the environment, economic growth, and national security.
Canadian Travel to the U.S.	Monthly and annual Canadian arrivals of one or more nights to the U.S. Annual data include province of origin, U.S. states visited, purpose of trip, activities, visitor nights, lodging, spending, and demographics.
Census of Fatal Occupational Injuries	Tracks fatal work injuries by industry, occupation, cause of injury, and worker demographic characteristics.
Commercial Space Licensing and Launches	Quarterly launch data is provided for commercial and noncommercial launches by country, payload, spacecraft, and success/failure of launch.
Employment by Industry and Occupation	Provides estimates of employment and wages for specific non-farm occupations.

Table 19. (Continued).

Database Name	Description
Federal Transit Administration Grant Assistance Programs	Summary data on funding levels for each transit program by state and urban area.
Gross Domestic Product (GDP) by Industry	Provides GDP estimates by industry, including many transportation industries, such as air, rail, transit, pipeline, trucking and warehousing, and water transportation.
Hazardous Material Incident Reporting System (HMIRS)	HMIRS contains data on spills, releases, or other incidents involving hazardous materials during the course of transportation. All modes of transportation are included except pipeline and bulk marine transportation.
International Visitor Arrivals Program (I-94)	Official data on monthly and final overseas visitor arrivals to the U.S.
U.S. Greenhouse Gas Emissions and Sinks	Greenhouse gas emissions by type and source, including transportation-related sources.
U.S. International Air Traveler Statistics (I-92)	Estimates of point-to-point air traffic totals between the U.S. and other countries. Data are available for plane type, origin and destination, and air carrier.

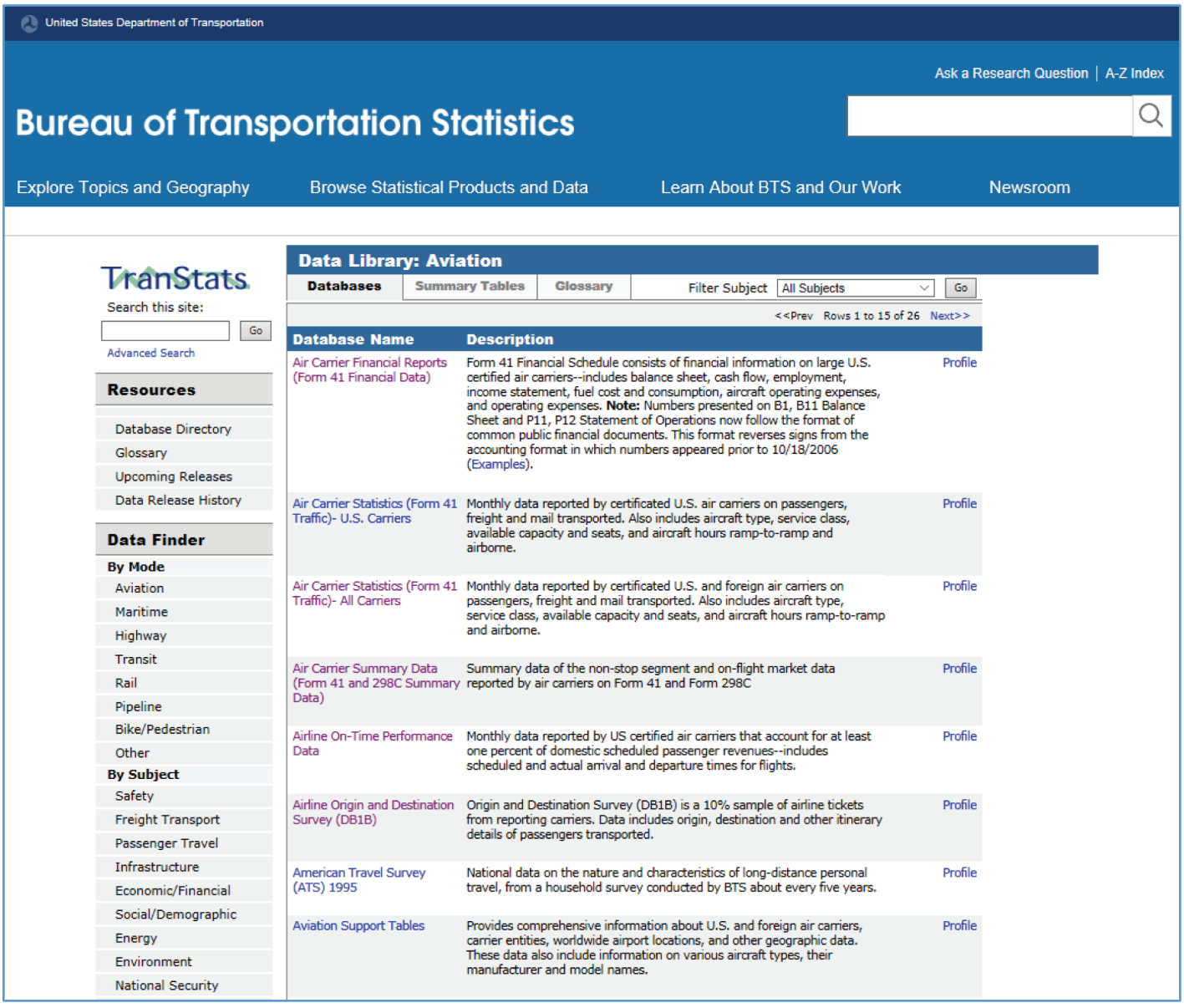

Figure 12. BTS aviation data library.

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2. Click on the database name [e.g., Air Carrier Statistics (Form 41 Traffic)—All Carriers].
3. The next page will list the data tables available in the database (see Figure 13).
4. Each data table has a Download link at the bottom right corner. Click on the Download link.
5. The next page will list the field name in the table (see Figure 14). Select the required fields, or select all fields check box. Next, set the filter for Geography, Year, and Period, and click on the Download button on the right. The download instructions can also be viewed by clicking the Download Instructions link to the left of the filters.

To perform the analysis using the built-in feature on the BTS website follow the following instructions:

1. Go to BTS aviation library using the link: https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0 (see Figure 12).

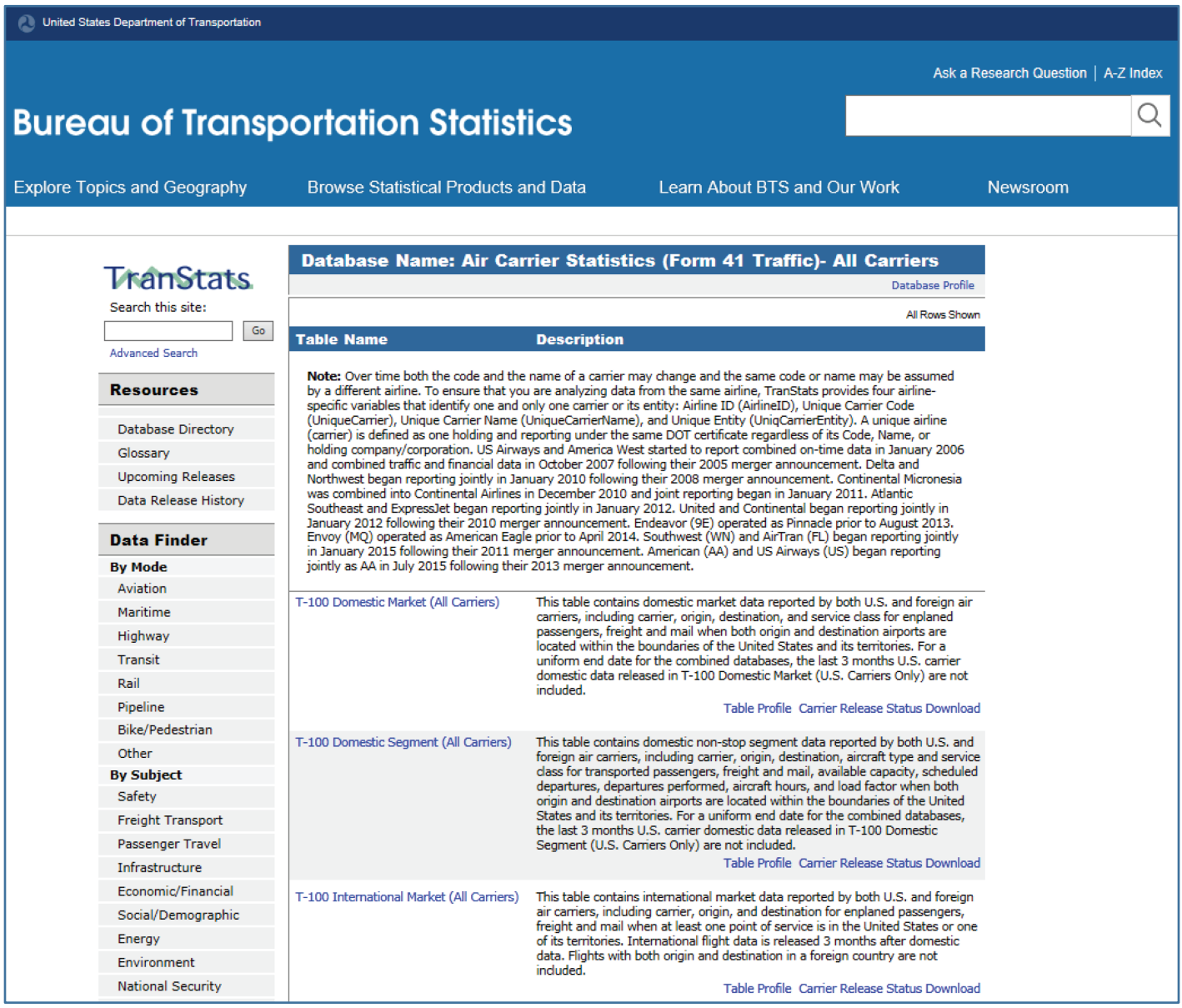

Figure 13. BTS page layout showing sample table names.

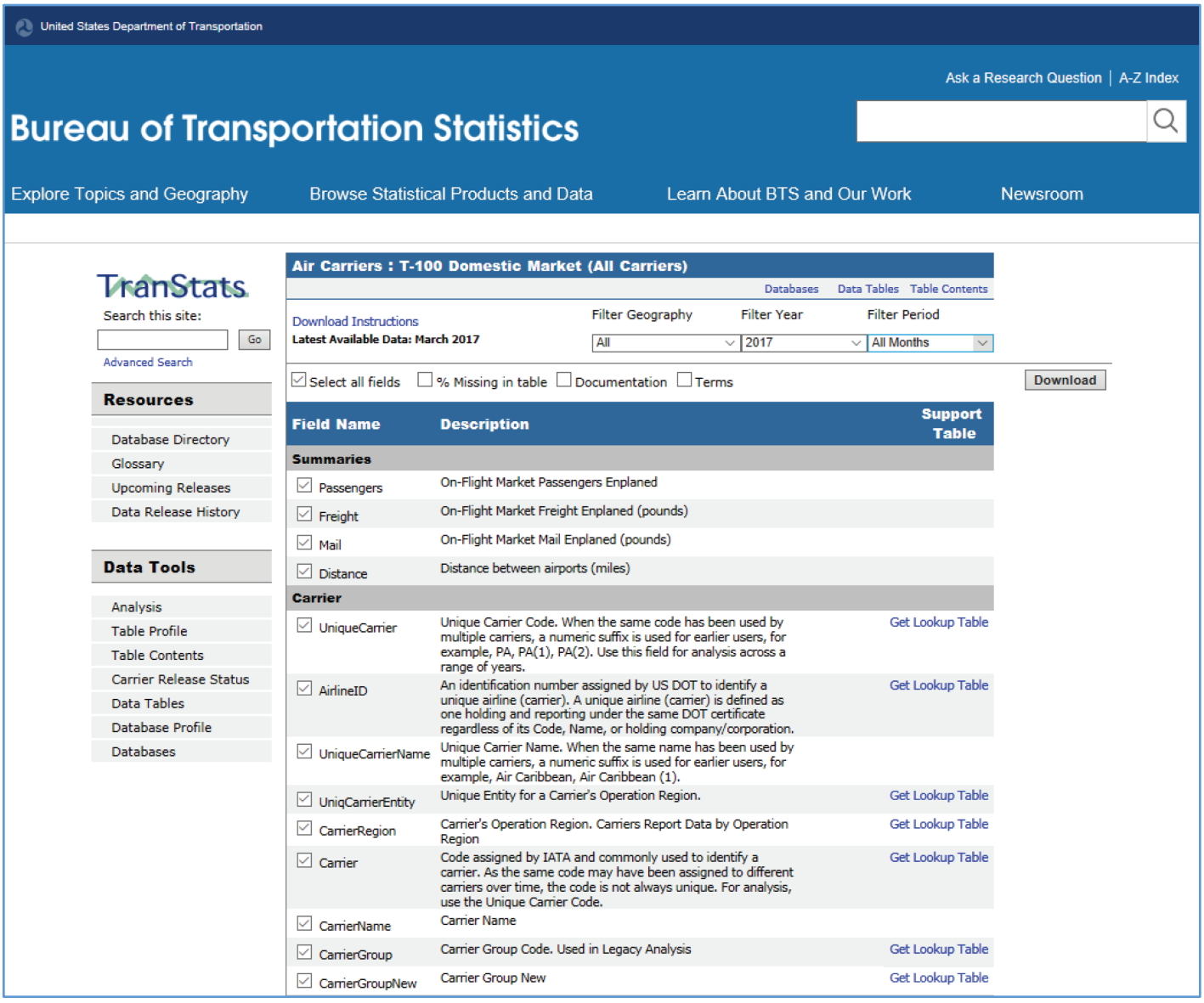

Figure 14. BTS sample data table download page.

2. Click on the database name [e.g., Air Carrier Statistics (Form 41 Traffic)—All Carriers].
3. The next page will list the data tables available in the database (see Figure 13). Click on the table name.
4. The next page will list the field name in the table along with an Analysis link to the right. Click on any of the Analysis links (see Figure 15).
5. The next page will show filters for Categories, Variables, Statistics, and Year (see Figure 16). The Categories filter has a drop down of all the fields by which data can be grouped. The Variables filter has a drop down of all the fields for which statistics can be computed. The Statistics filter has a drop down of various statistics and the Year filter has a drop down of all the years for which data is available. Set the filter and click on the Recalculate button.

Wait for the page to refresh and the calculated results to display. The calculated results can be downloaded using the Download results link on top of the filters.

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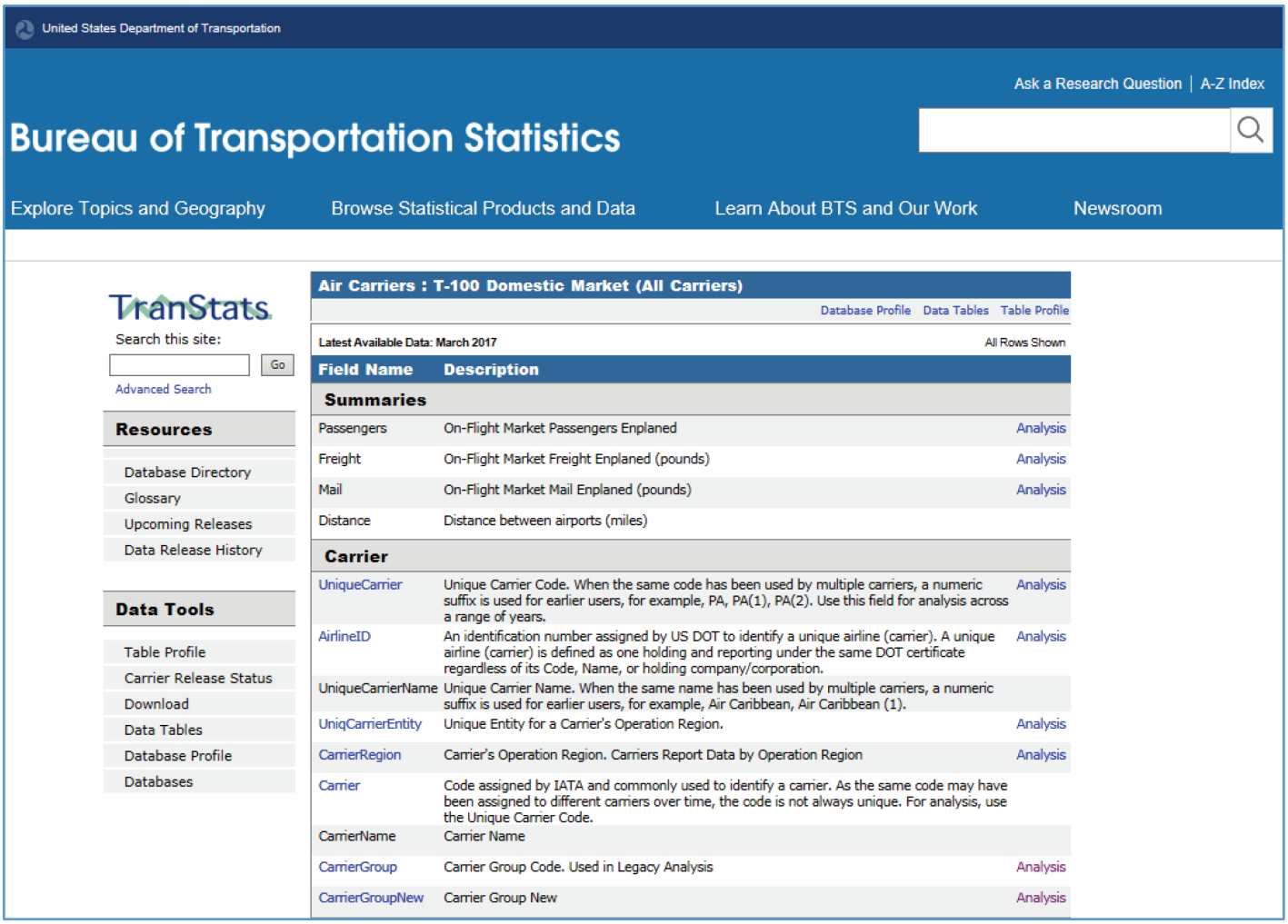

Figure 15. BTS sample of field names with analysis link.

4.3.2 System Wide Information Management (SWIM)

The SWIM system is an FAA information-sharing platform designed to facilitate an increased common situational awareness and a greater sharing of air traffic management system information and is a key source used in Collaborative Decision Marking. As one of the five transformational NextGen programs, SWIM is the infrastructure that offers a single point of access for aviation data, with producers of data publishing it once and users accessing customizable information through a single connection (FAA, https://www.faa.gov/air_traffic/technology/swim/questions_answers/). SWIM provides access to a live stream of data, but the data is in an encoded format. Substantial resources (both information technology and personnel) are needed to process and reformat the data to enable metric derivation and analysis. Currently, the SWIM data portfolio includes Flight and Flow, Aeronautical, and Weather.

The Flight and Flow data is provided through the following data streams:

1. Time-Based Flow Management (TBFM) data, which provides metering information.
2. TFMS data, which provides flight data and flow information.

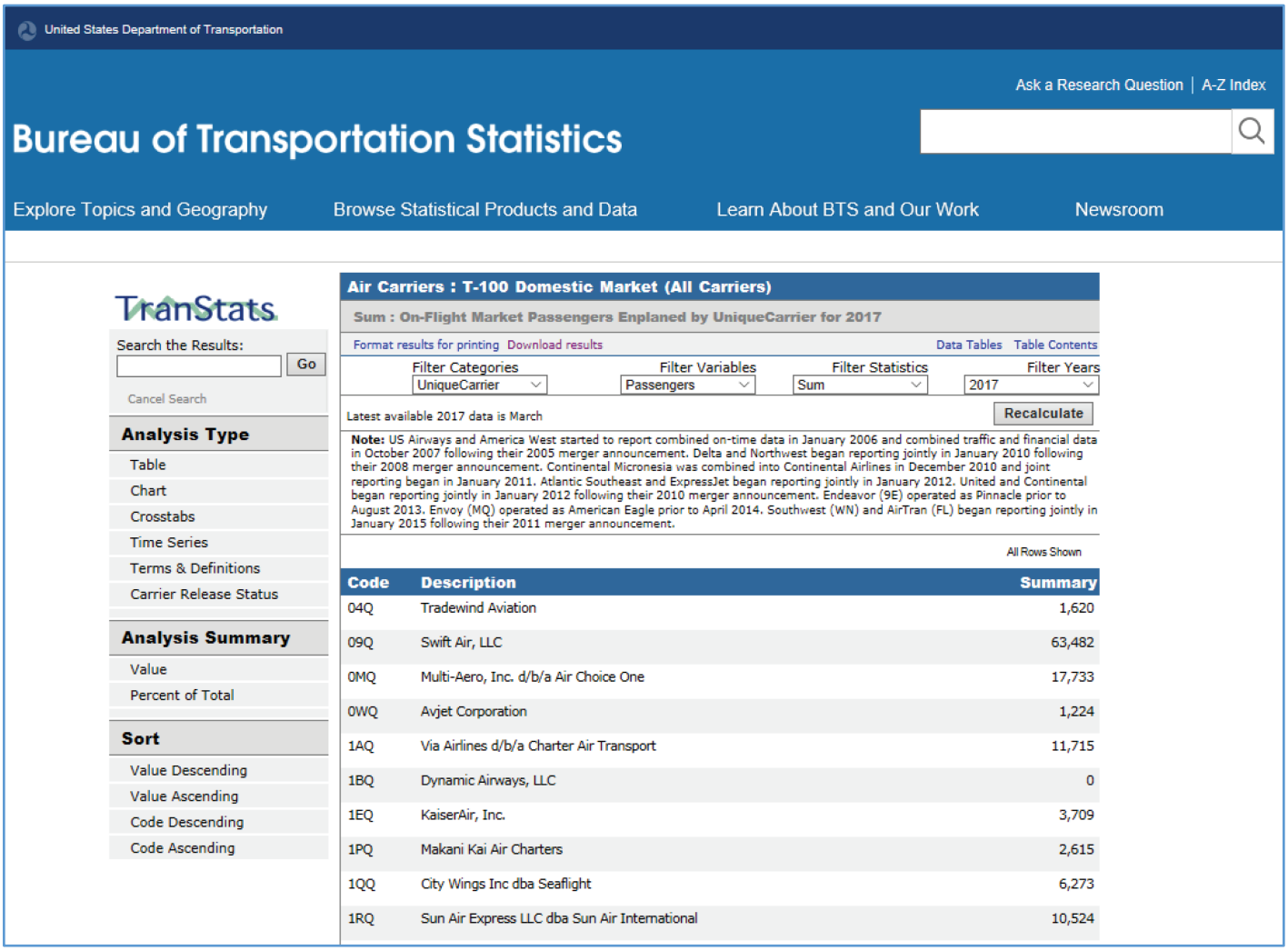

Figure 16. BTS sample of the analysis page.

3. SWIM Terminal Data Distribution Systems (STDDS), which collects and publishes data from over 150 airports. This data includes Surface Movement Event Service (SMES), Airport Data Service (ADS), Terminal Automation Information Service (TAIS), and Tower Departure Event Service (TDES).
4. SWIM Flight Data Publication Service (SFDPS) data which provides flight data and updates to clients for filed and active flight plans.

The Aeronautical data is provided through the following streams:

1. Notices to Airmen (NOTAM) Distribution Service, which provides alerts for potential hazards that could impact the safety of a flight.
2. Aeronautical Information Management Federal NOTAM Distribution Service (AIM FNS), which is a system-to-system interface that enables end systems to receive digital NOTAMs from FNS.
3. Aeronautical Information Management Special Activity Airspace (AIM SAA), which provides Airport reference and configuration data, definitions, and schedule information for Special Activity Airspace (SAA).

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The Weather data is provided from the following sources:

1. The Integrated Terminal Weather System (ITWS) Data Publication which provides short-term predictions of convection, and wind gust hazards, wind shear alerts.
2. Corridor Integrated Weather System (CIWS) Data Publication which provides 0–2 hour forecasts of convection intensity, echo tops, and winter precipitation.
3. Weather Message Switching Center Replacement (WMSCR), which provides textual aviation weather products such as Pilot Reports (PIREPs).
4. Enhanced Weather Information Network System (WINS), which includes numerical weather prediction model predictions, METAR (Meteorological Aerodrome Report) airport weather observations, and icing predictions.
5. NextGen Weather Radar (NEXRAD) data through Weather and Radar Processor (WARP) service.

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Acronyms

AAC	Aircraft Approach Category
AAC	Airport Adjusted Capacity
AAR	Airport Arrival Rate
AC	Advisory Circular
ACA	Airport Carbon Accreditation
ACARS	Addressing and Reporting System
ACE	Airline Cost per Enplanement
ACI	Airports Council International
ACM	Airport Capacity Model
ACN	Aircraft Classification Number
ACRP	Airport Cooperative Research Program
ADC	Average Daily Capacity
ADF	Aircraft Deicing Fluid
ADG	Airplane Design Group
ADR	Airport Departure Rate
ADS	Airport Data Service
AEDT	Aviation Environmental Design Tool
AIM FNS	Aeronautical Information Management Federal NOTAMS Distribution Service
AIM SAA	Aeronautical Information Management Special Activity Airspace
AIP	Airport Improvement Program
AOA	Air Operations Area
AR	Authorized Required
ARFF	Aircraft Rescue and Firefighting
ARTCC	Air Route Traffic Control Centers
ASPM	Aviation System Performance Metrics
ASQP	Airline Service Quality Performance
ASQP	Aviation System Quality and Performance
ASRS	Aviation Safety Reporting System
ASV	Annual Service Volume
ATA	Actual Time of Arrival
ATC	Air Traffic Control
ATCT	Air Traffic Control Tower
ATD	Actual Time of Departure
ATO	Air Traffic Organization
BTS	Bureau of Transportation Statistics
CANSO	Civil Air Navigation Services Organization
CAT	Category
CATS	Certification Activity Tracking System

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CDM	Collaborative Decision Making
CFR	Code of Federal Regulations
CIWS	Corridor Integrated Weather System
CO	Carbon Monoxide
CPE	Cost per Enplanement
CPO	Cost per Operation
dB	Decibels
DNL	Day-Night Average Sound Level
DOT	Department of Transportation
EDCT	Expected Departure Clearance Time
EMAS	Engineered Material Arresting Systems
EoR	Established on RNP
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FACT	Future Airport Capacity Task (FAA)
FIS	Federal Inspection Service
FOD	Foreign Object Debris
FSDS	Flight Schedule Data System
FCT	Federal Contract Towers
GA	General Aviation
GDP	Gross Domestic Product
GDP	Ground Delay Program
GHG	Greenhouse Gases
GS	Ground Stop
HCF	Honolulu Control Facility
HHI	Herfindahl-Hirschman Index
HMIRS	Hazardous Material Incident Reporting System
HNL	Honolulu International Airport
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IROPS	Irregular Operations
IT	Information Technology
ITWS	Integrated Weather System
JAT	Joint Analysis Team
KPI	Key Performance Indicator
LPV	Localizer Performance with Vertical Guidance
MDW	Chicago Midway International Airport
METAR	Meteorological Aerodrome Report
MoSs	Modifications of Standards
MRO	Multiple Runway Operations
MTOs	Managers of Tactical Operations
MVMC	Marginal Visual Meteorological Conditions
NAC	NextGen Advisory Committee
NAAQS	National Ambient Air Quality Standards
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NAVAIDs	Navigational Aids
NEPA	National Environmental Policy Act

NEXRAD	NextGen Weather Radar
NextGen	Next Generation Air Transportation System
NO_2	Nitrogen Dioxide
NOTAM	Notices to Airmen
NPDES	National Pollutant Discharge Elimination System
NPIAS	National Plan of Integrated Airport Systems
NTSB	National Transportation Research Board
O&D	Origination and Destination
O_3	Ozone
OIS	Operational Information System
OOOI	Gate Out, Wheels Off, Wheels On, and Gate In
OPSNET	Operations Network
ORD	Chicago O'Hare International Airport
PANCAP	Practical Annual Capacity
Pb	Lead
PBN	Performance Based Navigation
PCI	Pavement Condition Index
PCN	Pavement Classification Number
PD	Pilot Deviation
PFC	Passenger Facility Charges
PHC	Practical Hourly Capacity
PIREPs	Pilot Reports
PM	Particulate Matter
PMP	Pavement Management Plan
RDC	Runway Design Code
RE	Runway Excursions
RIM	Runway Incursion Mitigation
RNAV	Area Navigation
RNP	Required Navigational Performance
RNP AR	RNP Authorization Required
RPM	Revenue Passenger Miles
RSA	Runway Safety Area
SAA	Special Activity Airspace
SAER	System Airport Efficiency Rate
SFDPS	SWIM Flight Data Publication Service
SIPs	State Implementation Plans
SMES	Surface Movement Event Service
SMS	Safety Management System
SO_2	Sulfur Dioxide
STA	Scheduled Time of Arrival
STDDS	SWIM Terminal Data Distribution Systems
SWIM	System Wide Information Management
TAER	Terminal Arrival Efficiency Rate
TAF	Terminal Area Forecast
TAIS	Terminal Automation Information Service
TBFM	Time Based Flow Management
TDES	Tower Departure Event Service
TDG	Taxiway Design Group
TFDM	Terminal Flight Data Management
TFMS	Traffic Flow Management System
TFMSC	Traffic Flow Management System Counts

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TRACON	Terminal Radar Approach Control Facility
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VPD	Vehicle or Pedestrian Deviation
Wake ReCat	Wake Recategorization
WARP	Weather and Radar Processor
WINS	Weather Information Network System
WMSCR	Weather Message Switching Center Replacement

APPENDIX A

Smart Guide Instructions

Appendix A contains instructions on how to use the Smart Guide, along with screen captures of each page of the tool.

Home Page

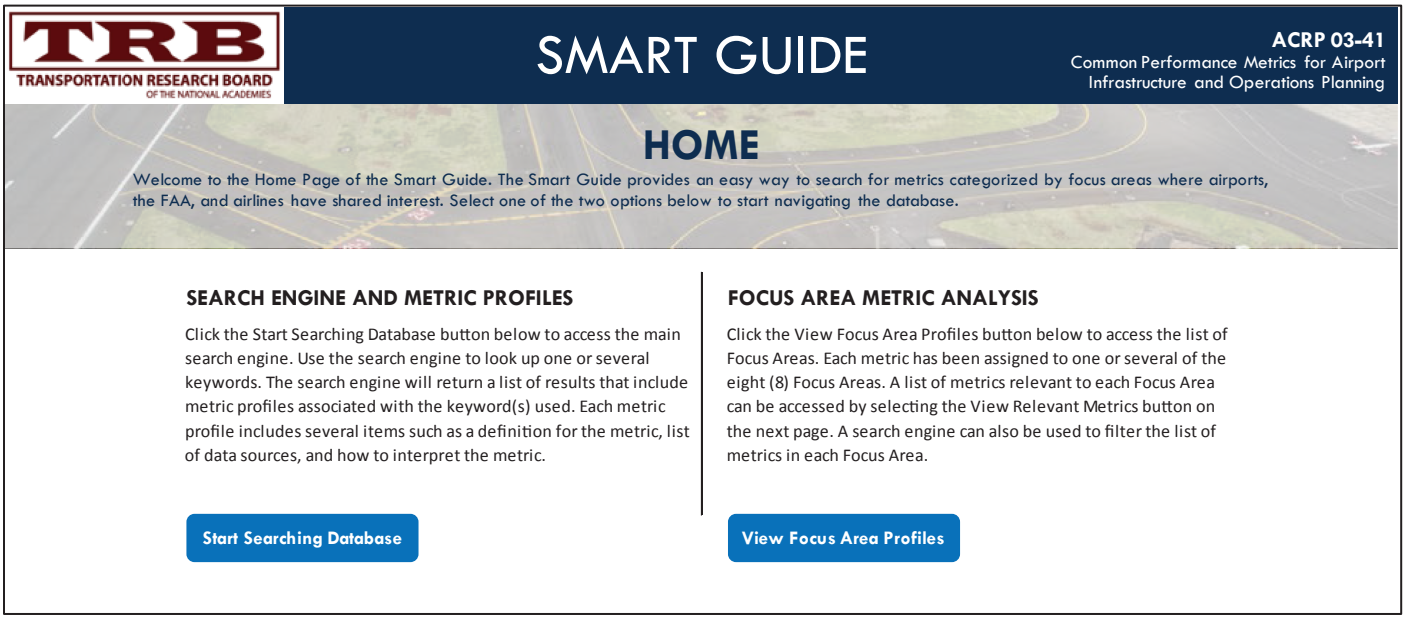

Figure 17. Smart Guide—Home page.

The Home page acts as a portal for the user to explore all functionalities of the Smart Guide. The user may search through the common performance metrics in one of two ways: (1) by using a straight search engine bar to search for a specific metric by keyword, or (2) by choosing a "Focus Area" to view related metrics.

Figure 17 shows the Home page and the two options for navigation. The clickable "Start Searching Database" button takes the user to the Search Engine Page (see Figure 18). This is where the user can type in a keyword(s). The second clickable button on the Home page, "View Focus Area Profiles," takes the user to the Focus Area main page (see Figure 21). The user selects this button to explore a focus area as opposed to typing a keyword(s). The user may then click on one of the focus areas to access the list of related metrics.

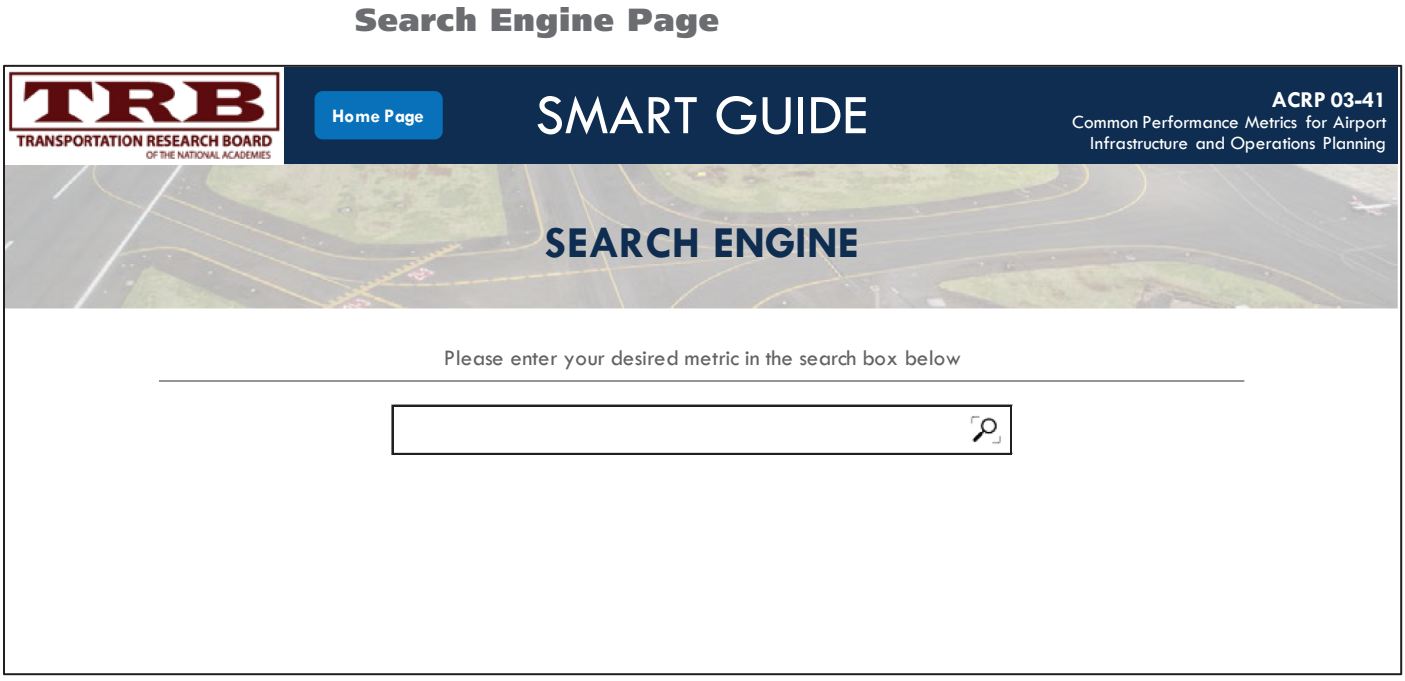

Figure 18. Smart Guide—Search Engine page.

This page allows the user to input generic search terms to navigate through the contents of the metrics database.

Figure 18 shows the Search Engine Page and its search bar. This section of the page functions in the same capacity as any search engine. The user is invited to type in a key word and click on the magnifying glass icon to initiate the search code. This brings the user to the Search Engine Results Page (see Figure 19) to the list of metrics that contain the chosen keyword. For ease of use, the Smart Guide Search Engine also returns research results that contain the keyword in plural form. For example, if the user types the keyword "runway" in the Search Engine Bar, the tool displays the list of metrics that contain the words "runway" as well as "runways."

Note: a clickable "Home Page" button is available on every page of the Smart Guide. It allows the user to quickly navigate back to the Home Page at any point.

Search Engine Results Page

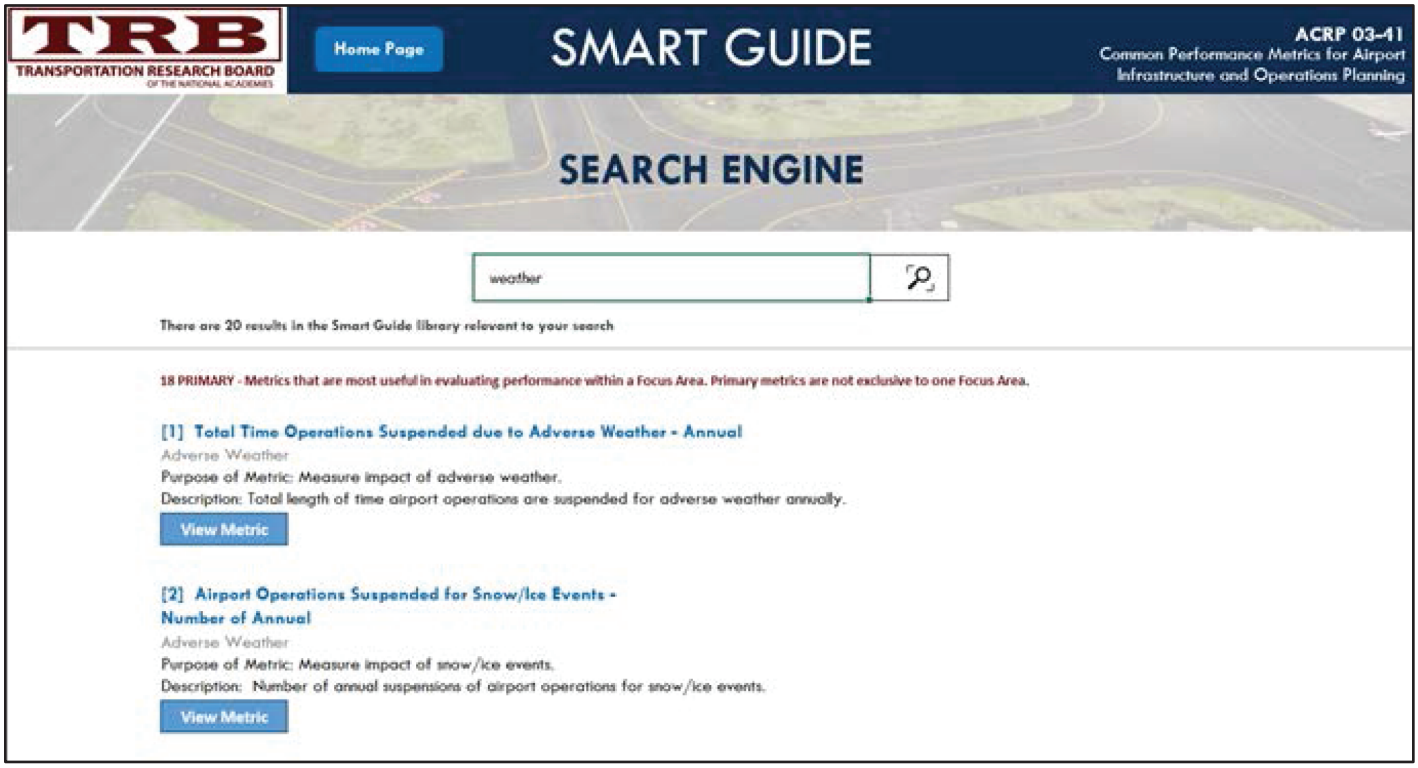

Figure 19. Smart Guide—Search Engine Results page.

As shown on Figure 19, the Search Engine Results page displays the list of performance metrics found in the metrics database relevant to the user search term that was typed in the search engine bar. Primary performance metrics are listed first followed by the secondary performance metrics. The search engine bar remains on this page to allow the user to submit a new search at any point.

After the user initiates the search engine function, a list of metrics that either contain the keyword in their name or in their description/guidance text appear. The display for each metric includes the assigned category, purpose, and description, as well as a clickable "View Metric" button that directs the user to the Metric Profile page (see Figure 20).

Metric Profile Page

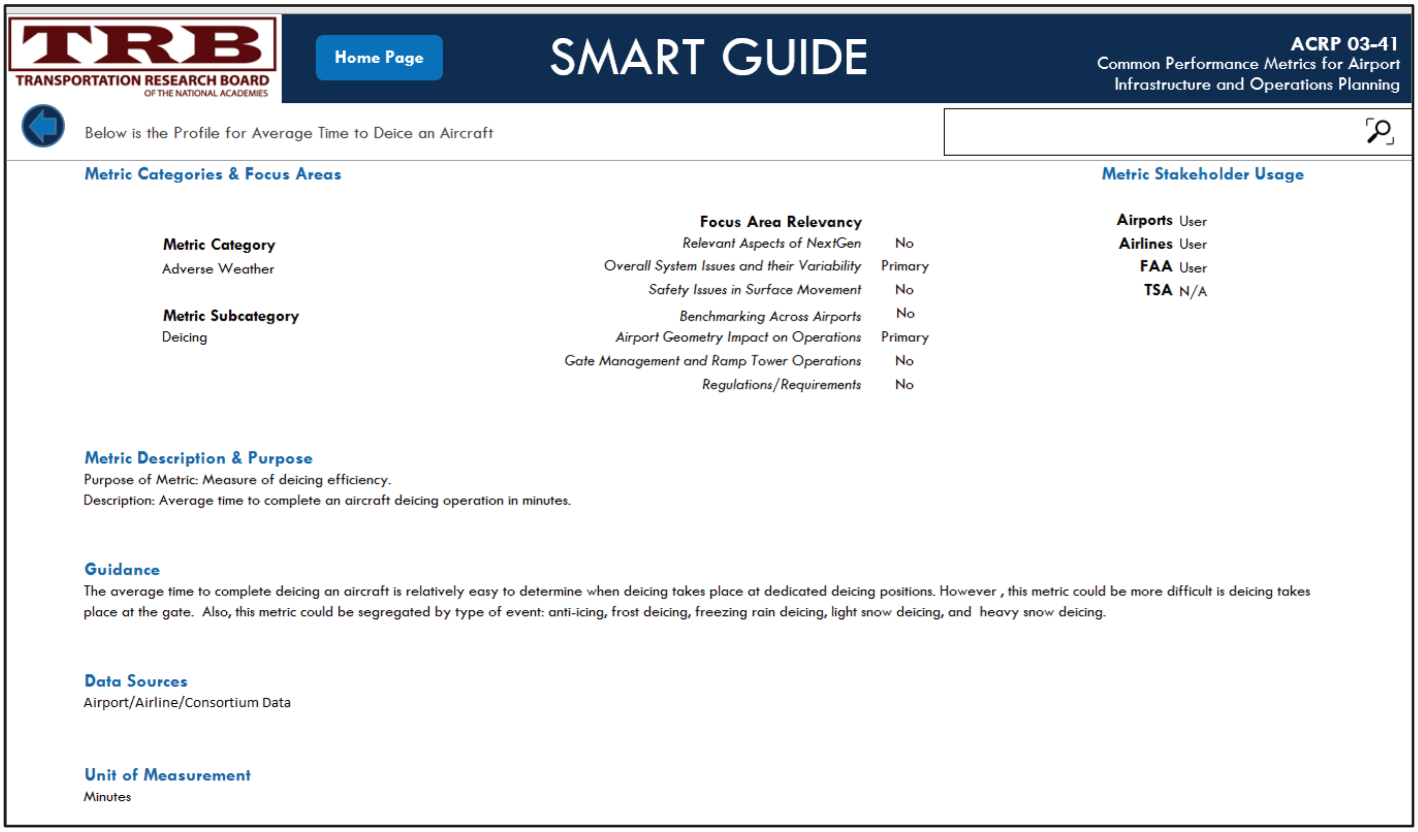

Figure 20. Smart Guide—Metric Profile page.

Figure 20 shows the core function of the Smart Guide tool, the Metric Profile page. When the user locates the specific metric relevant to their inquiry, they arrive at a metric profile. The metric profiles provide information that will aid the user measure performance and communicate with other stakeholders, including the FAA and airlines.

This page contains the name of the metric along with categories and sub-categories to which it belongs. The profile also contains relevancy to each focus area and the stakeholder usage of the metric. Stakeholder usage is defined as user, should know/understand, informational only, or not applicable (NA). The "Guidance" section of the metric profile allows the user to understand relevancy and differences that various stakeholders have in interpreting and applying the subject metric. Finally, the Metric Profile page provides a data source and unit of measurement.

Focus Area Main Page

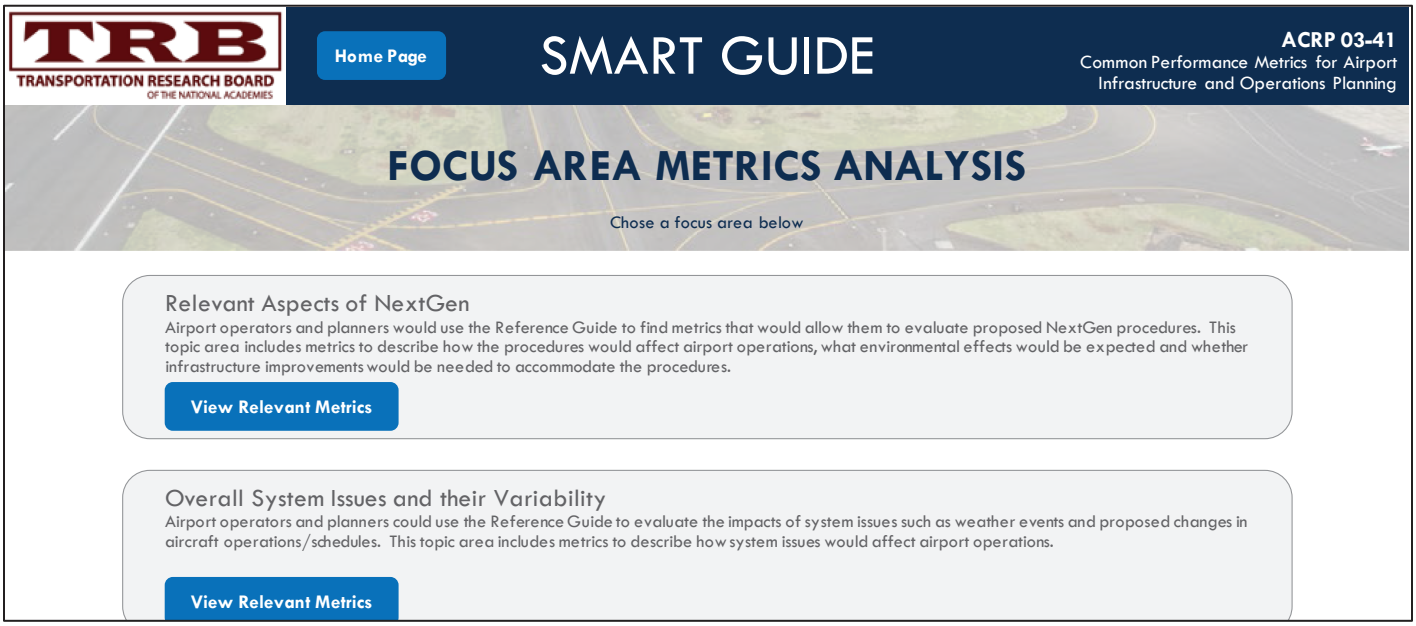

Figure 21. Smart Guide—Focus Area main page.

Figure 21 shows the Focus Area main page. It allows the user to choose a focus area and to filter through the common performance metrics found in the metrics database. This section lists each of the eight focus areas found within the metrics database (Relevant Aspects of NextGen, Overall System Issues and their Variability, Safety Issues in Surface Movement, Other Airfield Safety Issues, Benchmarking across Airports, Airport Geometry Impact on Operations, Gate Management and Ramp Tower Operations, and Regulations/Requirements). The user is invited to click on the "View Relevant Metrics" button, which brings up the Focus Area Results page (see Figure 22) to view the list of metrics associated with the selected focus area.

Figure 22. Smart Guide—Focus Area Results page.

Figure 22 shows the Focus Area Results page. This page lists common performance metrics relevant to the focus area selected. If the performance database includes both primary and secondary performance metrics for the subject focus area, primary performance metrics are listed first followed by the secondary performance metrics. Each metric in the results list is clickable, leading the user to the specific metrics profile. Two dropdown filters allow users to refine their search. These filters list the possible categories and sub-categories for the user to choose from to filter through the common performance metrics. Note that the Sub-Category filter only appears once a Category filter has been selected. The left portion of the page lists all the focus areas. Each of those buttons is clickable and allows the user to navigate to a different focus area. The user may click on "View Metric" under any of the metrics to arrive at the Metric Profile page for the desired metric.

APPENDIX B

Performance Metrics Database

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Adverse Weather	Suspended Operations	Total Time Operations Suspended Due to Adverse Weather—Annual Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Measure impact of adverse weather. Description: Total length of time airport operations are suspended for adverse weather annually.	User	User	User	Info Only	Airport Data
Adverse Weather	Suspended Operations	Airport Operations Suspended for Snow/Ice Events— Number of Annual Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Measure impact of snow/ice events. Description: Number of annual suspensions of airport operations for snow/ice events.	User	User	User	Info Only	Airport Data
Adverse Weather	Suspended Operations	Average Time Airport Operations Are Suspended for Snow/Ice Events Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Measure impact of snow/ice events. Description: Average length of time airport operations are suspended for snow/ice events. Averaged over the snow/ice season.	User	User	User	Info Only	Airport Data
Adverse Weather	Suspended Operations	Operations Suspended for Adverse Weather—Number of Annual Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Measure impact of adverse weather. Description: Number of suspensions of operations for adverse weather annually.	User	User	User	Info Only	Airport Data
Adverse Weather	Deicing	Deicing Throughput in Aircraft per Hour Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of deicing throughput efficiency. Description: Number of deicing operations completed per unit hour.	User	User	User	Info Only	Airport/ Airline/ Consortium Data

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Hours	Could also measure total time each runway is closed due to adverse weather annually. This would be more complex to determine than total time operations are suspended but may also be more useful.	SME input (variation on API Metric AO 0-1, Adverse Weather—Average Closing Time, found on p. 27 in *ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011.)
N/A	Number of Annual	For airport management purposes, the annual number of suspended operations for snow/ice events is likely most useful. Operations personnel may be interested in further breakdown of these events.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AO O-4, Airport Closures for Snow/Ice Events—Number of, p 27. SME input.
N/A	Hours	The annual average measured in hours is a general indication of degree of weather disruption for a winter season.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AO 0-7, Average Time Airport Closed for Snow/Ice Events, p 27. SME input.
N/A	Number of Annual	"Closures for adverse weather are normally caused by snow and ice, although other severe weather such as hurricanes and thunderstorms may also result in closure. The number of closures is related both to the severity of weather and the airport's ability to keep runways, taxiways and roadways clear. This indicator may reflect variations in weather more than variations in airport performance. The FAA Flight Delay Information—Air Traffic Control System Command Center tracks airport closures on a real time basis. http://www.fly.faa.gov/flyfaa/usmap.jsp Important for self-benchmarking. For peer benchmarking, be careful to compare with other airports experiencing similar weather conditions."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AO K-1, Closures for Adverse Weather, p. 21, Research Team modified the name of the metric to include "Number of Annual."
N/A	Number per Hour	From a planning standpoint, consider this metric in balancing throughput with runway capacity to avoid secondary deicing operations (aircraft exceeds holdover time waiting to take off). This metric could be segregated by type of event: anti-icing, frost deicing, freezing rain deicing, light snow deicing, and heavy snow deicing.	SME input.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Adverse Weather	Airfield Snow/Ice Removal	Primary Runway/ Taxiway Clearing Time—Average for Snow/Ice Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Safety Issues—Secondary	Purpose of Metric: Measure the ability to respond to a snow/ice event. Description: Average time to clear primary runways and related taxiways of snow/ice accumulation.	User	User	User	N/A	Airport Data
Adverse Weather	Airfield Snow/Ice Removal	Snow Removal Resources Identified in FAA-Approved Snow and Ice Control Plan Go back to Chapter 3—Safety Issues—Secondary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure the ability to respond to a snow/ice event. Description: Number of pieces of snow removal equipment (by type) in FAA-approved snow and ice control (removal) plan for Part 139 Certificated airports.	User	Info Only	Info Only	N/A	Airport Data
Adverse Weather	Deicing	Amount of Deicing or Anti-Icing Agent Applied to Airfield (by type)—Per Season Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure deicing efficiency and respond to stormwater management and industrial discharge permit regulations. Description: The amount of deicing agent used for airfield deicing in gallons applied per season.	User	Info Only	Info Only	N/A	Airport Data
Adverse Weather	Deicing	Dedicated Deicing Positions—Number of Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure the ability to respond to a snow/ice event. Description: Number of available dedicated deicing positions.	User	User	Info Only	N/A	Airport Data
Adverse Weather	Deicing	Average Time to Deice an Aircraft Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Measure of deicing efficiency. Description: Average time to complete an aircraft deicing operation in minutes.	User	User	User	N/A	Airport/ Airline/ Consortium Data

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Minutes	"Average time to clear primary runways and related taxiways of snow & ice is a function of the amount of snow & ice to be cleared, the rate of snowfall or other winter precipitation, and the manpower, equipment and communication tools employed. This API [Airport Performance Indicator] is best used for self benchmarking as an airport acquires new equipment or adopts different procedures and technologies. It may also be used for peer benchmarking with airports that experience similar weather conditions." May be useful to measure clearing time for "Priority 1" area defined in AC 150/5200-30D. Priority 1 area is defined as follows: "Areas appropriate for this category are those that directly contribute to safety and the re-establishment of aircraft operations at a minimum acceptable level of service. Priority 1 will generally consist of the primary runway(s) with taxiway turnoffs and associated taxiways leading to the terminal, portions of the terminal ramp, portions of the cargo ramp, airport rescue and fire fighting (ARFF) station ramps and access roads, mutual aid access points (including gates), emergency service roads, access to essential NAVAID, and centralized deicing facilities".	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AO K-4—Runway Clearing Time—Average for Snow/Ice, p. 24, and Airport Field Condition Assessments and Winter Operations Safety Advisory Circular, (AC 150/5200-30D, Change 1) Federal Aviation Administration, 3/8/2017, p. 1-3.
N/A	Count	"§139.313 Snow and ice control. (a) As determined by the Administrator, each certificate [Part 139] holder whose airport is located where snow and icing conditions occur must prepare, maintain, and carry out a snow and ice control plan in a manner authorized by the Administrator." "FAA Advisory Circulars contain methods and procedures for snow and ice control equipment, materials, and removal that are acceptable to the Administrator." AC No: 150/5200-30D, Airport Field Condition Assessments and Winter Operations Safety, can be used to determine airfield clearing priorities and airfield target clearance times. Minimum equipment requirements can then be determined by applying the guidance in AC No. 150/5220-20A, Airport Snow and Ice Control Equipment.	15 CFR Part 139, Certification of Airports, §139.313: Snow and Ice Control, Feb. 10, 2004. SME and Advisory Committee Input.
N/A	Gallons		SME input, 40 CFR Protection of Environment, Part 449—Airport Deicing Point Source Category §449.20: Monitoring, reporting and recordkeeping requirements. May 16, 2012.
N/A	Count		SME Input.
N/A	Minutes	The average time to complete deicing an aircraft is relatively easy to determine when deicing takes place at dedicated deicing positions. However, this metric could be more difficult if deicing takes place at the gate. Also, this metric could be segregated by type of event: anti-icing, frost deicing, freezing rain deicing, light snow deicing, and heavy snow deicing.	SME Input.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Adverse Weather	Deicing	Amount of Deicing or Anti-Icing Agent Applied to Aircraft (by type)—Per Season Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure deicing efficiency and respond to stormwater management and industrial discharge permit regulations. Description: Measure quantity of deicing agent used for aircraft deicing in gallons applied per season.	User	User	Info Only	N/A	Airport/ Airline/ Consortium Data
Adverse Weather	Deicing	Deicing % Fluid Recovered Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Respond to SWM and industrial discharge permit regulations. Description: Percent of aircraft deicing fluid that is captured/recovered. Deicing operations include removal of ice from aircraft, application of chemicals to prevent initial icing or further icing (anti-icing), and removal of (and preventing) ice from airfield pavement (runways, taxiways, aprons, and ramps). This indicator measures the percentage of undiluted aircraft deicing fluid (ADF) that is captured after being sprayed.	User	User	Info Only	N/A	Airport/ Airline/ Consortium Data
Adverse Events Including Weather	IROPS	Delays with Passengers on Aircraft that Exceed DOT Tarmac Delay Duration Standards Annually (Domestic) Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Secondary	Purpose of Metric: Measure of compliance with Federal standards. Description: Number of annual domestic tarmac delays with passenger on aircraft for more than three hours.	User	User	User	Info Only	Bureau of Transportation Statistics (BTS)—Tarmac Times
Adverse Events Including Weather	IROPS	Delays with Passengers on Aircraft that Exceed DOT Tarmac Delay Duration Standards Annually (International) Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Secondary	Purpose of Metric: Measure of compliance with federal standards. Description: Number of annual international tarmac delays with international passengers on aircraft for more than four hours.	User	User	User	Info Only	BTS—Tarmac Times

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Gallons	The Airport may be required to monitor the amount of aircraft deicing fluid applied in their NPDES permit. "A requirement may be included in the permit for the permittee to collect, and maintain on site during the term of the permit, up to five (5) years of data on the annual volume of ADF [Aircraft Deicing Fluid] used."	Advisory Committee, 40 CFR Protection of Environment, PART 449—Airport Deicing Point Source Category §449.20: Monitoring, reporting and recordkeeping requirements. May 16, 2012.
N/A	Percent	"EPA promulgated the Airport Deicing Effluent Guidelines in 2012 (40 CFR Part 449). The requirements generally apply to wastewater associated with the deicing of airfield pavement at commercial airports. The rule also established New Source Performance Standards for wastewater discharges associated with aircraft deicing for a subset of new airports. These requirements are incorporated into NPDES permits." "Existing and new primary airports with 1,000 or more annual jet departures ("non-propeller aircraft") that generate wastewater associated with airfield pavement deicing are to use non-urea-containing deicers, or alternatively, meet a numeric effluent limitation for ammonia." "New airports with 10,000 annual departures located in cold climate zones are required to collect 60 percent of aircraft deicing fluid after deicing. Airports that discharge the collected aircraft deicing fluid directly to waters of the U.S. must also meet numeric discharge requirements for chemical oxygen demand. The rule does not establish uniform, national requirements for aircraft deicing discharges at existing airports. Such requirements will continue to be established in general permits, or for individual permits on a site-specific, best professional judgment basis." "Regulatory implications may make obtaining peer data difficult. Apart from complying with minimum standards that may be set by federal law, this API [Airport Performance Indicator] is a useful environmental measure, which may be used for self-benchmarking and to peer-benchmark with similarly-situated peer airports. The facilities used for deicing and deicing fluid recapture vary from airport to airport, and must be considered in any comparison of fluid recovery between airports."	Advisory Committee and *ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric EV K-2, Deicing—% Fluid Recovered, p. 83 and SME input. 40 CFR Protection of Environment, PART 449—Airport Deicing Point Source Category §449.20: Monitoring, reporting and recordkeeping requirements. May 16, 2012. EPA Airport Deicing Effluent Guidelines, https://www.epa.gov/eg/airport-deicing-effluent-guidelines, accessed 8/25/17. EPA, Fact Sheet Effluent Guidelines for Airport Deicing Discharges, April 2012, p.1.
https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/subject_areas/airline_information/taxi_out_and_other_tarmac_times/index.html	Count	14 CFR Part 244—Reporting Tarmac Delay Data, requires covered carriers to report all passenger operations that experience a tarmac time of 3 hours or more at a U.S. airport.	SME input.
https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/subject_areas/airline_information/taxi_out_and_other_tarmac_times/index.html	Count	14 CFR § 259.4 Contingency Plan for Lengthy Tarmac Delays. Covered carrier shall adopt a Contingency Plan for Lengthy Tarmac Delays. The Contingency Plan will include the following: "(1) For domestic flights, assurance that the covered U.S. air carrier will not permit an aircraft to remain on the tarmac for more than three hours before allowing passengers to deplane unless:.." "(2) For international flights operated by covered carriers that depart from or arrive at a U.S. airport, assurance that the carrier will not permit an aircraft to remain on the tarmac at a U.S. airport for more than four hours before allowing passengers to deplane, unless:..."	Advisory committee input.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Adverse Events Including Weather	IROPS	Diversions to Other Airports-Number of Annual Go back to Chapter 3—System Issues—Secondary	Purpose of Metric: Measure of impact of adverse events including weather. Description: Number of aircraft diverted to other airports annually.	User	User	User	Info Only	BTS Airline On-Time Performance Data
Adverse Events Including Weather	IROPS	Diversions into Airport—Number of Annual Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Secondary	Purpose of Metric: Measure of impact of adverse events including weather. Description: Number of aircraft diverted to subject airport annually.	User	User	User	Info Only	FAA Air Traffic Control, Aviation System Performance Metrics (ASPM) for ASPM Airports
Airfield	Runway	Runway Pavement Condition Go back to Chapter 2—Intro Go back to Chapter 3—Safety Issues—Secondary	Purpose of Metric: This metric allows the FAA to closely monitor the condition of the runways, thus ensuring runway availability throughout the system. Description: FAA-harmonized metric. Percentage of runways with pavement in fair or better condition.	Should Know/ Understand	Info Only	User	N/A	FAA Operational Metrics

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
Refer to Guidance	Count	Total number of annual diversion to Other Airports can be computed using BTS Airline On-Time Performance Data. Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Airline On-Time Performance Data. Step 3: On the next page click on On-Time Performance. Step 4: On the next page scroll down to Cancellations and Diversions section and click on the Analysis link for Diverted field name. Step 5: On the next page, set the Filter Categories to "Dest," set the Filter Variables to "Diverted," set the Filter Statistics to "Sum," and select the appropriate year for Filter Years. Step 6: Click on Recalculate. Step 7: Once the page updates, the table below will show diversion counts by airports. Download the result to spreadsheet using the "Download results" option above the filter categories.	SME input.
Refer to Guidance	Count	For ASPM airports, this metric can be computed using ASPM diversion module. To access this data, the user must register using the following form and request for user login: https://aspm.faa.gov/Control/Users/sysMailTo.asp. Once registered and logged in, the user can access the diversion module using the following URL: https://aspm.faa.gov/apm/sys/diversions.asp. The diversion module has two types of reports: (1) ASPM Diversions: Detail Report: Provides flight-specific information about flights that were diverted from their intended destination due to adverse conditions at the intended arrival airport or a situation on board the aircraft that required the flight to land at a nearby airport. URL: http://aspmhelp.faa.gov/index.php/ASPM_Diversions_:_Detail_Report. (2) ASPM Diversions: Summary Report: Provides counts of diversions by date, by airport, or other specified grouping. URL: http://aspmhelp.faa.gov/index.php/ASPM_Diversions_:_Summary_Report. The diversions into an airport can be computed using the summary report. This metric could also be calculated using BTS data. The user will have to download the data for each month of the year, use a pivot table to get sum of Diversion into airports for each month's dataset and then sum up across all 12 months to arrive at the annual number of diversions into airports.	SME input.
https://www.faa.gov/air_traffic/flight_info/aeronav/aero_data/Airport_Data/	Qualitative	FAA reports annually. As part of airport inspections, FAA updates airport master records for public-use airports and reports the results through the Airport Safety Data Program. Runway pavement conditions are classified as excellent (no visible deterioration); good (e.g., all cracks and joints sealed); fair (e.g., mild surface cracking, unsealed joints, some slab edge spalling); poor (e.g., large open cracks, slab surface and edge spalling, vegetation growing through cracks and joints); or failed (e.g., widespread, severe cracking with raveling and deterioration). The FAA's goal is to maintain runway pavement in excellent, good, or fair condition for at least 93 percent of the paved runways in the National Plan of Integrated Airport Systems (NPIAS). The Runway Pavement Condition for a specific airport may be found at FAA—Aeronautical Information Services / Airport Data https://nfdc.faa.gov/xwiki/bin/view/NFDC/Airport+Data.	National Plan of Integrated Airport Systems (2017-2021), Federal Aviation Administration, September 2016, p. 35. FAA Operational Metrics, https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/, accessed 6/23/17.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Airfield	Runway	Pavement Condition Index (PCI)—by Runway Go back to Chapter 3—Safety Issues—Primary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Evaluating runway pavement. Description: "The PCI [Pavement Condition Index] is a numerical rating of the surface condition of a pavement and indicates functional performance with implications of structural performance." It is based on an objective measurement of the type, severity, and quantity of distress. "PCI values range from 100 for a pavement with no defects to 0 for a pavement with no remaining functional life."	User	User	User	N/A	Airport Records, Pavement Management Program
Airfield	Runway	Pavement Classification Number—by Runway Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Standardized method of reporting pavement strength. Description: "PCN is a number that expresses the load-carrying capacity of a pavement for unrestricted operations."	User	User	User	N/A	FAA Form 5010—Airport Master Record
Airfield	Runway	Runway Occupancy Time Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Measure of operational efficiency. Description: "Runway occupancy time [ROT] refers to the time interval that an aircraft occupies a runway. This time interval is usually expressed in seconds."	User	User	Info Only	N/A	ASDE-X

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	0 to 100	"Federally obligated airports must perform a detailed inspection of airfield pavements at least once a year for the PMP [Pavement Management Plan]. If a pavement condition index (PCI) survey is performed, as set forth in ASTM D5340, Standard Test Method for Airport Pavement Condition Index Surveys, the frequency of the detailed inspections by PCI surveys may be extended to three years." "Periodic PCI determinations on the same pavement will show the change in performance level over time. Distress intensity recorded over time helps determine how the pavement is performing. Airports can use the pavement condition survey to develop pavement performance data. Distress intensity recorded over time helps determine how the pavement is performing. The rate at which the distress intensity increases is a good indicator of the pavement performance." "By projecting the rate of deterioration, a life-cycle cost analysis can be performed for various M&R [maintenance and rehabilitation] alternatives. Not only can the best alternative be selected, but the optimal time of application can also be determined." "Computer pavement management programs such as MicroPAVER or FAA PAVEAIR can be used to calculate a PCI." The FAA also tracks pavement condition using the Runway Pavement Condition metric—refer to this metric for additional information.	U.S. Department of Transportation Federal Aviation Administration, AC No: 150/5320-6F, Airport Pavement Design and Evaluation, 11/10/2016, p. 5-1.; AC No: 150/5380-6C, Guidelines and Procedures for Maintenance of Airport Pavements, 10/10/2014, p. 8.; AC No: 150/5380-7B, Airport Pavement Management Program (PMP),10/10/2014, p. 13.
http://www.gcr1.com/5010WEB/	Number	The Aircraft Classification Number—Pavement Classification Number (ACN-PCN) method is the international method of reporting pavement strength for pavements with bearing strengths of 12,500 pounds (5 700 kg) or greater. With the ACN-PCN system, an aircraft's ACN can be compared to the published PCNs to determine if pavement strength limits aircraft operations at an airport. Aircraft manufacturers provide the official ACN for an aircraft. "The PCN for a pavement is reported as a five-part number where the following codes are ordered and separated by forward slashes: Numerical PCN value / Pavement type / Subgrade category / Allowable tire pressure / Method used to determine the PCN." "...[T]he FAA requires all public-use paved runways at all Part 14 CFR 139 certificated airports be assigned gross weight and PCN data." Airport must update the Form 5010 Gross Weight and PCN data after completing projects funded through the Airport Improvement Program (AIP) or Passenger Facility Charge (PFC) program. Refer to FAA AC No: 150/5335-5C Standardized Method of Reporting Airport Pavement Strength for information on how to determine PCNs.	FAA AC No: 150/5335-5C Standardized Method of Reporting Airport Pavement Strength—PCN, 8/14/2014, pp. i, ii, 2-1, 4-5 and 4-8.
N/A	Seconds	"For arrivals, runway occupancy time refers to the time an arriving aircraft takes between crossing the runway threshold until it is clear of the runway, meaning it is outside the Runway Safety Area (RSA). For departures, runway occupancy time refers to the time a departing aircraft takes from the moment it occupies an active runway, meaning the time it enters the RSA, until it clears the departure end." The runway occupancy time is influenced by traffic mix, weather conditions, and for arrivals, the runway exit locations. ASDE-X data can be used to measure (ROT) which can be used to evaluate benefits achieved by any technological or procedural changes implemented to reduce ROTs. ROTs can be averaged by aircraft type and used in capacity modeling. The FAA uses the average ROT to determine when reduced separation between aircraft on the final approach course is acceptable. "ROT is the length of time required for an arriving aircraft to proceed from over the runway threshold to a point clear of the runway. The average ROT is calculated by using the average of the ROT of no less than 250 arrivals. The 250 arrivals need not be consecutive but must contain a representative sample of the types of aircraft that use the runway. Average ROT documentation must be revalidated within 30 days if there is a significant change in runway/taxiway configuration, fleet mix, or other factors that may increase ROT."	*ACRP Report 79: Evaluating Airfield Capacity*, 2012, p. 27. Center for Air Transportation Systems Research Department of Systems Engineering and Operations Research George Mason University, *Runway Occupancy Time Extraction and Analysis Using Surface Track Data*, July 31, 2009, p. 2. Tamas Kolos-Lakatos and R. John Hansman, *The Influence of Runway Occupancy Time and Wake Vortex Separation Requirements on Runway Throughput*, August 2013, p. 39. FAA, JO 7210.3AA, Facility Operation and Administration, October 12, 2017 p. 10−4−8.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Airfield	Runway	Runway Queue for Maximum Throughput Conditions Go back to Chapter 3—Airport Geometry—Secondary Go back to Chapter 3—Gate Management—Secondary	Purpose of Metric: Measure of operational efficiency. Description: The number of departing aircraft waiting to use a runway that are on taxiways or holding bays for a given time interval.	User	User	Info Only	N/A	SWIM (ASDE-X)
Airfield	Runway	Runway Configuration Use Go back to Chapter 3—Airport Geometry—Secondary	Purpose of Metric: Input for capacity, delay, and environmental analysis. Description: The percentage of time a certain runway configuration, such as east or west flow, is used for a given period time.	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports
Airfield	Runway	Pavement Usage (number of passes over segments) Go back to Chapter 3—Airport Geometry—Secondary	Purpose of Metric: Calculation of Pavement Classification Number (PCN) for pavements and implementing pavement maintenance. Also used for input to airfield simulation modeling. Description: number of passes over airport pavement. For runways, usage data is available from FAA at towered airports. For taxiways, it is estimated. Data from ASDE-X and/or multilateral tracking systems can be available at larger airports.	Info Only	Info Only	User	Info Only	ASDE-X data
Airfield	Design	Critical Aircraft Go back to Chapter 3—Benchmarking—Primary Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Airport design. Description: The most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, including both itinerant and local operations but excluding touch-and-go operations. An operation is either a takeoff or landing.	User	User	User	N/A	Critical aircraft designations can be found on FAA-approved Airport Layout Plans

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Number of Aircraft	Commonly measured as average per hour time period. If considering maximum may want to consider a different timeframe.	Lisa Kosanke and Michael Schultz, Air Transport and Operations Symposium, Delft University of Technology, Delft, The Netherlands, July 2015.
Refer to Guidance	Percentage of Time Using Each Runway Configuration	The runway configuration use metric is used in capacity, delay and environmental impact modeling and analysis. Runway configuration use can be determined using ASDE-X data. Also, for ASPM airports, this metric can be computed using ASPM Efficiency: Frequency Report. To access this data the user must register using the following form and request for user login: https://aspm.faa.gov/Control/Users/sysMailTo.asp. Once registered and logged in, the user can access the Airport Efficiency module using the following URL: https://aspm.faa.gov/apm/sys/Efficiency.asp. ASPM Efficiency: Frequency Report: Provides operations frequency report by weather category and runway configurations URL: http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Frequency_Report.	*ACRP Report 79: Evaluating Airfield Capacity*, Transportation Research Board, Washington D.C., June 2012.
N/A	Count	Pavement is divided into segments, and traffic on each section is estimated. It is important to capture both the number of passes over the segments and the types of aircraft. In the past, an observer in the ATC would tally aircraft on taxiway segments to estimate usage on those pavements. It may be possible to use multi-lateral or ASDE X data to estimate both the number of passes by aircraft type on each section.	SME input.
N/A	Varies	"Different aircraft may define separate elements of airport design. Therefore, effective planning of an airport may need to consider different and multiple Critical Aircraft as listed below: - Critical Aircraft or grouping of aircraft in the most demanding Aircraft Approach Category (approach speed), expressed as Aircraft Approach Category (AAC) A, B, etc. - Critical Aircraft or grouping of aircraft in the most demanding Airplane Design Group (ADG) [wingspan], expressed as ADG I, II, etc. - Critical Aircraft Runway Design Code (RDC)—the combination of the most demanding AAC and ADG. - Critical Aircraft or grouping of aircraft for runway length. - Critical Aircraft or grouping of aircraft in the most demanding Taxiway Design Group (TDG), expressed as TDG 1, 2, etc. - Critical Aircraft for Engineered Material Arresting Systems (EMAS)." FAA AC 150/5000-17 "Critical Aircraft and Regular Use Determination" provides guidance on acceptable methods for establishing "Critical Aircraft" for existing and forecast operations at the airport.	FAA, AC 150/5000-17, Critical Aircraft and Regular Use Determination, 6/20/2017, p. 3-1.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Airline	Fares	Average Airfare Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Economic optimization. Description: Average domestic origin and destination airfare at airport.	User	User	User	N/A	Bureau of Transportation Statistics
Airline	Airline Capacity	Average Load Factor Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Economic optimization. Description: "A measure of airline production equal to revenue passenger miles divided by available seat miles."	User	User	Info Only	Info Only	Bureau of Transportation Statistics
Airline	Airline Capacity	Average Number of Seats per Airline Departure Operation Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Economic optimization. Description: "Average number of seats per airline departure operation."	Info Only	User	Info Only	Info Only	Bureau of Transportation Statistics

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://www.transtats.bts.gov/AverageFare/	Dollars per Ticket	It may be useful to compare the airport's average airfare to the U.S. average airfare or a competing airport's average airfare. Also, it may be useful to monitor the change in the airport's average airfare.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011—derivation of API Metric AS O-4 Airfare Average vs U.S. Average Airfare at airport compared with U.S. average (domestic O&D) and API Metric AS O-5 Airfare Change over Prior Period Airfare change over prior period (domestic O&D), p. 40.
https://www.transtats.bts.gov/Data_Elements.aspx?Data=5	Average of Percent Loaded	"The number of Revenue Passenger Miles (RPMs) expressed as a percentage of ASMs [Available Seat Miles], either on a particular flight or for the entire system. Load factor represents the proportion of airline output that is actually consumed. To calculate this figure, divide RPMs by ASMs. Load factor for a single flight can also be calculated by dividing the number of passengers by the number of seats." The monthly and annual average load factors for scheduled service based on origin or destination airport are provided at https://www.transtats.bts.gov/Data_Elements.aspx?Data=5.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AS O-9 Average Load Factor, p. 40. MIT Global Airline Industry Program—Airline Data Project—Glossary, http://web.mit.edu/airlinedata/www/Res_Glossary.html, accessed 8/19/2017.
Refer to Guidance	Average Count of Seats Available	Can be computed using BTS Air Carrier Statistics (Form 41 Traffic)- All Carriers. Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Air Carrier Statistics (Form 41 Traffic)—All Carriers. Step 3: On the next page click on T-100 Segment (All Carriers). Step 4: On the next page under the Summaries section, click on the Analysis link corresponding to the Seats field name. Step 5: On the next page, set the Filter Categories to "Origin," set the Filter Variables to "Seats," set the Filter Statistics to "Sum," and select the appropriate year for the Filter Years. Step 6: Click on Recalculate. Step 7: Once the page updates, the table below will show Seat counts by airports. Download the result to spreadsheet using the "Download results" option above the filter categories. Step 8: Change the Filter Variable to DepPerformed and click on Recalculate. Step 9: Once the page updates, the table below will show departure counts by airports. Download the result to spreadsheet using the "Download results" option above the filter categories. Step 10: Open the downloaded files and divide the Seat Count by the corresponding airport's Departure Count to arrive at the Average Number of Seats per Airline Departure Operations.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AS O-10 Average Number of Seats per Airline Operation, p. 40. SME input.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Airline	Airline Efficiency	Minimum Flight Connecting Times Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Scheduling optimization. Description: "Minimum published times for the particular airport."	Info Only	User	Info Only	Info Only	Airlines
Operations	Based Aircraft	Based Aircraft Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Estimate operational demands—primarily applicable to general aviation airports. Description: "Number of aircraft based at a particular airport. Helpful to track by aircraft type—piston, turboprop, jet, since utilization, fuel usage, and facilities requirements differ."	User	Info Only	User	N/A	Airport records
Capacity	Airport Capacity	Airport Arrival Rate (AAR) Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of capacity. Description: "The facility determined arrival rate that it can handle given the current weather conditions, traffic mix, and runway configuration. Facilities update the arrival rate when conditions change. When the AAR is reduced due to traffic management initiatives, it is referred to as the Efficiency AAR. When no traffic management initiatives are in effect it is referred to as the Capacity AAR. "	User	User	User	Info Only	http://www.fly.faa.gov/ois/
Capacity	Airport Capacity	Airport Departure Rate (ADR) Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of capacity. Description: "The number of departures an airport can support, per unit of time."	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Minimum Amount of Time	An airport may be able to obtain this information from the airlines. Airlines generally have standards for a specific airport because of walking time between gates.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric SQ O-32 Minimum Flight Connecting Times, p. 243. SME input.
N/A	Number of Aircraft	"Based aircraft counts are one criterion used to determine eligibility for inclusion in FAA's National Plan of Integrated Airport Systems (NPIAS). An airport must be included in the NPIAS in order to receive federal funds. In addition, the number of based aircraft drives operational demands on airport facilities like runways, lighting and navaids, as well as ground facilities such as hangar storage, fueling facilities, and aircraft service and repair facilities." "Very important for self-benchmarking and peer benchmarking." The FAA defines a based aircraft as the following: "A based aircraft at your facility is an aircraft that is operational & air worthy, which is typically based at your facility for a MAJORITY of the year." "Having accurate based aircraft information will help the FAA in planning and forecasting the growth in the general aviation community, especially as the FAA looks at LPV (Localizer Performance with Vertical Guidance) approaches and other system-wide improvements." "In the past, based aircraft counts were reported by individual airport managers to the FAA and state airport inspectors during the course of annual Form 5010-1 inspections. Little guidance was provided on how the numbers should be derived and no validation was required which resulted in unreliable counts. BasedAircraft.com provides the most consistent and verifiable counts of based aircraft found to date." Based aircraft information is reported in the NPIAS and the Airport Master Record (5010-1) forms at http://www.gcr1.com/5010WEB/advancedsearch.cfm.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators, Transportation Research Board*, Washington, D.C., March 2011. API Metric GA C-18 Based Aircraft, p. 126. National Based Aircraft Inventory Program—Frequently Asked Questions, FAA, https://www.basedaircraft.com/public/FrequentlyAskedQuestions.aspx, accessed 7/30/17.
http://www.fly.faa.gov/ois/	Number of Operations per Hour	AARs are reported by runway configuration for VMC, (2500/5), LOW VMC, IMC, and LOW IMC conditions on the Air Traffic Control System Command Center (ATCSCC) Operational Information System (OIS) Website. The OIS provides current information to customers about the status of the National Airspace System (NAS).	ASPM Efficiency: Definitions of Variables, FAA, http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Definitions_of_Variables, accessed 07/31/17.
Refer to Guidance	Number of Operations per Hour	For ASPM airports, this metric can be computed using ASPM Efficiency: Data Download Module. To access this user must register using the following form and request for user login: https://aspm.faa.gov/Control/Users/sysMailTo.asp. Once registered and logged in, the user can access the ASPM Efficiency: Data Download Module using the following URL: https://aspm.faa.gov/apm/sys/dataorders.asp. The hourly ADR Airport-Supplied Departure Rate can be obtained from ASPM Data Download: Detail By Hour download option.	ASPM Efficiency: Definitions of Variables, FAA, http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Definitions_of_Variables, accessed 07/31/17.

Metric Category	Metric Sub Category	Metric Name	Purpose of Metric & Description	User Information				Data Source
				Airports	Airlines	FAA	TSA	
Capacity	Airport Capacity	Average Daily Capacity (ADC) Go back to Chapter 2—Intro Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of airspace capacity. Description: This is an FAA harmonized metric. "Sum of the number of flights the FAA facilities plan as capability for landings and take-offs in a month(s), divided by the number of days in the month(s)."	Info Only	Info Only	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports
Capacity	Throughput	Peak Hour Operations Throughput in IMC Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Estimate capacity of an airport during IMC conditions. Description: Peak numbers of operations in an hour for an airport in IMC conditions.	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports

Weblink of Data Sources	Unit of Measuremer	Guidance	Citation
Refer to Guidance	Number of Operations per Day	The Average Daily Capacity is computed using daily hourly-called arrival and departure rates at airports, also known as "published rates." FAA facilities continuously monitor and adjust these rates to reflect airport capability. Per ASPM, "[t]he Average Daily Capacity, calculated as the sum of the Airport Departure Rates (ADR) and the Capacity Airport Arrival Rates (AAR) divided by the number of days in the period under consideration." FAA reports a systemwide ADC based on published rates at the Core Airports during certain busy hours. "This metric is part of the Re-Authorization Bill Section 214 performance metrics requirements. To increase the impact of the ADC metric, the ATO focuses on the hours of the day during which capacity matters the most. These hours capture periods when well over 90% of Core Airports' operations take place." "This measures the use of capacity in the NAS and how it is managed to accommodate air travel demand. A key benefit of NextGen is reduced delay through better capacity management. The FAA tracks how an airport manages available capacity during the time of day when the vast majority of operations occur. Since 2011, FAA realigned its reporting to use Core Airports as a good representation of the NAS, for several of its key performance measures, including airport capacity and operations." (Core Airports—ATL, BOS, BWI, CLT, DCA, DEN, DFW, DTW, EWR, FLL, HNL, IAD, IAH, JFK, LAS, LAX, LGA, MCO, MDW, MEM, MIA, MSP, ORD, PHL, PHX, SAN, SEA, SFO, SLC, TPA). "While this metric will help us understand the use of capacity at busy airports and during busy times, it can be misleading at less busy airports. For example, a low value may indicate that the airport capacity is not being effectively utilized. Alternatively, the demand may not reach the capacity in the first place." The FAA compares the average daily operation rates and the ADC for an overall assessment of NAS capacity, in terms of actual versus published rates. For ASPM airports, this metric can be computed using ASPM Efficiency: Data Download Module. To access this, the user must register using the following form and request for user login: https://aspm.faa.gov/Control/Users/sysMailTo.asp. Once registered and logged in, the user can access the ASPM Efficiency: Data Download Module using the following URL: https://aspm.faa.gov/apm/sys/dataorders.asp. The ADC can be computed from the published AAR and ADR obtained from ASPM Data Download: Detail By Hour download option. Note: If the ASPM Data Download: Detail By Hour data is downloaded in the DBF format, use column ADR to get the Airport-Supplied Departure Rate, and column AAR to get the Airport-Supplied Arrival Rate. For all other download formats use column DEP_RATE to get the Airport-Supplied Departure Rate and column ARR_RATE to get the Airport-Supplied Arrival Rate.	ASPM Efficiency: Definitions of Variables, FAA, http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Definitions_of_Variables, accessed 07/31/17. FAA Operation Metrics, https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/, accessed 07/31/17. "Report on NextGen Performance Metrics Pursuant to FAA Modernization and Reform Act of 2012, H.R. 658, Section 214," Federal Aviation Administration, 2013.
Refer to Guidance	Number of Operations	For ASPM airports, the data can be queried from ASPM, which provides peak hourly arrivals and departures for a defined time period and weather condition (in this case IMC). The Operations reported are Efficiency Flights—all traffic reported by TFMS and any flights reported by ARINC or ASQP that were missing from TFMS (typically very few). It includes all IFR flights and may include some but not all VFR flights. This metric can be computed using ASPM Efficiency: Data Download Module. To access this user must register using the following form and request for user login: https://aspm.faa.gov/Control/Users/sysMailTo.asp. Once registered and logged in, the user can access the ASPM Efficiency: Data Download Module and download the ASPM Data Download: Detail By Hour using the following URL:https://aspm.faa.gov/apm/sys/dataorders.asp. The Peak Hour Operations Throughput in IMC can be computed as the max of the MetricDep field (i.e., Count of ASPM Departures) + MetricArr field (i.e., Count of ASPM Arrivals) across all the instances where the MC (i.e., Meteorological Conditions Flag) is "I." Note: If the ASPM Data Download: Detail By Hour data is downloaded in the DBF format, use column MetricDep field (i.e., Count of ASPM Departures) and MetricArr field (i.e., Count of ASPM Arrivals). For all other download formats use column DEP_CNT field (i.e., Count of ASPM Departures) and ARR_CNT field (i.e., Count of ASPM Arrivals).	SME input. ASPM Throughput Analysis Manual, http://aspmhelp.faa.gov/index.php/ASPM_Throughput_Analysis_Manual#Definitions_of_Variables, accessed 8/25/17.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Capacity	Throughput	Peak Hour Operations Throughput in MVMC Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Estimate capacity of an airport during MVMC conditions. Description: Peak numbers of operations in an hour for an airport in marginal VMC conditions. MVMC conditions are defined as ceiling and visibility below visual approach minimums, but better than instrument conditions.	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports
Capacity	Throughput	Peak Hour Operations Throughput in VMC Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Estimate capacity of an airport during VMC conditions. Description: Peak numbers of operations in an hour for an airport in VMC conditions.	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports
Capacity	Airport Capacity	Peak Period Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Identify the period of time of highest utilization. Description: "Time of maximum aircraft operations at airport. May use seasonal framework, monthly, other."	User	User	Should Know/ Under-stand	User	Derived—Refer to *ACRP Report 82: Preparing Peak Period and Operational Profiles—Guidebook* for detailed information on data sources related to the peak period.

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
Refer to Guidance	Number of Operations	For ASPM airports, this metric can be computed using ASPM Efficiency: Data Download Module. To access this, the user must register using the following form and request for user login: https://aspm.faa.gov/Control/Users/sysMailTo.asp. Once registered and logged in, the user can access the ASPM Efficiency: Data Download Module and download the ASPM Data Download: Detail By Hour using the following URL: https://aspm.faa.gov/apm/sys/dataorders.asp. The Peak Hour Operations Throughput in IMC can be computed as the max of the MetricDep (i.e., Count of ASPM Departures) + MetricArr (i.e., Count of ASPM Arrivals) across all the instances where the Visibility and Ceiling correspond to MVMC (i.e., Ceiling 1,000 to 3,000 feet and/or visibility 3 to 5 miles inclusive). Note: If the ASPM Data Download: Detail By Hour data is downloaded in the DBF format, use column MetricDep field (i.e., Count of ASPM Departures) and MetricArr field (i.e., Count of ASPM Arrivals). For all other download formats use column DEP_CNT field (i.e., Count of ASPM Departures) and ARR_CNT field (i.e., Count of ASPM Arrivals).	SME input. ASPM Throughput Analysis Manual, http://aspmhelp.faa.gov/index.php/ASPM_Throughput_Analysis_Manual#Definitions_of_Variables, accessed 8/25/17.
Refer to Guidance	Number of Operations	The data can be queried from ASPM, which provides peak hourly arrivals and departures for a defined time period and weather condition (in this case VMC). The Operations reported are Efficiency Flights—all traffic reported by TFMS and any flights reported by ARINC or ASQP that were missing from TFMS (typically very few). It includes all IFR flights and may include some but not all VFR flights. This metric can be computed using ASPM Efficiency: Data Download Module. To access this, the user must register using the following form and request for user login: https://aspm.faa.gov/Control/Users/sysMailTo.asp. Once registered and logged in, the user can access the ASPM Efficiency: Data Download Module and download the ASPM Data Download: Detail By Hour using the following URL: https://aspm.faa.gov/apm/sys/dataorders.asp. The Peak Hour Operations Throughput in VMC can be computed as the max of the MetricDep field (i.e., Count of ASPM Departures) + MetricArr field (i.e., Count of ASPM Arrivals) across all the instances where the MC field (i.e., Meteorological Conditions Flag) is "V." Note: If the ASPM Data Download: Detail By Hour data is downloaded in the DBF format, use column MetricDep field (i.e., Count of ASPM Departures) and MetricArr field (i.e., Count of ASPM Arrivals). For all other download formats use column DEP_CNT field (i.e., Count of ASPM Departures) and ARR_CNT field (i.e., Count of ASPM Arrivals).	SME input. ASPM Throughput Analysis Manual, http://aspmhelp.faa.gov/index.php/ASPM_Throughput_Analysis_Manual#Definitions_of_Variables, accessed 8/25/17.
N/A	Timeframe	"Interval of time, often defined as 60 minutes, that represents the typical busy flow of passengers or aircraft operations that must be accommodated by a given airport facility. A peak period is defined with the intention of striking a balance between providing capacity at an acceptable service level for most of the time without incurring the cost of building for the single busiest time of the year." "The appropriate peak period (defined time interval) for some facilities such as security screening, may differ from other facilities, such as Customs and Border Protection. Also, some airport functions, such as ticketing, may peak at different times than other functions, such as baggage claim." Refer to *ACRP Report 82: Preparing Peak Period and Operational Profiles—Guidebook* for additional information and guidance.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators, Transportation Research Board*, Washington, D.C., March 2011. API Metric AO O-12 Peak Period, p. 27. *ACRP Report 82: Preparing Peak Period and Operational Profiles—Guidebook*, 2013, pp. 1 and 2.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Capacity	Airport Capacity	Maximum Sustainable Throughput Go back to Chapter 3—NextGen (L & M Airports)—Primary Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Airport Geometry—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of airfield capacity. Description: The number of aircraft operations an airfield can reasonably accommodate in a given period of time when there is a continuous demand for service during that period.	User	Should Know/ Under-stand	Should Know/ Under-stand	Info Only	Derived
Capacity	Air Traffic Control	System Airport Efficiency Rate (SAER) Go back to Chapter 3—System Issues—Secondary	Purpose of Metric: Air traffic control measure of how well demand is met on a system basis. Description: Weighted average (by demand) of arrival and departure efficiency rate.	Info Only	Should Know/ Under-stand	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports
Capacity	Air Traffic Control	Terminal Arrival Efficiency Rate (TAER) Go back to Chapter 3—System Issues—Secondary	Purpose of Metric: Air traffic control measure of how well arrival demand is met in the terminal area. Description: The actual number of arrivals divided by the arrival demand or Airport Arrival Rate, whichever is less.	Info Only	Should Know/ Under-stand	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Operations per Time Period (usually hourly)	The capacity of an airport in terms of maximum sustainable throughput may be estimated in accordance with the guidance in *ACRP Report 79: Evaluating Airfield Capacity*. "The maximum sustainable throughput definition of capacity is most useful for comparing demand and capacity and as input to analytical models for estimating aircraft delay. This definition of capacity is most relevant to the objectives of this guidebook [*ACRP Report 19A*], for two reasons. 1. Capacity, by itself, is not a very useful measure unless it is compared with some measure of demand. 2. The most useful demand–capacity comparisons are the ones that provide decision makers additional performance metrics, such as aircraft delay, the ability of the airfield to accommodate existing and projected airline schedules, and, in extreme cases, cancellations and diversions. As a result, ACRP Report 79 includes guidance on defining and estimating airfield capacity on an hourly basis for use in making appropriate demand–capacity comparisons and for input to currently available analytical models used to estimate aircraft delay." Refer to ACRP Report 79 Chapter 5, for guidance on selecting the appropriate airfield capacity model. ACRP Report 79 also provides information on data sources. Also, Maximum Sustainable Throughput can be determined for visual, marginal and instrument weather conditions.	*ACRP Report 79: Evaluating Airfield Capacity*, Transportation Research Board, Washington, D.C., 2012, pp. 3 and 5.
Refer to Guidance	Percentage	The ASPM Airport Efficiency module of ASPM provides data on the System Airport Efficiency Rate (SAER) and Terminal Arrival Efficiency Rate (TAER) metrics. Access to this module is restricted. "The system airport efficiency rate (SAER) is a good indicator of overall system performance. It measures the extent to which the airport facility handles the number of aircraft they indicated they could accommodate, and how well the demand is met. The best employment of available ground resources (e.g., airport runways and taxiways, landing and takeoff procedures, and air traffic control resources) will result in the highest available airport efficiency rate." The SAER can be obtained from the Efficiency: Standard Report The user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/Efficiency.asp and then under the Output tab select Efficiency: Standard Report option and running a query for the required airport and timeframe. Refer to http://aspmhelp.faa.gov/index.php/SAER for additional information.	FAA Operations & Performance Data, SAER, ASPM Airport Efficiency Manual, http://aspmhelp.faa.gov/index.php/SAER, accessed 8/27/17.
Refer to Guidance	Percentage	The ASPM Airport Efficiency module of ASPM provides data on the System Airport Efficiency Rate (SAER) and Terminal Arrival Efficiency Rate (TAER) metrics. Access to this module is restricted. The Terminal Arrival Efficiency Rate (TAER) measures the arrival efficiency of flights from 100 miles out to Wheels On (aircraft touches down) for a given time period. It is calculated by dividing the actual number of arrivals by the lesser of the facility set arrival rate or the number of demand units and is reported as a percentage not to exceed 100. The facility set arrival rate is the maximum rate that the airport can safely handle given the current conditions. Therefore, the airport's TAER score is not penalized when demand exceeds the facility set arrival rate. The TAER score is reported by hour and rolled up for larger periods. The Daily TAER is the sum of the Hourly TAER weighted by Demand. The TAER can be obtained from the Efficiency: ADC and TAER for Reportable Hours Report. The user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/Efficiency.asp and then under the Output tab select Efficiency: ADC and TAER for Reportable Hours Report option and running a query for the required airport and timeframe. Refer to http://aspmhelp.faa.gov/index.php/TAER for additional information.	FAA Operations & Performance Data, ASPM Airport Efficiency Manual, TAER, http://aspmhelp.faa.gov/index.php/TAER, accessed 8/27/17.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Capacity	Airport Capacity	Annual Service Volume Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Measure of airfield capacity. Description: According to FAA AC 150/5060-5, Airport Capacity and Delay, Change 2, "ASV [Annual Service Volume] is a reasonable estimate of an airport's annual capacity. It accounts for differences in runway use, aircraft mix, weather conditions, etc., that would be encountered over a year's time." *ACRP Report 79: Evaluating Airport Capacity*, states that "practical capacity (or service volume) answers the question, 'How many aircraft operations can an airfield accommodate at a specified level of service?' Level of service typically is defined in terms of a threshold level of average annual aircraft delay (e.g., 7 minutes per aircraft operation)."	User	Info Only	User	Info Only	Derived
Capacity	Airport Capacity	Practical Hourly Capacity Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Measure of airfield capacity. Description: Maximum aircraft movements per hour assuming average delay of no more than four minutes, or such other number of delay minutes as the airport may set.	User	Should Know/ Under-stand	Should Know/ Under-stand	Info Only	Derived

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Annual Aircraft Operations	The FAA's advisory circular AC 150/5060-5, Airport Capacity and Delay, Change 2, can be used for long-range planning purposes for simple capacity calculations of ASV. The last update to AC 150/5060-5 was in 1995. ACRP Report 79 includes a new Prototype Airfield Capacity Spreadsheet Model that allows the analyst to update certain characteristics and ATC procedures when calculating hourly capacity and ASV. The FAA's Future Airport Capacity Task (FACT) FACT3 analysis was based in part on ASVs. "In 2003, FAA convened a team to assess the Nation's future airport capacity needs. This effort, which became known as the Future Airport Capacity Task (FACT), represents a strategic approach to identify the airports that have the greatest need for additional capacity in the future. The identification is based on a macro-level analysis of the factors and trends contributing to congestion and delay at the busiest airports in the Nation." According to FACT3, "ASV calculates the yearly demand that results in a given level of average delay in simulated operations. ASV studies are conducted by the Capacity Analysis Group (AJR-G5) at the FAA's William J. Hughes Technical Center. ASV analysis considers multiple runway configurations, weighted by the annual frequency of occurrence, and utilizes an annual estimation of weather conditions for each configuration in its calculation. The resulting demand–delay curve can be used to estimate the average annual delay that results at a given level of annual demand."	AC 150/5060-5, Airport Capacity and Delay, Change 2, FAA, 12/01/95, paragraph 1-3. *ACRP Report 79: Evaluating Airport Capacity*, 2012, p. 3. *ACRP Report 104: Defining and Measuring Aircraft Delay and Airport Capacity Thresholds*, 2014, p. 39. FACT3: Airport Capacity Needs in the National Airspace System, FAA, January 2015, pp. 1 and 10.
N/A	Number of Movements per Hour	"Practical hourly capacity is largely a function of runway capacity which is determined by the number of runways, their configuration and separation, taxiway access and capacity, air traffic system restrictions, weather and terrain, type and mix of aircraft, arrival/departure mix. Many of these factors are fixed until new infrastructure is added." "There is no consensus on the best measure of runway capacity, which is a fundamental airport metric along with terminal capacity. Practical Hourly Capacity (PHC) is a useful measure because it incorporates a level of service requirement. The standard definition of PHC uses a maximum delay of 4 minutes, although individual airports may calculate PHC based on other maxima, such as 8 minutes, depending on individual circumstances and air carrier planning criteria. Runway capacity, expressed in movements per hour, is generally higher during optimum conditions than during IFR conditions when radar separation between aircraft is required. The magnitude of the difference varies from airport-to-airport depending on the airfield configuration and other drivers listed above. Other measures of runway capacity include declared runway capacity and maximum hourly capacity." "Useful for internal benchmarking as part of the process of determining whether additional airfield capacity is required." "Its annual equivalent, Practical Annual Capacity (PANCAP), is also used by the FAA and airports in capacity studies. Another measure, Maximum Throughput Capacity, assumes no limits on delays."	Airports Council International (ACI) World Economics Standing Committee, Guide to Airport Performance Measures, Prepared by Robert Hazel of Oliver Wyman, Inc., Reston, VA, February 2012, p. 22. *ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. Metric AO K-3 Practical Hourly Capacity, p. 23.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Capacity	Throughput	Airfield Throughput During Peak Periods Within Hour Go back to Chapter 3—Airport Geometry—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of airfield demand. Description: Actual total number of aircraft operations accommodated during a specified time interval with emphasis on peak periods within an hour (10 or 15 minutes).	User	Should Know/ Understand	Should Know/ Understand	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports
Delay	Airport	Average Annual Delay Go back to Chapter 3—Airport Geometry—Secondary	Purpose of Metric: A measure of airport delay. Description: Estimated average annual delay per operation at an airport.	User	User	User	Info Only	Derived

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
	Number of Aircraft	This metric was the underlying metric at LGA and other airports when analyzing voluntary "peak-spreading" strategies and is key in recognizing demand patterns such as an ideal hub push-back schedule. To access this data, the user must register using the following form and request for user login: https://aspm.faa.gov/Control/Users/sysMailTo.asp. Once registered and logged in, the user can access the Airport Efficiency module using the following URL: https://aspm.faa.gov/apm/sys/Throughput.asp. ASPM Throughput Analysis: Standard Report can be used to generate throughput count for every quarter hour by weather category and runway configurations. For additional information refer to http://aspmhelp.faa.gov/index.php/ASPM_Throughput_Analysis_Manual#My_Reports.	Advisory committee input.
N/A	Minutes of Delay/Aircraft	"Delay is typically expressed in minutes per aircraft operation, which can be translated into hours of annual delay and easily converted into dollar estimates to be used as a basis for comparison. Traditionally, four to six minutes of average delay per aircraft operation is used in ASV calculation. This can be considered as an acceptable level of delay. When the average annual delays per aircraft operation reaches four to six minutes, the airport is approaching its practical capacity and is generally considered congested." "The FAA's AC 150/5060-5 Airport Capacity and Delay and the subsequent Airport Capacity Model (ACM) provide straightforward calculations to estimate average delays for particular runway layouts, based on fleet mix and several other items. Using this approach, average hourly, daily, and annual delays can be estimated. The calculations were based on ATC rules and procedures that were in place when the model and advisory circular (AC) were developed. Analysts are not able to adjust the delay estimates as new procedures, technology, and/or separation rules are implemented." "When calculating aircraft delays for airport infrastructure projects, analysts often use computer simulation tools to evaluate delays and delay savings. Capacity driven delays can be predicted very accurately using these models." "To easily compare airport development alternatives, having a single value [Average Annualized Delay] for each option is useful. Analysts often will calculate a weighted average delay, based on the percent of time each wind/weather configuration is used throughout the year. The average annualized delay is a weighted average of the delays in the various wind/weather operating configurations used at an airport. Commonly, analysts will run entire days of flight demand for each of the typical wind/weather scenarios that occur at an airport. Then the average daily delay for each particular wind/weather configuration is multiplied by the annual percentage of time that wind/weather configuration is in use at that airport. This results in a weighted average annualized delay, which is the usual measure for comparing airport development alternatives." "Whether using simulation or spreadsheet or other analytical methods, delay analyses will typically be run for several wind/weather configurations that are used at an airport to evaluate delays in the various configurations." "For airlines, average delay information is not as meaningful as individual flight delay information." For additional guidance, refer to ACRP Report 104.	AC 150/5070-6B Change 2, Airport Master Plans, FAA, 1/27/2015, p. 51. *ACRP Report 104: Defining and Measuring Aircraft Delay and Airport Capacity Thresholds*, 2014, pp. 31, 32.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Delay	NAS	NAS On-Time Arrivals Go back to Chapter 2—Intro Go back to Chapter 3—System Issues—Secondary	Purpose of Metric: Measure of airspace efficiency. Description: FAA harmonized metric. "National Airspace System (NAS) On-Time Arrivals is the percentage of all flights arriving at the Core Airports less than 15 minutes late, based on the carrier flight plan filed with the FAA, and excluding minutes of delay attributed by air carriers to extreme weather, carrier circumstances, security delay, and prorated minutes for late arriving flights at the departure airport."	Info Only	Info Only	User	Info Only	Airline Service Quality Performance (ASQP): Airport: On-Time NAS Report
Delay	NAS	Number of Arrival and Departure Delays Go back to Chapter 2—Intro Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Measure of delays. Description: Delays of 15 minutes or more for arrivals and departures, captured by airport, for any number of days. This metric is one of FAA's harmonized metrics that is reported for the entire NAS. In this case, the FAA reports the annual Number of Arrival and Departure Delays on a systemwide basis (includes average of arrival and departure delays at all of the 30 Core Airports).	User	User	User	Info Only	FAA Operations Network (OPSNET)
Delay	Arrival	Average Gate Arrival Delay Go back to Chapter 2—Intro Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of arrival efficiency. Description: "The arrival delay is computed as the gap between scheduled arrival (gate in) time and actual arrival time, whenever the actual arrival is later than the scheduled arrival time. Arrival Delays are averaged over a period of time." This is one of FAA's harmonized metrics. In this case, the FAA reports annual Average Gate Arrival Delay on a systemwide basis (includes average of gate arrival delay for all 30 Core Airports).	User	User	User	Info Only	FAA/MITRE/ Airline Service Quality Performance System (ASQP) data derived from Aviation System Performance Metrics (ASPM) data

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
Refer to Guidance	NAS-Wide Time-Based Average	"Every month, DOT reporting carriers include the cause of arrival delay, along with the duration of all delays of 15 minutes or more. This metric captures delays that have been attributed to NAS and FAA related events. It is continuously monitored and used to take proactive action and reduce delays throughout the National Airspace System (NAS)." "This measure is based on arrival delays at the Core Airports reported by the Aviation System Quality Performance (ASQP) carriers for domestic flights." This metric can be computed using ASQP: Airport: Standard Report. To access this, the user must register using the following form and request for user login: https://aspm.faa.gov/Control/Users/sysMailTo.asp. Once registered and logged in, the user can access the ASPM Select output, "Airport: Standard Report" using the following url: https://aspm.faa.gov/asqp/sys/Airport.asp. The NAS On-Time Arrivals can be obtained from % On-Time Gate Arrivals field.	FAA Operational Metrics, https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/, accessed 6/23/17 and 08/03/17.
https://aspm.faa.gov/opsnet/sys/Delays.asp	Total Count of Delays	"The number of both arrival and departure delays is a meaningful indicator of efficiency. It conveys meaningful information to all operators, FAA, airline, aviation service providers and airport authority." Data may be obtained from OPSNET. "OPSNET Delays provides information about reportable delays provided daily through FAA's Air Traffic Operations Network (OPSNET). A reportable delay recorded in OPSNET is defined in FAA Order 7210.55F as, 'Delays to instrument flight rules (IFR) traffic of 15 minutes or more, which result from the ATC system detaining an aircraft at the gate, short of the runway, on the runway, on a taxiway, or in a holding configuration anywhere en route, must be reported. The IFR controlling facility must ensure delay reports are received and entered into OPSNET.' These OPSNET delays are caused by the application of initiatives by the Traffic Flow Management (TFM) in response to weather conditions, increased traffic volume, runway conditions, equipment outages, and other causes."	FAA Operational Metrics, https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/, accessed 6/23/17 and 08/03/17. OPSNET user manual, http://aspmhelp.faa.gov/index.php/Delays, accessed 08/03/17.
https://www.faa.gov/nextgen/snapshots/airport/	Minutes per Flight	"The average minutes of arrival delay represent a fundamental metric for all National Airspace System (NAS) operators and for the public. This metric is part of the Re-Authorization Bill Section 214 performance metrics requirements. The Department of Transportation (DOT) requires carriers to report both scheduled and actual gate in times as Airline Service Quality Performance (ASQP) data." The FAA measures and reports this metric on airport performance at locations where NextGen technologies have been implemented—the FAA's Core 30 Airports. The definition for this purpose is as follows: "During reportable hours, the yearly average of the difference between the Actual Gate-In Time and the Scheduled Gate-In Time for flights to the selected airport from any of the ASPM airports. The delay for each fiscal year (FY) is calculated based on the 0.5th–99.5th percentile of the distributions for the year. Flights may depart outside reportable hours, but must arrive during them. The reportable hours vary by airport." Refer to the NextGen Performance Snapshots Reference Guide for more information (https://www.faa.gov/nextgen/snapshots/guide/).	FAA Operational Metrics, https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/, accessed 08/03/17. FAA NextGen Performance Snapshots Reference Guide, https://www.faa.gov/nextgen/snapshots/guide/, accessed 08/03/17.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Delay	Departure	Average Gate Departure Delay Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Benchmarking—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of service quality. Description: Average gate departure delay per flight in minutes—measured from scheduled departure time at average and peak times. The FAA uses the following definition: "The sum of minutes of Gate Departure Delay of 1 minute or more, divided by all departures. Gate Departure Delay is the difference between the Actual Gate Out time and Scheduled or Flight Plan Gate Out time, in minutes."	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports
Delay	Taxi	Average Taxi-In Delay Go back to Chapter 3—Airport Geometry—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of efficiency of taxi operations. Description: The FAA defines this metric as the sum of minutes of Taxi-In Delay of 1 minute or more, divided by all arrivals. Taxi-In Delay equals actual Taxi-In Time minus Unimpeded Taxi-In Time.	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports
Delay	Taxi	Average Taxi -Out Delay Go back to Chapter 3 —Benchmarking —Primary Go back to Chapter 3 —Airport Geometry —Primary Go back to Chapter 3 —Gate Management —Primary	Purpose of Metric: Measure of efficiency of taxi operations. Description: The FAA defines this metric as the sum of minutes of Taxi -Out Delay of 1 minute or more, divided by all departures. Taxi-Out Delay equals actual Taxi-Out Time minus Unimpeded Taxi-Out Time.	User	User	Info Only	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://aspm.faa.gov/apm/sys/AnalysisAP.asp	Minutes per Flight	"Multiple delay measures are used by airports, airlines, and others to compare airports across countries; delay measures first should be standardized. It is important to determine the causes of gate departure delays, which may be largely beyond the airport's control and may vary by season. Related operational measures include flight cancellations and airport closures." "Useful for internal benchmarking and external benchmarking as the first step in analyzing the causes of delay." The user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/AnalysisAP.asp and then under the Output tab select Analysis: All Flights and running a query for the required airport and timeframe. The metric is the "Average Gate Departure Delay" fields in the table generated. Refer to http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_All_Flights for additional information	Airports Council International (ACI) World Economics Standing Committee, Guide to Airport Performance Measures, Prepared by Robert Hazel of Oliver Wyman, Inc., Reston, VA, February 2012. Metric-Gate Departure Delay—Service Quality 2, p. 23. FAA, ASPM Airport Analysis: Definitions of Variables, http://aspmhelp.faa.gov/index.php/ASPM_Airport_Analysis:_Definitions_of_Variables, accessed 08/28/17.
https://aspm.faa.gov/apm/sys/AnalysisAP.asp	Minutes per Flight	The definition for Average Taxi-In Delay is from the ASPM Airport Analysis User Manual. According to the ASPM Taxi Times: Definitions of Variables, Taxi In is defined as "the difference between the Wheels On time [Aircraft touches down] and Gate In time [Aircraft arrives at gate or parking position], in minutes." Unimpeded Taxi In Time is defined as "the estimated Taxi In Time for an aircraft by carrier under optimal operating conditions (when congestion, weather, or other delay factors are not significant). This number is estimated by calendar year for each carrier and airport based on observed values in the previous year." The user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/AnalysisAP.asp and then under the Output tab select Analysis: All Flights and running a query for the required airport and timeframe. The metric is the "Average Taxi In Delay" fields in the table generated. Refer to http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_All_Flights for additional information.	ASPM Airport Analysis: Definitions of Variables, http://aspmhelp.faa.gov/index.php/ASPM_Airport_Analysis:_Definitions_of_Variables, accessed 08/28/17. ASPM Taxi Times: Definitions of Variables, http://aspmhelp.faa.gov/index.php/ASPM_Taxi_Times:_Definitions_of_Variables, accessed 08/18/17.
https://aspm.faa.gov/apm/sys/AnalysisAP.asp	Minutes per Flight	The definition for Average Taxi Out Delay is from the ASPM Airport Analysis User Manual. According to the ASPM Taxi Times: Definitions of Variables , Taxi Out is "the difference between the Wheels Off time [Aircraft takes off] and Gate Out time [Aircraft leaves gate or parking position], in minutes." Unimpeded Taxi Out Time is "the estimated Taxi Out Time for an aircraft by carrier under optimal operating conditions (when congestion, weather, or other delay factors are not significant). This number is estimated by calendar year and season for each carrier and airport reporting OOOI data." The ACI Guide to Airport Performance Measures discusses a similar metric—Taxi Departure Delay defined as follows: "Average taxi delay for departing aircraft per flight in minutes—measured by comparing actual taxi time versus unimpeded taxi time at average and peak times. Taxi departure delays may be a function of airport capacity constraints, limited air traffic system capacity, airline scheduling practices, airline operational issues, adverse weather, and other factors." "It is important to determine the causes of gate departure delays, which may be largely beyond the airport's control and may vary by season." "Related operational measures include flight cancellations and airport closures." "Useful for internal benchmarking and external benchmarking as the first step in analyzing the causes of delay." Metric applies to all commercial service airports. The user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/AnalysisAP.asp and then under the Output tab select Analysis: All Flights and running a query for the required airport and timeframe. The metric is the "Average Taxi Out Delay" fields in the table generated. Refer to http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_All_Flights for additional information.	ASPM Airport Analysis: Definitions of Variables, http://aspmhelp.faa.gov/index.php/ASPM_Airport_Analysis :_Definitions_of_Variables, accessed 08/28/17. ASPM Taxi Times: Definitions of Variables, http://aspmhelp.faa.gov/index.php/ASPM Taxi Times: Definitions of Variables, accessed 08/18/17. Airports Council International (ACI) World Economics Standing Committe e, Guide to Airport Performance Measures, Prepared by Robert Hazel of Oliver Wyman, Inc., Reston, VA, February 2012, Metric Taxi Departure Delay Service Quality 3, pp. 23 and 24.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Delay	Airport	Number of Delays by Cause Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Air system optimization. Description: Delays by cause, such as weather, volume, and equipment.	User	User	User	Info Only	FAA Operations Network (OPSNET)
Delay	Departure	Number of Late Departures Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Gate optimization. Description: Total count of aircraft departing late from the gate.	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://aspm.faa.gov/opsnet/sys/Delays.asp	Count	OPSNET Delays provides information about reportable delays provided daily through FAA's Air Traffic Operations Network (OPSNET). A reportable delay recorded in OPSNET is defined in FAA Order 7210.55F as "[d]elays to instrument flight rules (IFR) traffic of 15 minutes or more, which result from the ATC system detaining an aircraft at the gate, short of the runway, on the runway, on a taxiway, or in a holding configuration anywhere en route, must be reported." "These OPSNET delays are caused by the application of initiatives by the Traffic Flow Management (TFM) in response to weather conditions, increased traffic volume, runway conditions, equipment outages, and other causes." The categories of delay causes resulting in a reportable delay are: Weather: The presence of adverse weather conditions affecting operations. This includes wind, rain, snow/ice, low cloud ceilings, low visibility, and tornado/ hurricane/thunderstorm. Volume: Delays must only be reported as volume when the airport is in its optimum configuration and no impacting conditions have been reported when the delays were incurred. Runway/Taxiway: Reductions in facility capacity due to runway/taxiway closure or configuration changes. Equipment: An equipment failure or outage causing reduced capacity. Other: All impacting conditions that are not otherwise attributed to weather, equipment, runway/taxiway, or volume, such as airshow, aircraft emergency, bomb threat, external radio frequency interference, military operations, nonradar procedures, etc." "Non-reportable delays are delays incurred by IFR traffic, but which should not be reported in OPSNET. These include delays caused by the aircraft operator/company (such as mechanical problems, pilot refusal to depart when weather conditions are below category (CAT) I/II minima, pilot requests for a nonstandard departure operation, and pilot refusal to accept an available route); delay for taxi time controlled by non-FAA entities; delays attributed to special traffic management programs; delays incurred because of initiatives imposed by non-FAA facilities." The user can access this metric by using the following url: https://aspm.faa.gov/opsnet/sys/Delays.asp and then under the Output tab select Standard Report and running a query for the required airport and timeframe. Refer to http://aspmhelp.faa.gov/index.php/OPSNET_Delays:_Standard_Report for additional information.	FAA, OPSNET: Delays, http://aspmhelp.faa.gov/index.php/Delays, accessed 08/29/17.
https://aspm.faa.gov/apm/sys/AnalysisAP.asp	Count	For ASPM airports, the Number of Late Departures can be computed using: http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_All_Flights Direct link: https://aspm.faa.gov/apm/sys/AnalysisAP.asp = (1-% On-Time Gate Departures)*Departures For Metric Computation. Note that % On-Time Gate Departures is the number of flights that departed within 15 minutes past Scheduled Gate Out time, expressed as a percent of the total number of Departures for Metric Computation.	SME input. FAA, ASPM Airport Analysis: Definitions of Variables, http://aspmhelp.faa.gov/index.php/ASPM_Airport_Analysis:_Definitions_of_Variables, 08/28/17.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Delay	Arrival	Arrival Delay per Flight Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Measure of efficiency. Description: Average arrival delay per flight—measured at average and peak times.	User	User	User	Info Only	BTS Airline On-Time Performance Data [Aviation System Performance Metrics (ASPM) for ASPM Airports]
Delay	Departure	Average Minutes of Delay per Delayed Gate Departure Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of efficiency. Description: The average delay for all flights with an actual Gate Out Time (Aircraft leaves gate or parking position) delayed 15 minutes or more compared to the schedule or flight plan Gate Out Time.	User	User	Info Only	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports
Delay	Arrival	Average Minutes of Delay per Delayed Gate Arrival Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of efficiency. Description: The average delay for all flights with an actual Gate In Time (Aircraft arrives at gate or parking position) delayed 15 minutes or more compared to the schedule or flight plan Gate In Time.	User	User	Info Only	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0	Minutes per Flight	"From the passenger's standpoint, arrival delays are usually more important than departure delays. However, in assessing an airport's delay performance, departure delays may be the most relevant. DOT delay measures do not count an aircraft as delayed until it is 15 minutes late." "Very important for self-benchmarking and peer benchmarking, as poor performance signals airfield capacity or ATC issues." The FAA discusses average delay per flight and provides the average arrival delay for the core airports in the NPIAS report. "The FAA monitors the day-to-day operations of the air traffic control system. Airport planners and designers use the average delay per aircraft operation as a measure of congestion. Through the Aviation System Performance Metrics (ASPM) system, FAA tracks delay indicators at the 30 busiest airports, referred to as 'core airports,'" "...using reporting from participating airlines. Delays can be measured against the scheduled flight time or against the flight plan. For purposes of this analysis, FAA used flight plan data." The average arrival delays can be computed using BTS Airline On-Time Performance Data. Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Airline On-Time Performance Data. Step 3: On the next page click on On-Time Performance. Step 4: On the next page scroll down to Arrival Performance section and click on the Analysis link for ArrDelayMinutes field name. Step 5: On the next page, set the Filter Categories to "Dest," set the Filter Variables to "ArrDelayMinutes," set the Filter Statistics to "Avg," and select the appropriate year for Filter Years. Step 6: Click on Recalculate. Step 7: Once the page updates, the table below will show Average delay per flight by airports. Download the result to spreadsheet using the "Download results" option above the filter categories. For ASPM airports, the user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/AnalysisAP.asp and then under the Output tab select Analysis: All Flights and running a query for the required airport and timeframe. The arrival delay per flight can be computed as [(Average Gate Arrival Delay * Arrivals For Metric Computation)—(Average Taxi In Delay * Arrivals For Metric Computation)]/ Arrivals For Metric Computation. Refer to http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_All_Flights for additional information	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric SQ K-3 Arrival Delay per Flight, p. 233. National Plan of Integrated Airport Systems (2017-2021), FAA, September 2016, pp. 21 and 22.
https://aspm.faa.gov/apm/sys/AnalysisAP.asp	Minutes per Flight	For ASPM airports, the user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/AnalysisAP.asp and then under the Output tab select Analysis: Delayed Flights option and running a query for the required airport and timeframe.	FAA, ASPM Airport Analysis: Definitions of Variables, http://aspmhelp.faa.gov/index.php/ASPM_Airport_Analysis:_Definitions_of_Variables, accessed 08/28/17.
https://aspm.faa.gov/apm/sys/AnalysisAP.asp	Minutes per Flight	For ASPM airports, the user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/AnalysisAP.asp and then under the Output tab select Analysis: Delayed Flights option and running a query for the required airport and timeframe.	FAA, ASPM Airport Analysis: Definitions of Variables, http://aspmhelp.faa.gov/index.php/ASPM_Airport_Analysis:_Definitions_of_Variables, accessed 08/28/17.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Delay	Departure	Departure Delay per Flight Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Measure of service quality. Description: "Average departure delay per flight—measured at average and peak times. DOT delay measures do not count an aircraft as delayed until it is 15 minutes late."	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports
Delay	Arrival	Delayed Gate Arrivals Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Measure of efficiency. Description: Number of flights with a Gate In Time delayed 15 minutes or more compared to the schedule or flight plan Gate In Time.	User	User	Info Only	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports
Delay	Departure	Delayed Gate Departures Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Measure of efficiency. Description: Number of flights delayed 15 minutes or more compared to the schedule or flight plan Gate Out time.	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://aspm.faa.gov/apm/sys/AnalysisAP.asp	Minutes per Flight	Metric applies to airports with passenger flights. "From the passenger's standpoint, arrival delays are usually more important than departure delays. However, in assessing an airport's delay performance, departure delays may be more relevant. Departure delays may be a function of limited airport capacity, limited ATC capacity, airline scheduling practices, airline operational issues, adverse weather and other factors. Measurement during peaks is typically more meaningful than at other times. Degree of airport control is likely to be very limited, though important in those instances, e.g., snow removal from runways and taxiways." "Very important for self-benchmarking and peer benchmarking, as poor performance signals airfield capacity or ATC issues." "A variety of delay data is available from the Bureau of Transportation Statistics, including delay and arrival delay data, and causes." The FAA discusses average delay per flight and provides the average departure delay for the core airports in the NPIAS report. "The FAA monitors the day-to-day operations of the air traffic control system. Airport planners and designers use the average delay per aircraft operation as a measure of congestion. Through the Aviation System Performance Metrics (ASPM) system, FAA tracks delay indicators at the 30 busiest airports, referred to as 'core airports,' using reporting from participating airlines. Delays can be measured against the scheduled flight time or against the flight plan. For purposes of this analysis, FAA used flight plan data." For ASPM airports, the user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/AnalysisAP.asp and then under the Output tab select Analysis : All Flights and running a query for the required airport and timeframe. The metric is the "Average Airport Departure Delay" fields in the table generated. Refer to http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_All_Flights for additional information	*ACRP Report 19A: Resource Guide to Airport Performance Indicators, Transportation Research Board*, Washington, D.C., March 2011. API Metric SQ K-5 Departure Delay per Flight, p. 235. National Plan of Integrated Airport Systems (2017-2021), FAA, September 2016, pp. 21 and 22.
https://aspm.faa.gov/apm/sys/AnalysisAP.asp	Count	For ASPM airports, the user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/AnalysisAP.asp and then under the Output tab select Analysis: Delayed Flights option and running a query for the required airport and timeframe.	FAA, ASPM Airport Analysis: Definitions of Variables, http://aspmhelp.faa.gov/index.php/ASPM_Airport_Analysis:_Definitions_of_Variables, accessed 08/28/17.
https://aspm.faa.gov/apm/sys/AnalysisAP.asp	Count	For ASPM airports, the user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/AnalysisAP.asp and then under the Output tab select Analysis: Delayed Flights option and running a query for the required airport and timeframe.	FAA, ASPM Airport Analysis: Definitions of Variables, http://aspmhelp.faa.gov/index.php/ASPM_Airport_Analysis:_Definitions_of_Variables, accessed 08/28/17.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Delay	Arrival	Percentage of Arriving Flights Delayed Go back to Chapter 3—System Issues—Secondary	Purpose of Metric: Measure of efficiency. Description: Percentage of arriving flights delayed by 15 or more minutes.	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airport and BTS on-time performance data
Delay	Departure	Percentage of Departing Flights Delayed Go back to Chapter 3—System Issues—Secondary	Purpose of Metric: Measure of efficiency. Description: Percentage of departing flights delayed by 15 or more minutes.	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airport and BTS on-time performance data

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
Refer to Guidance	Percentage	Metric applies to all commercial service airports. "From the passenger's standpoint, arrival delays are usually more important than departure delays. However, in assessing an airport's delay performance, departure delays may be the most relevant. DOT delay measures do not count an aircraft as delayed until it is 15 minutes late." "A variety of delay data is available from the Bureau of Transportation Statistics, including delay and arrival delay data, and causes." "Very important for self-benchmarking and peer benchmarking, as poor performance may signal airfield capacity or ATC issues." For ASPM airports, the user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/AnalysisAP.asp and then under the Output tab select Analysis: Delayed Flights option and running a query for the required airport and timeframe. To compute the metric for a year using BTS on-time performance data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0 Step 2: Click on Airline On-Time Performance Data. Step 3: On the next page click on On-Time Performance. Step 4: On the next page scroll down to Arrival Performance section and click on the Analysis link for ArrDel15 field name. Step 5: On the next page, set the Filter Categories to "Dest," set the Filter Statistics to "Proportion," set the Filter Variables to "ArrDel15," select the appropriate year for Filter Years. Note: Setting the Filter Statistics after the Filter Variable sometime resets the Filter Variable. Step 6: Click on Recalculate. Step 7: Once the page updates, the table below will show Percentage of Arriving Flights Delayed by airports. Download the result to spreadsheet using the "Download results" option above the filter categories.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric SQ K-7, Percent of Arriving Flights Delayed, p. 237.
Refer to Guidance	Percentage	Metric applies to all commercial service airports. "From the passenger's standpoint, arrival delays are usually more important than departure delays. However, in assessing an airport's delay performance, departure delays may be the most relevant. DOT delay measures do not count an aircraft as delayed until it is 15 minutes late." "A variety of delay data is available from the Bureau of Transportation Statistics, including delay and arrival delay data, and causes." "Very important for self-benchmarking and peer benchmarking, as poor performance may signal airfield capacity or ATC issues." For ASPM airports, the user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/AnalysisAP.asp and then under the Output tab select Analysis: Delayed Flights option and running a query for the required airport and timeframe. To compute the metric for a year using BTS on-time performance data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Airline On-Time Performance Data. Step 3: On the next page click on On-Time Performance. Step 4: On the next page scroll down to Departure Performance section and click on the Analysis link for DepDel15 field name. Step 5: On the next page, set the Filter Categories to "Dest," set the Filter Statistics to "Proportion," set the Filter Variables to "DepDel15," select the appropriate year for Filter Years. Note: Setting the Filter Statistics after the Filter Variable sometime resets the Filter Variable. Step 6: Click on Recalculate. Step 7: Once the page updates, the table below will show Percentage of Departing Flights Delayed by airports. Download the result to spreadsheet using the "Download results" option above the filter categories.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric SQ K-8, Percent of Departing Flights Delayed, p. 238.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Delay	Departure	Late Arriving Aircraft Go back to Chapter 3 – System Issues—Secondary	Purpose of Metric: Measure of delay propagation. Description: The minutes of delay caused by previous flights arriving late, causing the next flights to depart late.	User	Info Only	Info Only	Info Only	BTS Airline On-Time Performance Data
Environmental	Emissions/ Fuel Burn	Carbon Footprint Go back to Chapter 3—Gate Management—Secondary	Purpose of Metric: Measure of environmental impact. Description: "The carbon footprint is the total set of greenhouse gases (GHG) emissions caused by activities at the airport, expressed in terms of the amount of carbon dioxide or its equivalent in other GHGs, emitted." "Excludes emissions caused by airline/tenant operations and the public."	User	User	User	N/A	Analysis
Environmental	Emissions/ Fuel Burn	Emissions Exposure (CO_2 Emissions) Go back to Chapter 2—Intro Go back to Chapter 3—Gate Management—Secondary	Purpose of Metric: A measure of aviation's contribution to greenhouse gas emissions. Description: FAA Harmonized Metric. Quantity of carbon dioxide (CO_2) emitted by aircraft engines.	Should Know/Understand	Should Know/Understand	User	N/A	FAA Operational Metrics

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://www.transtats.bts.gov/databases.asp?Mode_Desc=Aviation&Mode_ID=1&Subject_ID2=0	Minutes	This metric can be compared to the total delay to determine the percentage of airport delays due to propagation of system disruptions in the NAS. To compute the metrics in BTS on-time performance data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_Desc=Aviation&Mode_ID=1&Subject_ID2=0 Step 2: Click on "Airline On-Time Performance Data" link Step 3: Click on "On-Time Performance" link Step 4: Click on any of the "Analysis" links Step 5: Set the filters as follow Filter Categories "Origin" Filter Variable "LateArrivalDelay" Filter Statistics "Sum" Filter Years—select years Step 6: Click on the "Recalculate" button	BTS Airline On-Time Performance Data
N/A	Metric Tons Carbon Dioxide Equivalents [MT CO2e]	"Tracking this PI [performance indicator] requires airports to periodically conduct an inventory of greenhouse gas emissions which requires the use of industry models for which there is not yet an industry standard. In addition, airports control a relatively small portion of total GHG emissions associated with the use of their facilities. (GHG emissions from airlines and public vehicles may be tracked separately from airport-controlled emissions.) Because the Carbon Footprint of an airport depends on the activities it controls, airports that provide ground handling using internal resources will have larger Carbon Footprints than airports that outsource this function—without any resulting difference in total greenhouse emissions from the airport premises. Many European airports use the methodology prescribed by the Airport Carbon Accreditation (ACA) program established by ACI Europe, which defines the set of emissions sources included and requires that airports have their carbon footprints independently verified in accordance with iSo 14064." Drivers include "[e]missions from sources within the airport's control, such as airport vehicles, heating and cooling equipment, lighting and other electrical uses. Emissions vary with total energy consumption, use of cleaner and more efficient energy sources, use of lower emission vehicles, emission control technology, and climate factors." Applies to all airports but particularly important for larger airports. "Useful for internal benchmarking." "See *ACRP Report 11: Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories*, which provides a framework for identifying and quantifying specific components of airport contributions to greenhouse gases."	Airports Council International (ACI) World Economics Standing Committee, Guide to Airport Performance Measures, Prepared by Robert Hazel of Oliver Wyman, Inc., Reston, VA, February 2012, Metric Carbon Footprint—Environmental 1, p. 46. *ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric EV K-1, Carbon Footprint, p. 82.
https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/	Kilograms of CO_2 Emitted	As part of measuring and tracking the National Airspace System (NAS) fuel efficiency from commercial aircraft operations, the FAA quantifies annual aircraft fuel burn using FAA's Aviation Environmental Design Tool (AEDT). AEDT is a FAA-developed computer model that estimates aircraft fuel burn and emissions for variable year emissions inventories and for operational, policy, and technology-related scenarios.	FAA Operational Metrics, https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/, accessed 08/0517, FAA NextGen Performance Snapshots Reference Guide, https://www.faa.gov/nextgen/snapshots/guide/, accessed 08/05/17.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Environmental	Noise	Noise Exposure Go back to Chapter 2—Intro Go back to Chapter 3—NextGen (L & M Airports)—Primary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure of noise impact. Description: Number of people exposed to significant noise. Significant aircraft noise levels are defined as values greater than or equal to Day-Night Average Sound Level (DNL) 65 decibels (dB). Airports conduct studies to determine the number of people within the DNL 65 dB as part of environmental and compatible land use analysis.	User	Info Only	User	N/A	Analysis
Financial	Airline	Airline Cost per Enplanement Go back to Chapter 3—Benchmarking—Primary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Economic optimization. Description: Commonly referred to as CPE (Cost per Enplanement). Average of what airlines pay per enplanement to the airport for use of airfield (landing fees, ramp/apron fees) and terminal space (space rentals net of any credits and reimbursements, plus gate charges).	User	User	User	N/A	Form 127—Certification Activity Tracking System (CATS)

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Number of People	Both individual airports and the FAA currently use the FAA's approved noise model, Aviation Environmental Design Tool (AEDT), to analyze aircraft noise. For environmental review of proposed development and noise compatibility planning, airports use AEDT to map noise exposure contours and determine the number of people residing within those contours including the DNL 65 dB contour. This metric is useful for self-benchmarking. However, "[b]ecause each airport is situated differently with respect to nearby homes, its use for peer benchmarking would be mainly on a macro level to highlight airports with similar noise issues." For additional information, refer to FAA Order 1050.1—Policies and Procedures for Considering Environmental Impacts and Title 14 CFR PART 150—Airport Noise Compatibility Planning. The FAA reports the number of persons exposed to significant aircraft noise (regardless of whether their houses or apartments have been sound-insulated) for the National Airspace System. "For calendar year 2015, the AEDT model calculates individual DNL contours for the top 121 U.S. airports using detailed flight tracks, runway use and track utilization. The contours are superimposed on year 2010 Census population densities projected to the current year being computed to calculate the number of people within the DNL 65 dB contour at each airport. For the remaining 597 smaller airports with at least 365 jet departures for the year, AEDT uses less detailed information consisting of flight tracks that extend straight-in and straight-out from the runway ends. The contours areas are then used to calculate people exposed using 2010 Census population densities projected to the current year being computed. The projection is used to account for population growth between 2010 and the computed year. The individual airport exposure data are then summed to the national level. Finally, the number of people relocated through the Airport Improvement Program (AIP) is subtracted from the total number of people exposed."	14 CFR Part 150, Airport Noise Compatibility Planning, September 2004, Appendix A to Part 150—Noise Exposure Maps, Sec. A150.101 Noise contours and land usages. FAA Order 1050.1F—Policies and Procedures for Considering Environmental Impacts, July 2015, p. B-3. FAA Performance Snapshots Reference Guide, https://www.faa.gov/nextgen/snapshots/guide/#environment_noise_exposure, accessed 8/5/17. *ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric EV K-8, Noise—Number of Homes within 65 dB DNL, p. 89.
https://cats.airports.faa.gov/	Dollars per Enplanement	Includes payments for aircraft parking positions (e.g., hard stands, tie-downs), federal inspection fees, and security reimbursements paid by the airline whether to the airport or another agency. Typically excludes special airline facilities self-financed by an airline (e.g., terminal facilities to be operated by the airline). Excludes ground or facility rentals for ancillary buildings (e.g., cargo buildings, hangars); airline self-funded construction (e.g., build-out of terminal space); other costs incurred by the airline to operate at the airport (e.g., fuel, maintenance, personnel, services, supplies, and equipment) except where the airport provides these services directly (e.g., deicing services at some airports). Does not include delay costs. "Becomes a difficult measurement where airlines self-invest in terminal facilities—including entire terminals or partial (e.g., certain concourses) and differing levels of airline investment in fit-up and equipment. Such practices remove significant parts of the terminal from the rate base. Can attempt to add back the nominal cost of such excluded rental fees to approach a meaningful API [Airport Performance Indicator] for the airport. Airport CPEs are often a function of the airport's capital development phase, as expansion programs are most likely to increase an airport's CPE when initially completed. CPE is highly sensitive to changes in the level of enplanements." "Very important for self-benchmarking, including the trend over time. Because difficult to obtain true 'apples-to-apples' measure, less reliable for peer benchmarking, but this API [Airport Performance Indicator] is one of the most widely used comparative measure among airports." Applicable to all commercial service airports.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric FN C-9, Airline Cost per Enplanement, p. 96.

118 Common Performance Metrics for Airport Infrastructure and Operational Planning

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Financial	Airline	Airline Cost per Operation Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Measure of financial performance. Description: Average of what airlines pay in airport fees per operation at the airport.	User	User	Info Only	N/A	Airline and Airport Data
Financial	Airline	Airline Cost per Terminal Square Foot Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of cost of airline to operate. Description: Airline square foot rental rate—average and by type of space.	User	User	Info Only	N/A	Airline and Airport Data
Financial	Airline	Airline Costs per Gate Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of cost of airline to operate. Description: Average airline gate rental payments to the airport, per gate.	User	User	Info Only	N/A	Airline and Airport Data
Financial	Airport	Debt Service Coverage Ratio Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure the ability to service debt. Description: "Net revenues as defined in an airport's bond ordinance divided by principal and interest requirements for the fiscal year." Individual airport calculations may differ based on the terms of bond indentures or airline agreements.	User	Info Only	Info Only	N/A	Airport Records or FAA Form 5100-127
Financial	Airline	Airport Cost per Enplanement Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Measure of total airport costs on a unit basis. Description: Airport total costs per enplanement; i.e., operating cost plus non-operating cost divided by enplanements.	User	User	Info Only	N/A	Airport Records or FAA Form 127

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Dollars per Operation	Has many of the same issues as Airline Cost per Enplanement (ACE). Guidance for ACE is also applicable to this metric. "In lieu of enplanement levels, over which airports have little control, this indicator substitutes operations, over which airports also have little control. Becomes a difficult measurement where airline self-investment in terminal facilities—including both entire terminals and differing levels of airline investment in fit-up and equipment—removes significant parts of the terminal from the rate base. Can attempt to add back the nominal cost of such excluded rental fees to approach a meaningful API for the airport. The Airline Cost per Operation (CPO), like the Airline Cost per Enplanement, is often a function of the airport's capital development phase, as expansion programs are most likely to increase an airport's CPO when initially completed. CPO is highly sensitive to changes in the level of operations, which may vary with changing equipment types as well as anticipated demand patterns." "May be used both to self-benchmark operating costs and for peer benchmarking." Applicable to "[a]ll commercial service airports, and also may be applied to cargo and general aviation airports."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric FN K-2, Airline Cost Per Operation, p. 106.
N/A	Dollars per Operation		*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. Metric FN O-2, Airline Cost per Terminal Sq. Ft. p. 116.
N/A	Dollars per Gate		*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric FN O-3, Airline Costs per Gate, p. 116.
https://cats.airports.faa.gov/	Percentage	"Definition is same as Moody's 'Debt service coverage per bond ordinance.' The Debt Service Coverage Ratio measures an airport's ability to service its debt, and shows the cash flow cushion available to meet debt serve obligations. May also be measured on a GAAP [Generally Accepted Accounting Principles] basis, as opposed to per bond ordnance. The airport's type of coverage -- whether a funding requirement (and if so, one-time or annual funding) or a revenue sufficiency test—affects its financial reserves and the level of rates and charges needed to generate the funding. Should also differentiate between required minimum coverage and actual coverage at a given time." "As defined above [in the Description], the Debt Service Coverage Ratio is an important factor in the bond rating process and is useful for self-benchmarking. It is not useful for peer benchmarking because of differences in the definition of net revenues." "In the broader corporate finance context, the Debt Service Coverage Ratio is typically defined as net operating income (earnings before interest and taxes) divided by total debt service. Using that definition, peer benchmarking may be conducted using Form 127 data. Care should be taken to compare airports with similar types of coverage." Applicable to all airports with outstanding revenue bonds.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric FN C-14, Debt Service Coverage, p. 101.
https://cats.airports.faa.gov/	Dollars per Enplanement	"Provides a measure of total airport costs on a unit basis, which must be paid from aeronautical and non-aeronautical sources. Important for self-benchmarking and peer benchmarking. Reasonably straightforward for peer benchmarking because use of Total Costs avoids definition and allocation differences between airports that arise when considering Operating and Non-Operating Costs, Direct and Indirect Costs, etc." Applicable to "[a]ll commercial service airports." "Cargo airports will use a different divisor, such as Operations. General aviation airports may track change in total airport costs over prior period."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric FN C-10, Airport Cost per Enplanement, p. 97.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Financial	Airport	Average Annual T-Hangar Space Rental Cost Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Measure of financial performance. Description: Average annual T- hangar space rental cost per square foot.	User	N/A	Info Only	N/A	Airport Records
Financial	Airport	Average Annual Tie-Down Space Rental Cost Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Measure of financial performance. Description: Average annual tie-down space rental cost.	User	N/A	Info Only	N/A	Airport Records
Financial	Airport	Maintenance Cost per Square Foot of Terminal Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of cost of maintaining the terminal. Description: "Maintenance cost per square foot of terminal maintained by airport. Measures terminal building maintenance costs including preventive and remedial maintenance."	User	Info Only	Info Only	Info Only	Airport data
Financial	Airport	Runway/ Taxiway Maintenance Cost Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of cost of maintaining runways and taxiways. Description: Total annual cost of maintaining runways and taxiways.	User	Info Only	Info Only	N/A	Airport Records
Financial	Fuel	Average Cost per Gallon Paid by General Aviation for Jet Fuel Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Measure of financial performance. Description: Average cost per gallon paid by general aviation for jet fuel.	User	Info Only	Info Only	N/A	AirNav

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Dollars per Square Foot	Applicable to general aviation airports.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric FN O-25, Average Annual Hangar Space Rental Cost, p. 116. SME input.
N/A	Dollars per Tie Down	Applicable to general aviation airports.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric FN O-26, Average Annual Tie-Down Space Rental Cost, p. 116. SME input.
N/A	Dollars per Square Foot	"Maintenance work is typically done using both internal and external resources. In addition, maintenance costs may be divided between standard and exceptional costs. For example, a roof repair would be considered a standard maintenance cost, whereas a roof replacement could be considered an exceptional maintenance cost." "Different types of terminal space have different maintenance requirements. Heavily-trafficked public areas such as hold rooms will need more intensive maintenance and upkeep than (e.g.) back office areas. In addition to tracking maintenance cost on a square foot basis, the maintenance cost of major terminal building systems can be tracked separately—including HVAC, electrical, plumbing, energy management, security, mechanical, water treatment, elevators, roofing, and flooring." "Can also measure terminal maintenance costs against the number of passengers using the particular facility." Also, for benchmarking purposes need to define maintenance consistently. "This API [Airport Performance Indicator] may be used for self-benchmarking and for peer benchmarking airports with similar facilities profiles. Maintenance costs are dependent on building age, so maintenance costs for a new terminal shouldn't be compared with those of an old one."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric MN K-5, Maintenance Cost per Square Foot of Terminal, p. 166. SME input.
N/A	Dollars	"An important part of the cost of operating an airport. FAA Form 127 includes the cost of repairs and maintenance for the entire airport, but does not break down the results for airfield versus terminal. May be important to differentiate between concrete and asphalt runways. This will assist in choice-of-materials decisions during construction of new runways and taxiways and at the time of major repair/renovation." Maintenance costs include rubber removal, minor patching, joint sealing, light-bulb replacement, minor electrical repairs, etc. Maintenance costs do not include the costs of periodic major pavement resurfacing or rehabilitation which are considered capital costs. "This API [Airport Performance Indicator] may be used for self-benchmarking and may also be used for peer benchmarking airports with similar airfield configurations and similar weather conditions."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric MN K-6, Runway/Taxiway Maintenance Cost, p. 167.
http://www.airnav.com/fuel/	Dollars	Applicable to airports with significant general aviation activity.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric FL O-1, Average Cost per Gallon Paid by General Aviation for Jet Fuel, p. 123.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Financial	Fuel	Average Cost per Gallon Paid for Aviation Gasoline Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Measure of financial performance. Description: Average cost per gallon paid for aviation gasoline—monthly.	User	Info Only	Info Only	N/A	AirNav
Safety	Emergency	ARFF Equipment versus ARFF Index Requirements Go back to Chapter 3—Safety Issues—Secondary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure of emergency preparedness. Description: ARFF equipment compared with federal requirements for the airport's index.	User	Info Only	User	N/A	Airport Data

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
http://www.airnav.com/fuel/	Dollars	Applicable to airports with significant general aviation activity.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AFL O-2, Average Cost per Gallon Paid for Aviation Gasoline, p. 123.
N/A	Count	Many airports have equipment in excess of ARFF Index to accommodate equipment down time. "§139.317 Aircraft rescue and firefighting: Equipment and agents. Unless otherwise authorized by the Administrator, the following rescue and firefighting equipment and agents are the minimum required for the Indexes referred to in §139.315: (a) Index A. One vehicle carrying at least— (1) 500 pounds of sodium-based dry chemical, halon 1211, or clean agent; or (2) 450 pounds of potassium-based dry chemical and water with a commensurate quantity of AFFF to total 100 gallons for simultaneous dry chemical and AFFF application. (b) Index B. Either of the following: (1) One vehicle carrying at least 500 pounds of sodium-based dry chemical, halon 1211, or clean agent and 1,500 gallons of water and the commensurate quantity of AFFF for foam production. (2) Two vehicles— (i) One vehicle carrying the extinguishing agents as specified in paragraphs (a)(1) or (a)(2) of this section; and (ii) One vehicle carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 1,500 gallons. (c) Index C. Either of the following: (1) Three vehicles— (i) One vehicle carrying the extinguishing agents as specified in paragraph (a)(1) or (a)(2) of this section; and (ii) Two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by all three vehicles is at least 3,000 gallons. (2) Two vehicles— (i) One vehicle carrying the extinguishing agents as specified in paragraph (b)(1) of this section; and (ii) One vehicle carrying water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 3,000 gallons. (d) Index D. Three vehicles— (1) One vehicle carrying the extinguishing agents as specified in paragraphs (a)(1) or (a)(2) of this section; and (2) Two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by all three vehicles is at least 4,000 gallons. (e) Index E. Three vehicles— (1) One vehicle carrying the extinguishing agents as specified in paragraphs (a)(1) or (a)(2) of this section; and (2) Two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by all three vehicles is at least 6,000 gallons."	SME, 14: CFR, Part 139—Certification of Airports, Subpart D—Operations, §139.317 Aircraft rescue and firefighting: Equipment and agents, June 4, 2004.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Safety	Emergency	ARFF Responses within Mandated Response Times (%) Go back to Chapter 3—Safety Issues—Secondary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure of airport safety. Description: Percentage of ARFF responses to emergencies within mandated response times.	User	Should Know/ Under-stand	User	N/A	Airport Records
Operation Times	Taxi	Taxi Time—Gate to Runway End, Peak vs. Unimpeded Go back to Chapter 3—Airport Geometry—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of taxi delay. Description: "Average time to taxi from the gate to the runway end during peak periods, compared with unimpeded taxi time."	User	User	User	Info Only	Aviation System Performance Metrics (ASPM) for ASPM Airports
Operation Times	Taxi	Average On-to-In Go back to Chapter 3—Airport Geometry—Secondary	Purpose of Metric: Measure of efficiency of taxi operations. Description: "The time it takes for an aircraft to travel from landing on the runway until the aircraft has park[ed] in its gate/parking position." Also referred to as average arrival taxi time.	User	User	User	N/A	Aviation System Performance Metrics (ASPM) for ASPM Airports
Operation Times	Taxi	Average Out-to-Off Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Airport Geometry—Secondary	Purpose of Metric: Measure of efficiency of taxi operations. Description: "The time it takes for an aircraft to travel out from a gate until the aircraft has lifted off the runway." Also known as average departure taxi time.	User	User	User	N/A	Aviation System Performance Metrics (ASPM) for ASPM Airports

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
	Percent	Required ARFF response times are provided in 14 CFR Part 139—"§139.319 Aircraft rescue and firefighting: Operational requirements. The response required by paragraph (h)(1)(ii) of this section must achieve the following performance criteria: (i) Within 3 minutes from the time of the alarm, at least one required aircraft rescue and firefighting vehicle must reach the midpoint of the farthest runway serving air carrier aircraft from its assigned post or reach any other specified point of comparable distance on the movement area that is available to air carriers, and begin application of extinguishing agent. (ii) Within 4 minutes from the time of alarm, all other required vehicles must reach the point specified in paragraph (h)(2)(i) of this section from their assigned posts and begin application of an extinguishing agent."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AR K-4 ARFF Responses within Mandated Response Times (%), p. 47. 14 CFR, Part 139—Certification of Airports, §139.319 Aircraft rescue and firefighting: Operational requirements., June 4, 2004.
https://aspm.faa.gov/apm/sys/TaxiTimes.asp	Minutes	"Unimpeded taxi time from gate to runway end is compared with average time during peak periods to provide measure of taxi time delay. Although operational changes may improve performance, primary drivers of taxi time will be airfield and taxiway design. This API [Airport Performance Indicator] may be used for self-benchmarking and peer benchmarking." Applicable to all commercial service airports. For ASPM airports, the user can access this metric by using the following url: https://aspm.faa.gov/apm/sys/TaxiTimes.asp and then under the Output tab select Taxi Times: Unimpeded Times Report option and running a query for the required airport and timeframe.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AO K-5, Taxi Time—Gate to Runway End, Peak vs. Unimpeded, p. 25.
https://aspm.faa.gov/apm/sys/TaxiTimes.asp	Minutes	"Data commonly used for evaluating aircraft travel times and delays at an airport is the out-off-on-in (OOOI) data. Many airlines use onboard systems, such as the Aircraft Communications Addressing and Reporting System (ACARS) to automatically record these times," defined as follows: "Wheels 'on' the runway is the actual time an aircraft landed on the runway. Wheels 'in' the gate or parking position is the time an aircraft arrived at the gate, typically measured when the parking brake is set. Also called the actual time of arrival (ATA), which can be compared to the scheduled time of arrival (STA)." For ASPM Airports, the user can access daily averages of this metric by using the following url: https://aspm.faa.gov/apm/sys/TaxiTimes.asp and then under the Output tab select Taxi Times: Standard Report option and running a query for the required airport and timeframe. This metric corresponds to field "Average Taxi In Time."	*ACRP Report 104: Defining and Measuring Aircraft Delay and Airport Capacity Thresholds*, Transportation Research Board, Washington, D.C., 2014, pp. 9 and 63.
https://aspm.faa.gov/apm/sys/AnalysisAP.asp	Minutes	"Data commonly used for evaluating aircraft travel times and delays at an airport is the out-off-on-in (OOOI) data. Many airlines use onboard systems, such as the Aircraft Communications Addressing and Reporting System (ACARS) to automatically record these times," defined as follows: "Wheels 'out' of the gate/parking position is the time an aircraft departed from the gate, typically measured when the parking brake is released. Also called the actual time of departure (ATD), which can be compared to the STD. Wheels 'off' the runway is the time an aircraft departed from the runway." For ASPM Airports, the user can access daily averages of this metric by using the following url: https://aspm.faa.gov/apm/sys/TaxiTimes.asp and then under the Output tab select Taxi Times: Standard Report option and running a query for the required airport and timeframe. This metric corresponds to field "Average Taxi Out Time."	*ACRP Report 104: Defining and Measuring Aircraft Delay and Airport Capacity Thresholds*, Transportation Research Board, Washington, D.C., 2014, pp. 9 and 63.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Operation Times	Taxi	Taxi-In Time Go back to Chapter 2—Intro Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Measure of efficiency of taxi operations. Description: FAA harmonized metric—Annual average Taxi-In Time for flights into the Core 30 Airports. The Taxi-In time is computed as the duration between landing (wheels on) time and gate in time, as reported by carriers. A system value is obtained by averaging these durations over a period of time.	Info Only	Info Only	User	N/A	FAA Harmonized Metrics (System Metrics) and NextGen Performance Snapshots (Core Airports)
Operation Times	Taxi	Taxi-Out Time Go back to Chapter 2—Intro Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Measure of efficiency of taxi operations. Description: FAA harmonized metric—Annual average Taxi-Out Time for flight departing from the Core 30 Airports. The Taxi-Out Time is computed as the duration between gate out time and take off (wheels off) time. A system value is obtained by averaging these durations over a period of time.	Info Only	Info Only	User	N/A	FAA Harmonized Metrics (System Metrics) and NextGen Performance Snapshots (Core Airports)
Operations	Aircraft	Number of Operations Go back to Chapter 2—Intro Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of NAS activity. Description: FAA harmonized metric. This metric is a count of all departure and arrival operations by airport, for all flights where FAA captured a flight plan record. [By fiscal year for FAA Core Airports Only].	Info Only	Info Only	User	N/A	FAA Operational Metrics

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/ and https://www.faa.gov/nextgen/snapshots/airport/	Minutes per Flight	"The Taxi-In Time metric is calculated as the average over all flights in the fiscal year (FY) defined within the scope." The Taxi-In Time for a flight is defined as the time the aircraft pulls into the gate minus the time the aircraft wheels touch the ground. This value is added to all the other flights within scope and divided by the number of flights. The scope is restricted to domestic ASQP flights departing from an ASPM airport and traveling to the selected airport by an ASQP reporting carrier. To be included, a flight needs to arrive within the reportable hours, but may depart the origin outside reportable hours. "This calculation may include time an aircraft spends in a non-movement area (defined in the Aeronautical Information Manual as taxiways and apron (ramp) areas not under the control of air traffic)." "Reporting carriers (operators) may use slightly different starting and/or ending points when gathering performance data."	FAA Operational Metrics—Efficiency, https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/, accessed 8/3/2017. NextGen Performance Snapshots Reference Guide, https://www.faa.gov/nextgen/snapshots/guide/, accessed 8/5/2017.
https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/ and https://www.faa.gov/nextgen/snapshots/airport/	Minutes per Flight	"The Taxi-Out Time metric is calculated as the average over all flights in the fiscal year (FY) defined within the scope." The Taxi-Out Time for a flight is defined as the time the aircraft takes off minus the time the aircraft pushes back from the gate. This value is added to all the other flights within scope and divided by the number of flights. The scope is restricted to domestic ASQP flights departing from the selected airport and traveling to an ASPM airport. To be included, a flight needs to depart within the reportable hours, but may arrive at the destination outside the reportable hours. "This calculation may include time an aircraft spends in a non-movement area (defined in the Aeronautical Information Manual as Taxiways and apron (ramp) areas not under the control of air traffic). Reporting carriers (operators) may use slightly different starting and/or ending points when gathering performance data."	FAA Operational Metrics—Efficiency, https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/, accessed 8/3/2017. NextGen Performance Snapshots Reference Guide, ttps://www.faa.gov/nextgen/snapshots/guide/, accessed 8/5/2017.
https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/	Count of Operations	"The count of both arrival and departure operations [at the FAA Core Airports] provides a good foundation for assessing the overall level of National Airspace System (NAS) activity."	FAA Operational Metrics—Efficiency, https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/, accessed 6/23/17.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Operations	Aircraft	Annual Aircraft Operations Go back to Chapter 3—Benchmarking—Primary Go back to Chapter 3—Airport Geometry—Secondary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure airport aircraft activity. Description: Total annual takeoffs and landings (counted separately) including passenger, cargo, and noncommercial (general aviation and military).	User	Info Only	User	Info Only	Airport records or FAA's OPSNET for Towered Airports
Operations	Aircraft	Average Daily Operations Go back to Chapter 2—Intro Go back to Chapter 3—Gate Management—Secondary	Purpose of Metric: Measure of airspace capacity. Description: FAA harmonized metric. "Sum of the number of flights the FAA facilities actually land and take-off in a month(s), divided by the number of days in the month(s). These average daily operation rates can be compared to the average daily capacity (ADC). The average daily actual operation rates for Core Airports are often compared to the ADC, or published rates." This metric is part of the Re-Authorization Bill Section 214 performance metrics requirements.	Info Only	Info Only	User	Info Only	FAA Operational Metrics

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://aspm.faa.gov/opsnet/sys/Airport.asp	Number of Operations	Applicable to all airports. However, for general aviation airports this metric is one of their most important since they do not track enplanements. For towered airports, operations information is available through FAA's OPSNET at https://aspm.faa.gov/opsnet/sys/Airport.asp. OPSNET records include the following information and data under Airport Operations: IFR itinerant and VFR itinerant operations (arrivals and departures), and local operations at the airport as reported by Air Traffic Control Towers (ATCTs). It does not include overflights. "Other sources for non-towered airports include: (1) asking the airport manager, FBO, or other airport personnel, (2) extrapolating a sample count into an annual estimate, and (3) assigning each based aircraft an assumed number of operations. For general aviation airports, see ACRP publication, Report 129 Evaluating Methods for Counting Aircraft Operations at Non-Towered Airports. Categories of GA aircraft operations are often divided into Based versus Transient, and Local versus Itinerant: Based operations: total operations made by aircraft based at the local airport regardless of purpose. Transient operations: total operations made by aircraft other than those based at the airport. Typically consist of business or pleasure flights originating at other airports, with termination or a stopover at the local airport. Local operations: aircraft movements for training, pilot currency or pleasure flying within the immediate area of the local airport. These typically consist of touch-and-go operations, practice instrument approaches, flights to and within practice areas, and pleasure flights originating and terminating at the local airport. Itinerant operations: arrivals and departures other than local operations that generally originate OR terminate at another airport. Important for self-benchmarking and peer benchmarking, especially for general aviation airports. For general aviation airports, total aircraft operations (along with based aircraft) impacts landing fee revenues, fuel sales, FBO sales, airside personnel required, hangar space, etc."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AO C-1, Annual Aircraft Operations, p. 20.
https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/	Number of Operations per Day	"A comparison between these average daily operation rates and the ADC allows for an overall assessment of NAS capacity, in terms of actual versus published rates. To allow for proper comparison with the ADC metric, ATO focuses on the hours of the day during which capacity matters the most. These hours capture periods when well over 90% of Core Airports' operations take place." "While this metric [comparison of average daily operation rates and the ADC] will help us [FAA] understand the use of capacity at busy airports and during busy times, it can be misleading at less busy airports. For example, a low value may indicate that the airport capacity is not being effectively utilized. Alternatively, the demand may not reach the capacity in the first place." The FAA reports the average daily operations for the Core Airports—ATL, BOS, BWI, CLT, DCA, DEN, DFW, DTW, EWR, FLL, HNL, IAD, IAH, JFK, LAS, LAX, LGA, MCO, MDW, MEM, MIA, MSP, ORD, PHL, PHX, SAN, SEA, SFO, SLC, TPA.	FAA Operational Metrics—Capacity, https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/, accessed 08/07/17. "Report on NextGen Performance Metrics Pursuant to FAA Modernization and Reform Act of 2012, H.R. 658, Section 214," Federal Aviation Administration, 2013, p. 4.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Operations	Aircraft	Operations—Traffic Counts per FAA ATCT Go back to Chapter 3—Airport Geometry—Secondary	Purpose of Metric: Measure of aircraft activity at FAA-funded airports, including Federal Contract Towers (FCT). Description: Number of arrivals and departures at an airport—includes IFR itinerant, VFR itinerant and local operations at the airport as reported by Air Traffic Control Towers (ATCTs). It does not include overflights. Monthly and annual counts are available.	User	Info Only	User	Info Only	FAA Operations Network (OPSNET)
Operations	Aircraft	Cancellations Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Secondary	Purpose of Metric: Measure the number of canceled operations. Description: Count of operations that were canceled.	User	User	User	Info Only	BTS On Time Performance data or Aviation System Performance Metrics (ASPM)—ASQP

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://aspm.faa.gov/opsnet/sys/Airport.asp	Count of Operations	FAA ATCT Traffic Counts are provided in OPSNET. OPSNET reports operations as IFR and VFR Itinerant Operations and Local Operations. IFR and VFR Itinerant Operations include operations by air carrier, air taxi, general aviation, and military aviation arriving from outside the airport traffic pattern or departing the airport traffic pattern. Air carrier is defined as aircraft with seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds, carrying passengers or cargo for hire or compensation. Air Taxi is defined as aircraft designed to have a maximum seating capacity of 60 seats or less or a maximum payload capacity of 18,000 pounds or less, carrying passengers or cargo for hire or compensation. General aviation is defined as takeoffs and landings of all civil aircraft, except for air carriers or air taxis. Military is defined as operations by all classes of military takeoffs and landings at FAA and FTC facilities. Note that the definitions of air carrier and air taxi are not the same as those used for air carrier and operator certification in Part 121 Operating Requirement: Domestic, Flag and Supplemental Operations and Part 135 Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons on Board Such Aircraft. Local Operations include "operations by civil and military aviation remaining in the local traffic pattern, simulated instrument approaches at the airport, including the following subcategories, and operations to or from the airport and a practice area within a 20−mile radius of the tower. 1.Civil: All civilian operations, including local flights by air carrier and air taxi aircraft. 2.Military: All classes of military operations."	OPSNET Reports: Definitions of Variables, http://aspmhelp.faa.gov/index.php/OPSNET_Reports:_Definitions_of_Variables, accessed 08/07/17. OPSNET: Airport Operations, http://aspmhelp.faa.gov/index.php/Airport_Operations, accessed 09/06/17.
Refer to Guidance	Count of Operations	According to the Bureau of Statistics Glossary, a Canceled Flight is defined as a "flight that was listed in a carrier's computer reservation system during the seven calendar days prior to scheduled departure but was not operated." ASQP includes data from carriers with one percent or more of total domestic scheduled service passenger revenues who are required to report data for their flights involving any airport in the 48 contiguous states that account for 1% or more of domestic scheduled service passenger enplanements. The reporting carriers have uniformly elected to report data on their entire domestic system operations. To compute the metric for a year using BTS on-time performance data (includes domestic flights only): Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Airline On-Time Performance Data. Step 3: On the next page click on On-Time Performance. Step 4: On the next page scroll down to Cancellations and Diversions section and click on the Analysis link for Cancelled field name. Step 5: On the next page, set the Filter Categories to "Dest," set the Filter Variables to "Cancelled", set the Filter Statistics to "Sum" and select the appropriate year for Filter Years. Step 6: Click on Recalculate. Step 7: Once the page updates, the table below will show canceled counts by airports. Download the result to spreadsheet using the "Download results" option above the filter categories.	ASQP: Definitions of Variables, http://aspmhelp.faa.gov/index.php/ASQP:_Definitions_of_Variables, accessed 08/07/17.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Operations	Aircraft	Landed Weight Go back to Chapter 3—Benchmarking—Secondary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure of total aircraft landed weight. Description: "The total amounts of [max gross landing] weight of aircraft landings … at the airport for domestic, international and cargo carriers (lbs) … depending on the basis for charging landing fees (i.e., by take-off or landing). Does not include landed weights for GA and Military aircraft."	User	User	User	Info Only	FAA Form 5100-127
Operations	Cargo	Cargo Tons Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Measure of the cargo market. Description: Cargo tons including both domestic and international, and both freight and mail.	User	User	Info Only	N/A	Computed using BTS—T100 Segment

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://cats.airports.faa.gov/Reports/rpt127.cfm	Lbs	Provides measure of total aircraft landed weight at the airport, which is important for calculating weight-based landing fee budget and fee rate. "Most airports apply the landing fee rate to aircraft based on the maximum certificated landed weight of the aircraft." "The landing fee rate is typically derived from a formula in the airport use/operating agreement designed to recover the airport's cost of operating the airfield." "The formula for calculating the landing fee rate on a cost-recovery basis is common to most airports: airfield costs (collected in the Airfield Cost Center) are divided by landed weight (or takeoff weight, as applicable). However what 'Airfield Costs' includes can vary from airport to airport." A related metric, Average Landed Weight—Change over Prior Period may also be useful. This metric "[p]rovides measure of changing aircraft mix at the airport, which is important to determine facilities requirements as well as to calculate weight-based landing fee budget and landing fee rate. Airports will track not only change in average landed weight (takeoff weight, where applicable), but specific numeric changes in the number of operations by each aircraft type." This metric is applicable to all commercial service airport and is useful for self-benchmarking and peer benchmarking.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric FN O-67, Landed Weight (000 Lbs) p. 118, Metric PC C-26, Landing Fee Rate, p. 200, API Metric AS K-1, Average Landed Weight—Change over Prior Period, p. 39.
Refer to Guidance.	Tons	"Changes in cargo volume are tracked by virtually all airports with significant cargo activity." "Carriers must report cargo tons to DOT including belly cargo and freighter cargo. T-100 cargo data contains a breakdown of freight and mail, along with origin, destination, airline, aircraft type, and miles. Segment-based data means actual origin and destination cannot be tracked. Cargo data issues include questions about the completeness of mail volume reporting. Careful for consistency in use of the U.S. Short Ton (2000 lbs.), which is prevalent in the U.S., and the Metric Ton or 'Tonne' (1000 kg or 2204.6 lbs.) of the metric system, converting where necessary." "Some airports point out that cargo volume itself may not be a good indicator of revenue to the airport due to the value of shipments, and that overall cargo economic impact to the region may be of equal or greater importance. Other airports note that they primarily track cargo landing fee revenue, which in the absence of freighter service, is generated solely by integrators such as FedEx and UPS, and does not capture landing fee revenue from belly cargo." "A volume of cargo/express moves in and out of airport facilities exclusively by truck, never seeing the inside of an aircraft. This is particularly true at airports serving as integrator hubs for cargo carriers. It is useful to measure and track these volumes, as they can affect the amount and type of cargo space required by the carriers and the airport." "Useful for self-benchmarking and peer benchmarking. Useful to track over different reporting periods to spot trends—e.g., annual, monthly, rolling 12 months." To calculate this metric using BTS data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Air Carrier Statistics (Form 41 Traffic)—All Carriers. Step 3: On the next page click on T-100 Segment (All Carriers). Step 4: On the next page under the Summaries section, click on the Analysis link corresponding to the Freight field name. Step 5: On the next page, set the Filter Categories to "Dest," set the Filter Variables to "Freight," set the Filter Statistics to "Sum," and select the appropriate year for the Filter Years. Step 6: Click on Recalculate. Step 7: Once the page updates, the table below will show Seat counts by airports. Download the result to spreadsheet using the "Download results" option above the filter categories. Step 8: Change the Filter Variable to "Mail" and click on Recalculate. Step 9: Once the page updates, the table below will show departure counts by airports. Download the result to spreadsheet using the "Download results" option above the filter categories. Step 10: Open the downloaded files and add the Freight and Mail sums for each airport to arrive at the total Cargo Tons for Arrivals at airports. To determine the Cargo for Departing flight at airports, the process is repeated by setting the Filter Categories to "Origin."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AS C-2, Cargo Tons—Change over Prior Period, p. 30.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Operations	Cargo	Domestic Flights—Number of All Cargo Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of the cargo market. Description: Number of domestic flights—all cargo.	User	User	Info Only	Info Only	Computed using BTS—T100 Domestic Segment
Operations	Cargo	Domestic Landed Weight—All-Cargo Aircraft Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of the cargo market. Description: Domestic landed weight (maximum landing weight) of all-cargo aircraft.	User	User	Should Know/Understand	Info Only	Computed using BTS—T100 Domestic Segment
Operations	Cargo	International Cargo Flights—Number of Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of the cargo market. Description: Number of international cargo flights.	User	User	Should Know/Understand	Info Only	BTS—T100 International Segment

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
Refer to Guidance	Number of Flights	May be useful to monitor the increase or decrease in number of domestic cargo flights over the prior reporting period(s). "To receive AIP funding, airports must report All-Cargo Flights to the FAA on an annual basis. The airport-filed report lists arrivals by cargo carrier and equipment during each month; however, it does not distinguish between domestic and international flights. Unlike passenger flights, limited schedule information is available for cargo flights." "Useful for self-benchmarking. Utility of peer benchmarking is limited by data availability." To calculate this metric from BTS data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Air Carrier Statistics (Form 41 Traffic)—All Carriers. Step 3: On the next page click on download link for T-100 Domestic Segment (All Carriers). Step 4: On the next page set Filter Geography to "All." Select Filter Year and set Filter Period to "All Month." Check Select all fields and click on the Download button. Step 5: Unzip the downloaded file and open in Excel. Step 6: For the required origin (ORIGIN field) or destination (DEST field) sum DEPARTURE_PERFORMED field for which AIRCRAFT_CONFIG field value is "2."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AS O-15, Domestic Flights—Number of All Cargo, p. 40, API Metric AS K-3, Domestic Cargo Flights—Change over Prior Period, p. 36.
Refer to Guidance	1000 Pounds	May be useful to monitor the change in total domestic cargo tons enplaned and deplaned over the prior period. "Domestic cargo includes both freight and mail. T-100 cargo data contains a breakdown of freight and mail, along with origin, destination, airline, aircraft type, and miles. Segment based data means actual origin and destination cannot be tracked. Domestic cargo data from the T-100 is available on a monthly basis approximately 3 months after the end of the month. Careful for consistency in use of the U.S. Short Ton (2000 lbs or .906 of the Metric Ton), which is prevalent in the U.S., and the Metric Ton or 'Tonne' (1000 kg or 2204.6 lbs) of the metric system, converting where necessary. May be useful to track O&D cargo tonnage and transit tonnage separately. A volume of cargo/express moves in and out of airport facilities exclusively by truck, never seeing the inside of an aircraft. This is particularly true at airports serving as integrator hubs for cargo carriers. It is useful to measure and track these volumes, as they can affect the amount and type of cargo space required by the carriers and the airport. Useful for self-benchmarking and peer benchmarking." To calculate this metric based on BTS data Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Air Carrier Statistics (Form 41 Traffic)—All Carriers. Step 3: On the next page click on download link for T-100 Domestic Segment (All Carriers). Step 4: On the next page set Filter Geography to "All." Select Filter Year and set Filter Period to "All Month." Check Select all fields and click on the Download button. Step 5: Unzip the downloaded file and open in Excel. Step 6: For the required origin (ORIGIN field) or destination (DEST field) sum FREIGHT and MAIL fields for which AIRCRAFT_CONFIG field value is "2."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric CA K-3, Domestic Cargo Tons—Change over Prior Period, p. 54.
Refer to Guidance	Number of Flights	To calculate this metric based on BTS data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Air Carrier Statistics (Form 41 Traffic)—All Carriers. Step 3: On the next page click on download link for T-100 International Segment (All Carriers). Step 4: On the next page set Filter Geography to "All." Select Filter Year and set Filter Period to "All Month." Check Select all fields and click on the Download button. Step 5: Unzip the downloaded file and open in Excel. Step 6: For the required origin (ORIGIN field) or destination (DEST field) sum DEPARTURE_PERFORMED field for which AIRCRAFT_CONFIG field value is "2."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric CA O-24, International Cargo Flights, p. 57.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Operations	Cargo	International Landed Weight—All-Cargo Aircraft Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of the cargo market. Description: International landed weight (maximum landing weight) of all-cargo aircraft.	User	User	Should Know/Understand	Info Only	BTS—T100 International Segment
Operations	Passenger	Domestic Passenger Flights—Number of Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of passenger traffic. Description: Number of domestic flights—passenger.	User	User	Info Only	Info Only	"Airport records, individual airline schedules and reports, and industry flight information from vendors including OAG." Also, BTS data.

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
Refer to Guidance	Tons	May be useful to track the change in total international cargo tons enplaned and deplaned over the prior period. International cargo includes both freight and mail. "T-100 cargo data contains a breakdown of freight and mail, along with origin, destination, airline, aircraft type, and miles. Segment based data means actual origin and destination cannot be tracked. International cargo data from the T-100 is available on a monthly basis approximately 6 months after the end of the month. Careful for consistency in use of the U.S. Short Ton (2000 lbs or .906 of the Metric Ton), which is prevalent in the U.S., and the Metric Ton or 'Tonne' (1000 kg or 2204.6 lbs) of the metric system, converting where necessary. May be useful to track O&D cargo tonnage and transit tonnage separately using airport records. Useful for self-benchmarking and peer benchmarking. A volume of cargo/express moves in and out of airport facilities exclusively by truck, never seeing the inside of an aircraft. This is particularly true at airports serving as integrator hubs for cargo carriers. It is useful to measure and track these volumes, as they can affect the amount and type of cargo space required by the carriers and the airport." To calculate this metric based on BTS data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Air Carrier Statistics (Form 41 Traffic)—All Carriers. Step 3: On the next page click on download link for T-100 International Segment (All Carriers.) Step 4: On the next page set Filter Geography to "All." Select Filter Year and set Filter Period to "All Month." Check Select all fields and click on the Download button. Step 5: Unzip the downloaded file and open in Excel. Step 6: For the required origin (ORIGIN field) or destination (DEST field) sum FREIGHT and MAIL fields for which AIRCRAFT_CONFIG field value is "2."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric CA K-5, International Cargo Tons—Change over Prior Period, p. 56.
Refer to Guidance	Number of Flights	Applicable to airports with commercial service and charter flights. "Airports closely track the number of flights overall and in individual markets because: (1) more flights generally mean more passengers, and (2) having a greater number of flights in individual markets creates more options for passengers and makes air service more attractive, particularly to business travelers. The number of daily flights required to establish a useful air service pattern varies depending on the type of market served, with short-haul business markets often considered to require a minimum of three flights per day, while longhaul international flights are often considered to require only a single daily or even less (e.g., four or five flights per week). Tracking charter flights is more difficult because published schedule information is often not available. Substitution of smaller aircraft in a market (even with more frequency) may mask a decline in available seats. Very important for self-benchmarking, also important for peer benchmarking with airports seen as competitive." To obtain this metric from BTS data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Air Carrier Statistics (Form 41 Traffic)—All Carriers. Step 3: On the next page click on download link for T-100 Domestic Segment (All Carriers). Step 4: On the next page set Filter Geography to "All." Select Filter Year and set Filter Period to "All Month." Check Select all fields and click on the Download button. Step 5: Unzip the downloaded file and open in Excel. Step 6: For the required origin (ORIGIN field) or destination (DEST field) sum DEPARTURE_PERFORMED field for which AIRCRAFT_CONFIG field value is "1."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AS C-5, Passenger Flights—Change in Number of Domestic & International, p. 33, Metric AS O-16 Domestic Flights—Number of Passenger, p. 40.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Operations	Passenger	International Passenger Flights—Number of Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of passenger traffic. Description: Number of international flights—passenger.	User	User	Info Only	Info Only	"Airport records, individual airline schedules and reports, and industry flight information from vendors including OAG." Also, BTS data.
Operations	Passenger	International Arriving Passengers Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of passenger traffic. Description: Number of international arriving passengers.	User	User	Info Only	Info Only	Airport records, BTS data
Operations	Passenger	International Passengers to Total Passengers (%) Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Measure of passenger traffic. Description: International passengers as percentage of total international and domestic enplanements.	User	User	Info Only	Info Only	Airport records, BTS data

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
Refer to Guidance	Number of Flights	Applicable to airports with commercial service and charter flights. "Airports closely track the number of flights overall and in individual markets because: (1) more flights generally mean more passengers, and (2) having a greater number of flights in individual markets creates more options for passengers and makes air service more attractive, particularly to business travelers. The number of daily flights required to establish a useful air service pattern varies depending on the type of market served, with short-haul business markets often considered to require a minimum of three flights per day, while longhaul international flights are often considered to require only a single daily or even less (e.g., four or five flights per week). Tracking charter flights is more difficult because published schedule information is often not available. Substitution of smaller aircraft in a market (even with more frequency) may mask a decline in available seats. Very important for self-benchmarking, also important for peer benchmarking with airports seen as competitive." To obtain this metric using BTS data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Air Carrier Statistics (Form 41 Traffic)—All Carriers. Step 3: On the next page click on download link for T-100 International Segment (All Carriers). Step 4: On the next page set Filter Geography to "All." Select Filter Year and set Filter Period to "All Month." Check Select all fields and click on the Download button. Step 5: Unzip the downloaded file and open in Excel. Step 6: For the required origin (ORIGIN field) or destination (DEST) sum DEPARTURE_PERFORMED field for which AIRCRAFT_CONFIG field value is "1."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AS C-5, Passenger Flights—Change in Number of Domestic & International, p. 33, API Metric AS O-24 International Flights—Number of Passenger, p. 40.
Refer to Guidance	Number of Passengers	To obtain this metric using BTS data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Air Carrier Statistics (Form 41 Traffic—All Carriers. Step 3: On the next page click on download link for T-100 International Segment (All Carriers). Step 4: On the next page set Filter Geography to "All." Select Filter Year and set Filter Period to "All Month." Check Select all fields and click on the Download button. Step 5: Unzip the downloaded file and open in Excel. Step 6: For the required destination (DEST field) sum PASSENGERS field to get total International Arriving Passengers.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AS O-21, International Arriving Passengers, p. 40.
Refer to Guidance	Percentage	To calculate this metric using BTS data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Air Carrier Statistics (Form 41 Traffic)—All Carriers. Step 3: On the next page click on download link for T-100 International Segment (All Carriers). Step 4: On the next page set Filter Geography to "All." Select Filter Year and set Filter Period to "All Month." Check Select all fields and click on the Download button. Step 5: Unzip the downloaded file and open in Excel. Step 6: For the required destination (DEST field) sum PASSENGERS field to get total International Arriving Passengers. Step 7: Repeat Steps 1 through 6 for T-100 Segment (All Carriers) data to get Total Passenger count. Step 8: Divide Total International Passengers by Total Passengers.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AS O-27, International Passengers to Total Passengers (%), p. 40.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Operations	Passenger	Enplaned Passengers—Annual Go back to Chapter 3—Benchmarking—Primary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Track the number of enplaned passengers because the majority of airport revenues are generated directly or indirectly from enplaned passengers. Description: Enplaned passengers are passengers boarding a plane at a particular airport. This includes origin and destination passengers and connecting passengers.	User	User	Info Only	User	FAA Form 5100-127
Operations	Passenger	Origination and Destination (O&D) Passengers—Annual Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Differentiate portion of enplanements from the total count that includes connecting passengers. Description: Annual number of passengers that either begin or end their trip at the subject airport (as contrasted with total enplanements which includes connecting passengers). A passenger is counted as "origination" at the airport where they begin their air travel on the itinerary and "destination" at the airport where they finish their travel for that itinerary.	User	User	Info Only	User	BTS data
Operations	Passenger	Connecting Passengers—Annual Go back to Chapter 3—Benchmarking—Primary Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Differentiate portion of enplanements from the total count that includes origin and destination passengers. Description: Connecting passengers—these are passengers boarding at an intermediate point on their itinerary (i.e. a point that is not the start or end of their trip).	User	User	Info Only	Info Only	Calculate
Operations	Passenger	Air Carrier Concentration Go back to Chapter 3—Benchmarking—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of market concentration. Description: Percentage of enplanements by each air carrier.	User	User	User	Info Only	BTS—T100 Segment

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://cats.airports.faa.gov/Reports/reports.cfm	Number of Passengers	"At commercial service airports, the number of enplanements largely drives production of airport revenue (e.g., aeronautical charges, concessions, PFCs, grant funding) and the facilities and services required. Therefore, airports closely monitor the number and trend of enplanements and take steps to attract additional air service." When used for peer benchmarking, the number of enplanements measures the trend and vitality of the airport's passenger market. "Useful to track over different reporting periods to spot trends—e.g., annual, monthly, rolling 12 months." Note that the FAA uses a different metric, "Revenue Enplanements," to determine the amount of Airport Improvement Program passenger entitlement funds for primary airports. Each year, the FAA asks on-demand air carriers to report the number of revenue passengers they transported in the previous calendar year. The FAA uses this data to help allocate Airport Improvement Program funds to eligible airports.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AS C-3, Enplanements—Change over Prior Period, p. 31. SME input.
Refer to Guidance	Number of Passengers	This metric is applicable primarily to airports with a significant number of connecting passengers. "For other airports, the number of O&D passengers will be approximately the same as the number of total passengers." Used for sizing pre-security terminal and ground access facilities. Also used in air service development to indicate strength of demand for service to the market, which is important at connecting hubs. O&D traffic is the traffic that is expected to continue to use the airport, even if an airline shifted their connecting activities over a different hub. To calculate this metric using BTS data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Air Carrier Statistics (Form 41 Traffic)—All Carriers. Step 3: On the next page click on download link for T-100 Segment (All Carriers). Step 4: On the next page set Filter Geography to "All." Select Filter Year and set Filter Period to "All Month." Check Select all fields and click on the Download button. Step 5: Unzip the downloaded file and open in Excel. Step 6: Select the required airport under Origin (ORIGIN field) and the required airport under destination (DEST field), and sum PASSENGERS field to get total O&D passenger counts.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric FN O-82 O&D Passengers, p. 118. Airports Council International (ACI) World Economics Standing Committee, Guide to Airport Performance Measures, Prepared by Robert Hazel of Oliver Wyman, Inc., Reston, VA, February 2012, Metric, Origination and Destination Passengers (total annual)—Core 2, p. 12. SME input.
N/A	Number of Passengers	Connecting passengers is equal to total passengers minus O&D passengers.	SME input.
N/A	Percent	This metric is used to determine if an airport is required to provide a Competition Plan. Medium or large hub airports with one or two air carriers controlling more than 50% of the passenger boardings fall under the Competition Plan Requirements in 49 USC § 47106(f). "49 USC § 47106(f) prohibits the FAA from issuing an AIP grant to a covered airport unless the airport has submitted a written Competition Plan."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AS O-1 Air Carrier Concentration, p. 40. FAA Order 5100.38D, Airport Improvement Program Handbook, Appendix X. Competition Plans, September 30, 2014, p. X-1.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Operations	Passenger	Herfindahl-Hirschman Index (HHI) Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of market concentration. Description: The Herfindahl-Hirschman Index (HHI) is a commonly used measure of the extent of market concentration for individual airport air service studies. "The HHI is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. For example, for a market consisting of four firms with shares of 30, 30, 20, and 20 percent, the HHI is 2,600 (302 + 302 + 202 + 202 = 2,600)."	User	Info Only	Info Only	Info Only	Analysis
Operations	Other Operations	Average Daily Operations—Military Go back to Chapter 3—Gate Management—Secondary	Purpose of Metric: Measure of military activity and characterization of airport. Description: Average daily operations for military flights.	User	Info Only	Info Only	Info Only	FAA Operations Network (OPSNET)
Operations	Other Operations	Charter Flights—Number of Annual Go back to Chapter 3—Gate Management—Secondary	Purpose of Metric: Measure of charter activity and characterization of airport. Description: Number of annual charter flights.	User	Info Only	Info Only	Info Only	Airport/Airline Records
Operations	Passenger	Destinations -Nonstop—Annual Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Measure of economic benefits. Description: "Number of airports with nonstop service, including destinations with only seasonal service, measured over the course of a year."	User	User	User	Info Only	Airports/ Airlines Records/BTS Air Carrier Statistics

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Number	The HHI may be calculated using the air carrier concentration for each airline. "The HHI takes into account the relative size distribution of the firms in a market. It approaches zero when a market is occupied by a large number of firms of relatively equal size and reaches its maximum of 10,000 points when a market is controlled by a single firm. The HHI increases both as the number of firms in the market decreases and as the disparity in size between those firms increases." Relevant for Airport Competition Plan requirements and review.	SME input. U.S. Department of Justice, Antitrust Division, https://www.justice.gov/atr/herfindahl-hirschman-index, accessed 08/09/17.
https://aspm.faa.gov/opsnet/sys/main.asp	Average Count of Operations	This data can be queried from the OPSNET website (https://aspm.faa.gov/opsnet/sys/main.asp). The average daily operations is then calculated by taking the total number of operations from the queried divided by the number of days queried. Military flights are included in ATC counts, but from the airport's perspective they may present different challenges. Do they use gates? Servicing them (passenger disembarking; transportation to the terminal; fueling) presents different challenges to the airport.	SME input.
N/A	Count of Operations	Charter flights are included in ATC counts, but from the airport's perspective they may present different challenges. Servicing them (passenger disembarking; transportation to the terminal: fueling) presents different challenges to the airport.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric ASO-13, Charter Flights—Number of, p. 40. SME input.
Refer to Guidance	Count of Destinations	Applicable to all commercial service airports. "Airports closely monitor the number of nonstop destinations and typically track the number of domestic and international destinations separately. Having a greater number of nonstop destinations, especially those involving long-haul international flights, generates regional economic benefits." To obtain this metric using BTS data: Step 1: Go to https://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0. Step 2: Click on Air Carrier Statistics (Form 41 Traffic)—All Carriers. Step 3: On the next page click on download link for T-100 Segment (All Carriers). Step 4: On the next page set Filter Geography to "All." Select Filter Year and set Filter Period to "All Month." Check Select all fields and click on the Download button. Step 5: Unzip the downloaded file and open in Excel. Step 6: Select the required airport under Origin (ORIGIN field). Step 7: Copy all records in the destination (DEST field) to another sheet. Step 8: Under Data option in Excel, select Remove Duplicates to get list of Nonstop destinations.	Airports Council International (ACI) World Economics Standing Committee, Guide to Airport Performance Measures, Prepared by Robert Hazel of Oliver Wyman, Inc., Reston, VA, February 2012, Metric, Destinations —Nonstop—Core 5, pp. 14, 15.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Safety	Airfield	Annual Part 139 Inspection Results Go back to Chapter 3—Safety Issues—Primary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure of airport safety. Description: "Number of deficiencies identified in airport's annual Part 139 inspection by FAA."	User	Info Only	User	N/A	Airport Records—Part 139 Inspection Report
Safety	Wildlife	Wildlife/Bird Strikes Go back to Chapter 3—Safety Issues—Primary	Purpose of Metric: Count of wildlife/bird strikes. Description: Number of reported bird/wildlife strikes at the airport.	User	User	User	N/A	Airport Records and the FAA Wildlife Hazard Database
Safety	Incursion	Runway Incursions Vehicle /Pedestrian Go back to Chapter 3—Safety Issues—Primary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure of airport safety. Description: Annual number of runway incursions classified as vehicle or pedestrian deviation (VPD).	User	User	User	N/A	FAA, FAA Runway Safety Office—Runway Incursion Database

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Count	"Airports strive for continuous compliance with Part 139 and to achieve a zero discrepancy rating. This metric tracks the number of deficiencies identified in the annual inspection, and provides guidance to the airport on areas that need focus." Inspections occur annually, but may also include surprise inspections "useful for self-benchmarking and for peer benchmarking."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric SR K-3, Annual Part 139 Inspection Results, p. 218. SME Input.
https://wildlife.faa.gov/	Count	The FAA Wildlife Strike Database contains records of reported wildlife strikes since 1990. Strike reporting is voluntary. Therefore, this database only represents information received from airlines, airports, pilots, and other sources. "The database contains key information for each wildlife strike, including the date, airport, airline, aircraft, and species involved. This API [Airport Performance Indicator] may be used for self-benchmarking, as well as peer benchmarking with other airports having similar wildlife populations. Although probably too complex for peer benchmarking, individual airports may find it useful to measure and track the direction and distance of bird strikes from the airport." For Part 139 Certificated Airports, wildlife strikes may trigger a requirement to prepare a wildlife hazard assessment. "(b) In a manner authorized by the Administrator, each certificate holder must ensure that a wildlife hazard assessment is conducted when any of the following events occurs on or near the airport: (1) An air carrier aircraft experiences multiple wildlife strikes; (2) An air carrier aircraft experiences substantial damage from striking wildlife. As used in this paragraph, substantial damage means damage or structural failure incurred by an aircraft that adversely affects the structural strength, performance, or flight characteristics of the aircraft and that would normally require major repair or replacement of the affected component; (3) An air carrier aircraft experiences an engine ingestion of wildlife; or (4) Wildlife of a size, or in numbers, capable of causing an event described in paragraphs (b)(1), (b)(2), or (b)(3) of this section is observed to have access to any airport flight pattern or aircraft movement area."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric AO K-6, Wildlife/Bird Strikes, p. 26. SME Input.
https://www.asias.faa.gov/apex/f?p=100:28:::NO:28::	Number	Runway incursions are classified by cause: "a. Operational Incident. A surface event attributed to ATCT action or inaction. b. Pilot Deviation (PD). A surface event caused by a pilot or other person operating an aircraft under its own power (see FAA Order 8020.11, Aircraft Accident and Incident Notification, Investigation and Reporting, for the official definition). c. Vehicle or Pedestrian Deviation (VPD). A surface event caused by a vehicle driver or pedestrian (see FAA Order 8020.11, Aircraft Accident and Incident Notification, Investigation and Reporting, for the official definition). d. Other. Surface events which cannot clearly be attributed to a mistake or incorrect action by an air traffic controller, pilot, driver, or pedestrian will be classified as 'other.' These events would include incursions caused by equipment failure or other factors." VPD incursions may be of particular interest to airports because they may involve airport-operated vehicles.	FAA, Order 7050.1B, Runway Safety Program, 11/07/13, p. A-1. *ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric SR C-28, Runway Incursions, p. 215.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Safety	Incursion	Runway Incursions Go back to Chapter 3—Safety Issues—Secondary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure of airport safety. Description: Annual number of occurrences 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.	User	User	User	N/A	FAA, FAA Runway Safety Office—Runway Incursion Database
Safety	Incursion	Runway Incursions Rate (A&B) Go back to Chapter 2—Intro Go back to Chapter 3—Safety Issues— Secondary	Purpose of Metric: Measure of airport safety. Description: FAA harmonized operational metric. Annual (fiscal year) number of Category A & B (most serious) runway incursions per million operations. Includes all airports with an air traffic control tower.	User	User	User	Info Only	FAA Operational Metrics
Safety	Airfield	Surface Incidents Go back to Chapter 3—Safety Issues—Primary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure of safety. Description: Number of annual surface accidents and incidents.	User	User	User	N/A	Airport/Air Traffic Control records
Safety	Airfield	Runway Excursions Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Safety Issues—Primary	Purpose of Metric: Measure of safety. Description: Number of annual veer-offs or overruns off the runway surface.	User	User	User	N/A	Airport Records
Safety	Airfield	Hot Spots—Number Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Safety Issues—Primary Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Measure of airport safety. Description: Number of locations on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary.	User	User	User	N/A	FAA

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://www.asias.faa.gov/apex/f?p=100:28:::NO:28::	Number	Runway Incursions classified by severity of the event. The Severity Classifications are: "a. Accident. An incursion that results in a collision. For the purposes of tracking incursion performance, an accident will be treated as a Category A runway incursion. b. Category A. A serious incident in which a collision was narrowly avoided. c. Category B. An incident in which separation decreases and there is a significant potential for collision, which may result in a time critical corrective/evasive response to avoid a collision. d. Category C. An incident characterized by ample time and/or distance to avoid a collision. e. Category D. An incident that meets the definition of a runway incursion, such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and take-off of aircraft, but with no immediate safety consequences. f. Category E. An incident in which insufficient or conflicting evidence of the event precludes assigning another category." "Runway incursions occur for multiple reasons, and the airport must focus on those within its control. Certain incursions are within airport control, e.g., when caused by an airport-operated vehicle. In other situations control may be less evident or only partial, but still significant, e.g., where faulty signage contributes to an incursion."	FAA, Order 7050.1B, Runway Safety Program, 11/07/13, p. B-1. *ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric SR C-28, Runway Incursions, p. 215.
https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/	Incursions per Million Operations	"Runway Incursions involve the incorrect presence of an aircraft, vehicle or person on the airport surface designated for takeoffs and landings. Category A and B runway incursions have significant potential for a collision or require extreme action to avoid a collision. This metric is part of the Re-Authorization Bill Section 214 performance metrics requirements."	FAA, Operational Metrics, https://www.faa.gov/data_research/aviation_data_statistics/operational_metrics/, accessed 08/31/17.
N/A	Number	The FAA defines a Surface Incident as an "Unauthorized or unapproved movement within the designated movement area (excluding runway incursions) or an occurrence in that same area associated with the operation of an aircraft that affects or could affect the safety of flight."	FAA, Order 7050.1B, Runway Safety Program, 11/07/13, p. 3.
N/A	Number	"The Civil Air Navigation Services Organization (CANSO) defines a runway excursion as 'An event in which an aircraft veers off or overruns the runway surface during either take-off or landing.' Runway excursions lead to more runway accidents than all the other causes combined." Factors that can contribute to runway excursions include runway contamination, adverse weather conditions, mechanical failure, pilot error and unstable approaches. Of these factors, airports have the most influence on runway contamination because they are responsible for snow and ice removal. The FAA is developing a system to collect and classify runway excursions.	FAA, Runway Excursions Support Tool, https://runwayexcursions.faa.gov/content.html?id=c, accessed 09/04/17. FAA, National Runway Safety Plan, 2015—2017, p. 13.
https://www.faa.gov/airports/runway_safety/hotspots/hotspots_list/	Number	"By identifying hot spots, it is easier for users of an airport to plan the safest possible path of movement in and around that airport. Planning is a crucial safety activity for airport users—both pilots and air traffic controllers alike. By making sure that aircraft surface movements are planned and properly coordinated with air traffic control, pilots add another layer of safety to their flight preparations. Proper planning helps avoid confusion by eliminating last-minute questions and building familiarity with known problem areas."	FAA, Runway Safety, Hot Spots List, https://www.faa.gov/airports/runway_safety/hotspots/hotspots_list/, accessed 08/31/2017. Advisory Committee Input.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Safety	Airfield	Runway Incursion Mitigation (RIM) Locations—Number Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Safety Issues—Primary Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Measure of airport safety. Description: Number of locations on an airport identified as Runway Incursion Mitigation (RIM) Locations.	User	Should Know/ Under-stand	User	N/A	FAA
Safety	Emergency	Emergency Responses—Annual Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Safety Issues—Primary	Purpose of Metric: Measure of airport safety. Description: Annual number of emergency responses.	User	Info Only	User	Info Only	Airport Records
Safety	Incursion	Vehicle Runway Crossings Per Day Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Safety Issues—Primary	Purpose of Metric: Measure of risk for runway incursions. Description: Number of vehicle runway crossings per day.	User	Info Only	User	N/A	Airport Records
Security	Airfield	Air Operations Area (AOA) Violations Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Safety Issues—Secondary	Purpose of Metric: Measure of airport security. Description: Annual number of security rules violations that apply to the Air Operations Area (AOA). AOA refers to a portion of an airport, specified in the airport security program, in which security measures specified in Title 49 of the Code of Federal Regulations are carried out. This area includes aircraft movement areas, aircraft parking areas, loading ramps, and safety areas for use by aircraft and any adjacent areas (such as general aviation areas) that are not separated by adequate security systems, measures, or procedures.	User	Info Only	User	Info Only	Airport Data
Security	Terminal	Number of Security Lanes Staffed at Peak Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of security screening availability. Description: Number of staffed public security lanes during peak period.	User	Info Only	Info Only	User	TSA

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://www.faa.gov/airports/special_programs/rim/media/RIM-Inventory-2017-9-29.pdf	Number	"Airfield geometry has been identified as a primary contributing factor for runway incursions. After analyzing more than six years of national runway incursion data between 2007 and 2013, we [the FAA] developed a preliminary inventory of locations (initial version released in July 2015) at airports where risk factors might contribute to a runway incursion."	FAA, Runway Incursion Mitigation (RIM) Program Airports, https://www.faa.gov/airports/special_programs/rim/, accessed, 10/16/2017.
N/A	Number	Emergency responses may be broken down by type—hazmat, medical emergencies, fires, and aircraft incidents.	Advisory committee input.
N/A	Number	Each vehicle runway crossing is an opportunity for an incursion and/or an incident/accident with an aircraft. Vehicle runway crossings also increase workload for ATC ground control. FAA and airports coordinate to minimize vehicle runway crossings. Changes in infrastructure (e.g., perimeter road) and/or procedures to access facilities may be necessary.	SME input.
N/A	Count	Minimizing AOA violations requires constant vigilance by airport management and tenants. Useful for self-benchmarking or peer benchmarking	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric PS K-1, Air Operations Area (AOA) Violations, p. 190.
N/A	Count		SME Input.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Security	Terminal	Total Number of Security Lanes Available Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of security screening availability. Description: Number of public security lanes.	User	Info Only	Info Only	User	TSA
Security	Terminal	Federal Inspection Service (FIS) Lanes Staffed at Peak Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of FIS availability. Description: Number of staffed FIS lanes during peak period.	User	Info Only	Info Only	Info Only	U.S. Customs and Border Protection
Security	Terminal	Federal Inspection Service (FIS) Service Volumes /Throughput Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of FIS capacity. Description: Average and peak number of people per hour passing through FIS.	User	Info Only	Info Only	Info Only	U.S. Customs and Border Protection
Security	Terminal	Total Federal Inspection Service (FIS) Lanes Available Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure of FIS availability. Description: Number of FIS lanes.	User	Info Only	Info Only	Info Only	U.S. Customs and Border Protection
Security	Terminal	Security Breaches that Force Rescreening—Annual Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Measure of airport security. Description: Annual number of security breaches that force rescreening.	User	Info Only	Info Only	User	Security/ Facility Records
Security	Terminal	Wait Times at Security Checkpoints Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Measure of security efficiency. Description: Wait times at security checkpoints—measured at average and at peak times.	Info Only	Info Only	Info Only	User	TSA
Terminal Facilities	Remote Parking	Aircraft Remote Parking—Remain Overnight Positions Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of ability to accommodate aircraft parking remote from gates. Description: Number of remain overnight positions—will vary depending on the size of aircraft.	User	User	Info Only	Info Only	Airport Data
Terminal Facilities	Terminal	Escalators, Moving Walkways, Baggage Claim Equipment and Elevators—Percentage of Time in Service Go back to Chapter 3—Benchmarking—Secondary	Purpose of Metric: Measure reliability of terminal transit. Description: Percentage of time that escalators, moving walkways, baggage claim equipment, and elevators are in service.	User	Info Only	Info Only	Info Only	Airport Maintenance Records

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Count		SME Input.
N/A	Count		SME Input.
N/A	People per Hour		SME Input.
N/A	Count		SME Input.
N/A	Count	Security breaches could include failure to display badge, piggybacking, and failure to challenge. Understanding of reason behind breach or violation could increase metric usefulness and information.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric PS O-32, Security Breaches and Violations, p. 198. SME Input.
https://apps.tsa.dhs.gov/mytsa/wait_times_home.aspx	Time	Availability of real-time data may help identify and correct problems. Comparative information may highlight need for additional staffing. The TSA public "Wait Time" web site is active. In addition, airports have access to TSA wait time data at their own airport. Airports also frequently conduct their own studies of wait times. Although wait times at security checkpoints are a function of TSA staffing levels, passengers tend to hold airports responsible, including wait times, in their evaluation of airports.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric SQ K-10, Wait Times at Security Checkpoints, p. 240.
N/A	Count		SME input.
N/A	Percent	Escalators, moving sidewalks, baggage claim equipment, and elevators are highly visible and heavily-used facilities. "High out-of-service time reflects poorly on the airport maintenance and its customer care program. Should measure each type of facility separately. Useful for self-benchmarking and for peer benchmarking."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric MN K-3, Escalators, Moving Walkways, and Elevators—Percent of Time in Service, p. 164. SME input.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Terminal Facilities	Operations	Enplanements per Gate Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of gate usage. Description: Annual enplanements divided by number of gates.	User	User	Info Only	Info Only	Airport Records
Terminal Facilities	Operations	Contact Gate Usage—Turns per Day Go back to Chapter 3—Benchmarking—Primary Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of contact gate usage. Description: For an individual contact gate, the number of aircraft served on the contact gate on a given day. An empty aircraft towed onto the gate prior to a departure or towed off after arrival is typically considered as a 1/2 turn.	User	User	Info Only	Should Know/Understand	Proprietary Airline Data
Terminal Facilities	Terminal	Contact Gates—Number of Go back to Chapter 3—Gate Management—Primary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure of contact gate availability. Description: Number of contact gates (those gates directly adjacent to terminal/concourse building and accessible from the building) usable by aircraft of any size.	User	User	User	Should Know/Understand	Airport data
Terminal Facilities	Operations	Contact Gate Utilization Go back to Chapter 3—System Issues—Primary Go back to Chapter 3—Gate Management—Primary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure of contact gate usage. Description: Number of departures per contact gate.	User	User	User	Info Only	Airport Data
Terminal Facilities	Terminal	Number of Jet Bridges on Airport Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of jet bridge availability. Description: Number of jet bridges on the airport.	User	User	Info Only	Info Only	Airport Data

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Number per Gate	"Provides a measure of the intensity of gate usage and, at a more detailed level, is also used as a service level indicator. As the number of enplanements per gate increases, airports must consider whether to add more gates or to restrict carriers from adding service except during non-peak or unused time slots. Further analysis of gate utilization during the schedule peak is also required. As with other gate-based measures, gate utilization requires an understanding of gate capacity by aircraft type. The arrangement under which carriers use gates varies from airport to airport, often even gate to gate within a particular airport. Some gates are leased by the carrier for its exclusive use or preferential use; others are designated common-use. Accommodation and recapture provisions are often employed by airports. This indicator is useful for self-benchmarking and peer benchmarking. Gate utilization by low-cost carriers is often higher than that of legacy network carriers."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric TO K-1, Enplanements per Gate, p. 246.
N/A	Number of Turns per Day	Used in gate planning analysis and often in airfield and terminal simulations. Data may be available from airports with gate management. Could calculate turns per day for individual carriers by using OAG data and their total number of leased gates.	SME input.
N/A	Count	May be useful to identify the number of common use, preferential use, and exclusive use gates. When a Competition Plan is required, the plan must identify the number of gates available at the airport by lease arrangement, i.e., exclusive, preferential, or common-use, and current allocation of gates.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric TO O-6 Gates—Number of, p. 249. FAA Order 5100.38D, Airport Improvement Program Handbook, Appendix X. Competition Plans, September 30, 2014, p. X-3.
N/A	Count	Often measured as the average number of flight departures per gate per day, typically separate for weekdays and the weekend. "As the number of departures per gate increases, airports must consider whether to add more gates or to restrict carriers from adding service except during non-peak or unused time slots. Further analysis of gate utilization during the schedule peak is also required. As with other gate-based measures, gate utilization requires an understanding of gate capacity by aircraft type. This indicator is useful for self-benchmarking and peer benchmarking. Gate utilization by low-cost carriers is often higher than by legacy network carriers." Per FAA policy, a Competition Plan must provide gate utilization to meet the requirements in 49 USC § 47106(f). For Competition Plans, gate utilization is reported (departures/gate) per week and month for each gate.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric TO K-3, Gate Utilization, p. 248. FAA Order 5100.38D, Airport Improvement Program Handbook, Appendix X. Competition Plans, September 30, 2014, p. X-3. SME input.
N/A	Count	May be useful to track the number of jet bridges with pre-conditioned and 400 Hz power as measures of environmental sustainability.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric TO O-12, Number of Jet Bridges on Airport, p. 249. Advisor Committee input.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Terminal Facilities	Terminal	Usable [Contact] Gates in Service—Number Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of contact gate availability. Description: Number of usable contact gates being used during a specified period.	User	User	Info Only	Info Only	Airport Data
Terminal Facilities	Terminal	Inter-Terminal Transportation—Wait Times at Peak Periods Go back to Chapter 3—Internal Benchmarking	Purpose of Metric: Measure of inter-terminal transportation efficiency. Description: Inter-terminal transportation—wait times at peak periods.	User	Info Only	Info Only	Info Only	Airport Data
Terminal Facilities	Terminal	Baggage Claim Utilization Go back to Chapter 3—Internal Benchmarking	Purpose of Metric: Measure of baggage claim usage. Description: Average number of baggage carousels/conveyor systems in use during average and peak period.	User	User	Info Only	Info Only	Airport Data
Terminal Facilities	Terminal	Baggage Claim Availability Go back to Chapter 3—Internal Benchmarking	Purpose of Metric: Measure of baggage claim availability. Description: Number of baggage claim carousels/ conveyor systems available.	User	User	Info Only	Info Only	Airport Data
Terminal Facilities	Terminal	Originating Passengers/ Square Foot Ticketing Check-in Space Go back to Chapter 3—Internal Benchmarking	Purpose of Metric: Measure of ticketing area efficiency. Description: Number of originating passengers/square foot of ticketing check-in space on an average day.	User	Info Only	Info Only	Info Only	Airport Data
Fuel Storage	Jet Fuel	Number of Days Jet Fuel Supply On Site Go back to Chapter 3—Internal Benchmarking	Purpose of Metric: Measure of fuel availability in the event of disruption to supply chain. Description: Number of days of jet fuel supply on site available based on average daily pumped.	User	N/A	N/A	N/A	Airport Data
Fuel Storage	Avgas	Number of Days Avgas Supply On Site Go back to Chapter 3—Internal Benchmarking	Purpose of Metric: Measure of fuel availability in event of disruption to supply chain. Description: Number of days of Avgas supply on site available based on average daily pumped.	User	N/A	N/A	N/A	Airport Data
Fuel Storage	Jet Fuel	Average Daily Jet Fuel Pumped Go back to Chapter 3—Internal Benchmarking	Purpose of Metric: Measure of fuel usage. Description: Average gallons of jet fuel pumped per day.	User	N/A	N/A	N/A	Airport Data

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Count		*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric TO O-8 Usable Gates in Service—Number, p. 249.
N/A	Time		*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric SQ O-31 Inter-Terminal Transportation—Wait Times at Peak Periods, p. 243.
N/A	Count		SME input.
N/A	Count		SME input.
N/A	Passengers per Square Foot		SME input.
N/A	Days	This metric is useful for benchmarking jet fuel storage capacity and planning for future needs.	SME input.
N/A	Days	This metric is useful for benchmarking Avgas storage capacity and planning for future needs.	SME input.
N/A	Gallons per Day	This metric is useful for benchmarking jet fuel flowage, estimating the adequacy of jet fuel storage capacity (see metric Number of Days Jet Fuel Supply On Site), and for tracking fuel flowage revenues, where applicable.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric GA C-19, Fuel Use/Sales—Change over Prior Period, p. 127. SME input.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Fuel Storage	Avgas	Average Daily Avgas Pumped Go back to Chapter 3—Internal Benchmarking	Purpose of Metric: Measure of fuel usage. Description: Average gallons of Avgas pumped per day.	User	N/A	N/A	N/A	Airport Data
Terminal Facilities	Terminal	Baggage Delivery Time Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Measure of customer service. Description: Average time in minutes for delivery of first bag and last bag—measured over the course of a year.	User	User	Info Only	Info Only	Airport Data
Capacity	Airport Capacity	Percent Visual Meteorological Conditions Go back to Chapter 3—NextGen (S Airports)—Primary Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Measure of percentage of time that Visual Meteorological Conditions (VMC) are present. Description: Percentage of time that airport visibility conditions are VMC—annual average.	User	Info Only	User	N/A	Weather Data
Capacity	Airport Capacity	Percent Instrument Meteorological Conditions Go back to Chapter 3—NextGen (S Airports)—Primary Go back to Chapter 3—System Issues—Primary	Purpose of Metric: Measure of percentage of time that Instrument Meteorological Conditions (IMC) are present. Description: Percentage of time that airport visibility conditions are IMC—annual average.	User	Info Only	User	N/A	Weather Data
Financial	Airport	Airport Concession Revenue per Enplaned Passenger Go back to Chapter 3—Benchmarking—Primary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure of passenger spending in terminal concessions as non-airline revenue centers to indicate success/health of an airport's revenue enhancement program. Description: Gross revenue to the airport per enplanement (or for total passenger) for spending on terminal retail.	User	Info Only	User	N/A	Airport Records or FAA Form 127

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
N/A	Gallons per Day	This metric is useful for benchmarking Avgas flowage, estimating the adequacy of Avgas storage capacity (see metric Number of Days Avgas Supply On Site), and for tracking fuel flowage revenues, where applicable.	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric GA C-19, Fuel Use/Sales—Change over Prior Period, p. 127. SME input.
N/A	Time	This metric applies to all commercial service airports and is useful for internal and external benchmarking. Drivers include "airline or ground handling company operational performance, airline scheduling practices (which determine volume of connections and connecting times), security screening issues (often driven by government agency management of screening), and airport layout, facilities, and equipment." "Baggage delivery time is an important service quality metric, although one that is largely beyond the control of airports and within the control of airlines or their designated ground handling companies. In its Baggage Improvement Programme, the International Air Transport Association (IATA) lists over 70 performance issues to be tracked over the course of baggage check-in, security screening, transfer, and re-delivery to the passenger. The airport role in these issues is largely limited to providing necessary facilities and equipment.	Airports Council International (ACI) World Economics Standing Committee, Guide to Airport Performance Measures, Prepared by Robert Hazel of Oliver Wyman, Inc., Reston, VA, February 2012, Metric Baggage Delivery Time—Service Quality 5, p. 25.
	Percent	This metric is important for conducting capacity analysis. However, the percentage of time that an individual airport can actually conduct Visual Meteorological Conditions (VMC) operations may be affected by local procedures, obstructions, or other factors.	SME input.
	Percent	This metric is important for conducting capacity analysis. However, at a given airport, the percentage of time that Instrument Meteorological Conditions (IMC) operations are in effect may be affected by local procedures, obstructions, or other factors.	SME input.
https://cats.airports.faa.gov/reports/rpt127.cfm	Dollars per Enplanement	Applicable to all commercial service airports. "General aviation airports will look at total concession revenue, and change from prior period." "Revenue to the airport is a function of both gross sales and the airport's contractual arrangements with concessionaires. International airports may have large duty free sales, which should be isolated before comparing to domestic airports. Also, in benchmarking, group airports by size, but medium and large airports may have similar concession profiles. Careful to be consistent on concessions included, e.g., advertising, telecommunications, and other services. Important for self-benchmarking and peer benchmarking because concession revenues are a key contributor to airport operating revenues. Useful to track over different reporting periods to spot trends—e.g., annual, monthly, rolling 12 months." Regarding data sources, "*Airport Revenue News Annual Factbook* provides more detailed information on concession sales for many U.S. airports. FAA Form 127 and ACI-NA Benchmarking Survey divide Concessions into Food and Beverage, Retail & Duty Free, and Services and Other Terminal Concessions."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric CN C-7, Concession Revenue to the Airport per Enplanement, p. 61. Advisory Committee input.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Financial	Airport	Non-Aeronautical Operating Revenue as % of Total Operating Revenue Go back to Chapter 3—Benchmarking—Primary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure of airport dependence on airline charges to support the budget and effectiveness of an airport's non-aeronautical revenue program. Description: Total annual non-aeronautical operating revenue as a percentage of total annual operating revenue.	User	User	User	N/A	Airport Records or FAA Form 127
Safety	Emergency	ARFF Index Go back to Chapter 3—Safety Issues—Secondary Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Determine Aircraft Rescue Firefighting (ARFF) requirements for Part 139 Certificated Airports. Description: The ARFF Index is an alphabetic letter (A, B, C, D, or E) that is tied to federal requirements for ARFF equipment.	User	Info Only	User	N/A	Airport Records
Safety	Accidents /Collisions	Serious Injuries/Fatalities of Employees and Passengers on Aircraft Aprons Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of airport ramp safety. Description: Number of annual serious/fatal injuries of employees and passengers in the ramp areas.	User	User	User	N/A	Airport Data, NTSB (National Transportation Safety Board)
Safety	Accidents /Collisions	Accidents /Incidents per Ramp—Number of Go back to Chapter 3—Gate Management—Primary	Purpose of Metric: Measure of airport ramp safety. Description: Number of annual accidents and incident in ramp area.	User	User	User	N/A	Airport Data

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://cats.airports.faa.gov/reports/rpt127.cfm	Percent	"Applicable to all airports. Measures success in diversifying revenue source away from aeronautical charges. Typically includes revenues from concessions, parking, rental cars, land and other business development. Excludes aeronautical operating revenues and non-operating revenues (such as PFCs and interest income)." Useful for self-benchmarking and peer benchmarking."	*ACRP Report 19A: Resource Guide to Airport Performance Indicators*, Transportation Research Board, Washington, D.C., March 2011. API Metric FN C-15, Non-Aeronautical Operating Revenue as % of Total Operating Revenue, p. 102. Advisory Committee input.
N/A	Letter	§139.315 Aircraft rescue and firefighting: Index determination. (a) An index is required by paragraph (c) of this section for each certificate holder. The Index is determined by a combination of— (1) The length of air carrier aircraft and (2) Average daily departures of air carrier aircraft. (b) For the purpose of Index determination, air carrier aircraft lengths are grouped as follows: (1) Index A includes aircraft less than 90 feet in length. (2) Index B includes aircraft at least 90 feet but less than 126 feet in length. (3) Index C includes aircraft at least 126 feet but less than 159 feet in length. (4) Index D includes aircraft at least 159 feet but less than 200 feet in length. (5) Index E includes aircraft at least 200 feet in length. (c) Except as provided in §139.319(c), if there are five or more average daily departures of air carrier aircraft in a single Index group serving that airport, the longest aircraft with an average of five or more daily departures determines the Index required for the airport. When there are fewer than five average daily departures of the longest air carrier aircraft serving the airport, the Index required for the airport will be the next lower Index group than the Index group prescribed for the longest aircraft.	14 CFR Part 139—Certification of Airports, §139.315 Aircraft rescue and firefighting: Index determination.
N/A	Number	Use National Transportation Safety Board Definitions found in 49 CFR § 830.2 "Serious injury means any injury which: (1) Requires hospitalization for more than 48 hours, commencing within 7 days from the date of the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, muscle, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface. Fatal injury means any injury which results in death within 30 days of the accident."	SME input and 49 CFR Part 830—Notification and Reporting of Aircraft Accidents or Incidents and Overdue Aircraft, and Preservation of Aircraft Wreckage, Mail, Cargo, and Records, Aug. 24, 2010, § 830.2.
N/A	Number	This metric could be tracked by who is involved or cause to better understand the safety problems including: • Number of aircraft and aircraft accidents/incidents per ramp area per year • Number of aircraft and vehicle accidents/incidents per ramp area per year • Number of aircraft and ground personnel accidents/incidents per ramp area per year • Number of aircraft and equipment accidents/incidents per ramp area per year • Number of accidents/incidents where gate adjacency was a causal factor • Number of accidents/incidents where wingtip clearance was a causal factor • Number of accidents/incidents where insufficient coordination was a causal factor • Number of accidents/incidents where infringement on the movement area was a causal factor	SME input.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Airspace /Air Traffic	Procedural	PBN Procedures—Number of and Use Go back to Chapter 3—NextGen (L & M Airports)—Primary Go back to Chapter 3—NextGen (S Airports)—Primary	Purpose of Metric: Measure of NextGen implementation. Description: The number of Performance Based Navigation (PBN) procedures and usage of each PBN procedure at an airport.	User	User	User	N/A	FAA Performance Based Navigation (PBN) Dashboard
Airport	Characteristic	National Plan of Integrated Airport System (NPIAS) Classification Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Categorize airports by type of activity and activity levels. Description: the Regulatory and Policy Classifications of airports in the National Plan of Integrated Airport Systems (NPIAS)	Should Know /Understand	Info Only	User	N/A	FAA—Current Version of the annual Report to Congress National Plan of Integrated Airport Systems (NPIAS)
Airport	Characteristic	Instrument Approaches—Number of Go back to Chapter 3—Benchmarking—Primary	Purpose of Metric: Measure airport's capability to support operations in Instrument Meteorological Conditions. Description: The number of instrument approaches available at an airport.	User	User	User	N/A	FAA Approach Plates
NextGen	Equipage	Airport Operator Equipage Go back to Chapter 3—NextGen (L & M Airports)—Primary Go back to Chapter 3—NextGen (S Airports)—Primary	Purpose of Metric: Measure the potential for benefits from NextGen. Description: The percentage of aircraft operations equipped for Performance Based Navigation operating at the airport.	User	User	User	N/A	Performance Based Navigation (PBN) Dashboard
NextGen	WakeCat	Heavy Jets and B757s—Percentage Go back to Chapter 3—NextGen (L & M Airports)—Primary Go back to Chapter 3—NextGen (S Airports)—Primary	Purpose of Metric: Measure the potential for benefits from NextGen. Description: The percentage of operations by heavy jets and B757s at an airport	User	Info Only	User	N/A	Airport Data
NextGen	Minimums	Lowest Minimums Go back to Chapter 3—NextGen (L & M Airports)—Primary Go back to Chapter 3—NextGen (S Airports)—Primary Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Measure the potential for benefits from NextGen. Description: The lowest visibility minimums available for approaches to an airport.	User	User	User	User	FAA Approach Plates

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://www.faa.gov/nextgen/pbn/dashboard/	Number and Percent	"The Performance Based Navigation (PBN) Dashboard provides implementation and usage statistics for all major airports in the National Airspace System with published PBN procedures. The data is captured on a periodic basis and displayed in an easy to interpret format for interested parties."	FAA Performance Based Navigation (PBN) Implementation and Usage, https://www.faa.gov/nextgen/pbn/dashboard/, accessed 08/05/17.
N/A	Classification	Refer to FAA Airport Categories, https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/categories/ descriptions of the classifications. Airports in the NPIAS are grouped into two major categories: primary and nonprimary. "Primary airports are defined as public airports receiving scheduled air carrier service with 10,000 or more enplaned passengers per year." Primary airports are grouped into four categories defined in statute: large, medium, small, and nonhub." Nonprimary airports, including general aviation airports, are classified as "national," "regional," "local, basic," and "unclassified." These classifications may be particularly useful for general aviation airports when selecting airports for external benchmarking.	FAA, Report to Congress National Plan of Integrated Airport Systems (NPIAS) 2017–2021, 9/30/2017, p. 3 and Appendix C.
https://www.faa.gov/air_traffic/flight_info/aeronav/Aero_Data/Airport_Data/	Count	May be useful to smaller general aviation airports when selecting airports for external benchmarking.	SME input.
https://www.faa.gov/nextgen/pbn/dashboard/	Percent	The estimated percentage of the airport operations that are PBN equipped (by type) is available on the FAA's PBN Dashboard. "The equipage levels for the airport are based on the actual equipage of individual flights where possible, and supplemented with the equipment suffix filed by the airline when the equipment information is not available. The equipage shown in the chart may not reflect the actual equipage operating at the airport."	SME input and FAA, Performance Based Navigation (PBN) Implementation and Usage, https://www.faa.gov/nextgen/pbn/dashboard/, accessed 10/17/17.
N/A	Percent	The percentage of operations by heavy jets and B757s may be considered in determining the benefits of Wake Turbulence Recategorization.	SME input.
https://www.faa.gov/air_traffic/flight_info/aeronav/Aero_Data/Airport_Data/	Height above Threshold and Statue Miles	The lowest available minimums may be of interest when considering the potential benefit of a PBN procedure.	SME input.

Metric Category	Metric Sub-Category	Metric Name	Purpose of Metric & Description	User Information				Data Sources
				Airports	Airlines	FAA	TSA	
Airfield	Runway	NAVAID Availability Go back to Chapter 3—Safety Issues—Primary	Purpose of Metric: Airfield capacity optimization and safety. Description: Percentage of operation hours that installed non-federal NAVAIDs are available.	User	User	User	N/A	NOTAMs
Capacity	Deicing	Taxi Time—Deicing Pad to Departure Runway Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Measure of impact of deicing operations on taxi time and airfield capacity. Description: Average time for aircraft to travel from deicing pad to departure runway.	User	User	Info Only	N/A	Analysis
Capacity	Deicing	Taxi Time—Gate to Deicing Pad Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Measure of impact of deicing operations on taxi time and airfield capacity. Description: Average time for aircraft to travel from gate to deicing pad.	User	User	Info Only	N/A	Analysis
Capacity	Airport Capacity	Modifications to Standards for Group VI Aircraft Go back to Chapter 3—Airport Geometry—Primary	Purpose of Metric: Measure impact of Group VI Aircraft on airport operations. Description: Number of Modifications of Standards (MoSs) for Design Airplane Design Group VI Standards.	User	User	User	N/A	ALP
Airfield	Throughput	Total Number of Runway Crossings by Aircraft to Access Runway Ends Go back to Chapter 3—Airport Geometry—Secondary	Purpose of Metric: Measure of complexity of airfield operations. Description: Total number of runway crossings from the terminal gate to arrive at the departure runway.	User	Info Only	Info Only	N/A	ALP
Environ-mental	Emissions	Criteria Pollutant Emissions Go back to Chapter 3—Regulations—Primary	Purpose of Metric: Measure the impact of a proposed project on air quality. Description: Criteria Pollutant Emissions are the quantities of Criterial Pollutants (carbon monoxide (CO), nitrogen dioxide (NO2), ozone (O3), particulate matter (PM), sulfur dioxide (SO2), and lead (PBS)) that would be emitted due to a proposed project.	User	Info Only	User	N/A	Analysis

Weblink of Data Sources	Unit of Measurement	Guidance	Citation
https://pilotweb.nas.faa.gov/PilotWeb/notamRetrievalByICAOAction.do?method=displayByICAOs	Percent	Important metric for state or local funded NAVAIDs at smaller airports.	Advisory Committee input.
N/A	Minutes		SME input.
N/A	Minutes		SME input.
N/A	Number	Modifications to design standards for Group VI aircraft may affect airport operations.	FAA, Order 5300.1G Modifications to Agency Airport Design, Construction, and Equipment Standards, 9/29/17, pp. 1, 9.
N/A	Number	Runway crossing add to the complexity of airfield operations.	SME input.
N/A	Tons per Year	The EPA regulates these pollutants under the Clean Air Act. Airport and aircraft criteria pollutant emissions are inputs to state and regional State Implementation Plans (SIPs) that are required under the Clean Air Act. In addition, under NEPA, an analysis of a proposed project's impact on attainment and maintenance of the National Ambient Air Quality Standards (NAAQS) for criteria air pollutants is included in Environmental Assessments, Environmental Impact Statements, and, if appropriate, Categorical Exclusions. Therefore, particularly for airport improvement projects, it is important to consider how emissions of Criteria Pollutants may be affected. Both individual airports and the FAA currently use the FAA's approved noise model, Aviation Environmental Design Tool (AEDT), to prepare an emissions inventory of criteria pollutants.	FAA, 1050.1F Desk Reference, July 2015, p. 1-5.

APPENDIX C

List of ASPM Data Modules

Appendix C contains the list of ASPM Data Modules and their associated reports, along with links to each respective user manual.

Module Group: Metric

Module Name	Reports
Airport Analysis: Provides information on aircraft departure and arrival times and flight delays at selected airports compared to the schedule and flight plan time. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Airport_Analysis_Manual	**Analysis: All Flights:** Provides information about percentages of delayed flights and average time of delay for flights departing and arriving at selected airports: **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_All_Flights **Analysis: Delayed Flights:** Provides information about the number and percentage of flight departures and arrivals delayed 15 or more minutes for a selected airport or group of airports. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_Delayed_Flights **Analysis: All Flights Comparison:** Provides comparison of the number and percentages of on-time and delayed departure flights and on-time and delayed arrivals for a selected airport or group of airports for different time ranges. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_All_Flights_Comparison **Analysis: Delayed Flights Comparison:** Provides comparison of the number and percentages of delayed departure flights and delayed arrivals for a selected airport or group of airports for different time ranges. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_Delayed_Flights_Comparison **Analysis: EDCT Report:** Provides counts of arrivals and departures with Expect Departure Clearance Time (EDCT) delays at selected airports. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Airport_Analysis:_EDCT_Report **Airport Analysis: EDCT Compliance Report:** Provides counts and percentages of arrivals and departures with Expect Departure Clearance Time (EDCT) delays at selected airports and provides details on the number and percentage of flights with EDCTs that departed or arrived prior to, on time, or after the specified EDCT time. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Airport_Analysis:_EDCT_Compliance_Report

Module Name	Reports
City Pair Analysis: Provides information on aircraft departure and arrival times and flight delays between city pairs compared to the schedule and flight plan times. Access to this module is restricted. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_City_Pair_Analysis_Manual	**Analysis: All Flights:** Provides information about percentages of delayed flights and average time of delay for flights departing from a selected airport of group of airports and arriving at a selected airport or group of airports. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_All_Flights **Analysis: Delayed Flights:** Provides information about the number and percentage of flight departures and arrivals delayed 15 or more minutes, between two selected airports or groups of airports. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_Delayed_Flights **Analysis: All Flights Comparison:** Provides comparison of the number and percentages of on-time and delayed departure flights and on-time and delayed arrivals between two selected airports or groups of airports for different time ranges. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_All_Flights_Comparison **Analysis: Delayed Flights Comparison:** Provided comparison of the number and percentages of delayed departure flights and delayed arrivals between two selected airports or groups of airports for different time ranges. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_Delayed_Flights_Comparison **Analysis: Block Time Reliability:** Provides information on scheduled and actual block time and block delay. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_Block_Time_Reliability **Analysis: Block Time Analysis:** Provides information on average scheduled and actual block time and block delay. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_Block_Time_Analysis **Analysis: Block Time Comparison:** Provides comparison of scheduled and actual block time and block delay at selected airports at two different dates or time ranges. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Analysis:_Block_Time_Comparison
Taxi Times: Provides data on actual and unimpeded taxi time data by airport and air carrier. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Taxi_Times_Manual	**ASPM Taxi Times: Standard Report:** Provides information on Taxi Out and Taxi In times (both total and average) for departures and arrivals at a selected airport or group of airports. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Taxi_Times:_Standard_Report **ASPM Taxi Times: Unimpeded Times Report:** Provides information on unimpeded Taxi Out and Taxi In times compared to the average, median, and 10th percentile times for a selected airport or group of airports. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Taxi_Times:_Unimpeded_Times_Report **ASPM Taxi Times: Medians Report:** Provides information on the median taxi time by hour by airport and/or carrier for the date(s) specified. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Taxi_Times:_Medians_Report **ASPM Taxi Times: Long Taxi Times Report:** Provides information on flights with taxi out times of 90 or more minutes. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Taxi_Times:_Long_Taxi_Times_Report **ASPM Taxi Times: Statistical Report:** Provides information on the minimum, average, median, and maximum taxi times. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Taxi_Times:_Statistical_Report
Individual Flights: Provides information on aircraft departure and arrival times and flight delays for individual flights. compared to the schedule and flight plan times. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Individual_Flights_Manual	**Flight Data Report:** Provides information about Arrivals and Departures for Metric Calculations (complete flight records). **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Individual_Flights:_Flight_Data_Report **Flight-per-Page Report:** Provides flight information, delay causality data (ASQP and OPSNET causes of delay), and departure and arrival dates of individual Metric flights (flight records with complete data) per given city pair and dates. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Individual_Flights:_Flight-per-Page_Report

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Module Name	Reports
Cancellations: This module calculates cancellations by analyzing the best estimate from the following record types: (1) TFMS Flight Plans for commercial flights that are canceled and not refiled; (2) Scheduled flights that never flew; and (3) ASQP Cancellations, reported approximately six weeks after the end of the month. The best estimate of canceled arrivals is then used to calculate the Completion Rate. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Cancellations_Manual	**ASPM Cancellations: Canceled Flights Report:** Provides flight specific information on canceled flights, including cancellation causes where provided by ASQP. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Cancellations_:_Canceled_Flights_Report **ASPM Cancellations: Summary of Cancellations Report:** Provides counts of canceled departures and arrivals based on ASQP Canceled flights, TFMS Flight Plans Canceled, Scheduled Flights not Flown, and cancellation best estimates. It also displays Completion Rates based on the best estimates. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Cancellations_:_Summary_of_Cancellations_Report **ASPM Cancellations: City Pair Cancellation Summary Report:** Provides flight specific information on canceled flights, including cancellation causes where provided by ASQP between selected city pair. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Cancellations_:_City_Pair_Cancellation_Summary_Report

Module Group: Efficiency

Module Name	Reports
Airport Efficiency: Provides data on the System Airport Efficiency Rate (SAER) and Terminal Arrival Efficiency Rate (TAER) metrics. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Airport_Efficiency_Manual	**TAER and SAER** **ASPM Efficiency: Standard Report:** Provides Efficiency flights aggregated by date/hour of Wheels On for the TAER, and Wheels Off and Wheels On for SAER departures and arrivals. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Standard_Report **ASPM Efficiency: Detail Report:** Provides information about the variables contributing to the TAER (Terminal Arrival Efficiency Rate) for individual flights. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Detail_Report **ASPM Efficiency: TAER Summary Analysis Report:** Provides detail on the data available for calculation of the TAER. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_TAER_Summary_Analysis_Report **ASPM Efficiency: TAER Detail Analysis Report:** Provides TAER metrics for the selected airport(s). **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_TAER_Detail_Analysis_Report **ASPM Efficiency: Frequency Report:** Provides operations frequency report by weather category and runway configurations. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Frequency_Report **ASPM Efficiency: TAER Means Report:** Provides information on average aircraft speed from 100 miles to 40 miles from the airport, and distance from 40 miles to Wheels On by date, airport, runway configuration, arrival fix, physical class, weight class, and arrival meteorological conditions, for use in TAER demand calculations. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_TAER_Means_Report **ASPM Efficiency: TAER Counts and Default Report:** Provided TAER Counts. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_TAER_Counts_and_Default_Report **ASPM Efficiency: ADC and TAER for Reportable Hours Report:** Provides TAER and ADC values for a selected facility or group of facilities limited to the reportable hours. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_ADC_and_TAER_for_Reportable_Hours_Report **ASPM Efficiency: SAER For Reportable Hours Report:** Provides departure and arrival efficiency rates per 24-hour period compared to the reportable hours for the same facility. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_SAER_For_Reportable_Hours_Report **ASPM Efficiency: Reportable Hours by Facility Report:** Provides the start and end of reportable hours for Core airports by fiscal year (the report cannot be generated for any other time period). Reportable hours are intended to represent the busiest hours of the day for each airport and are used to calculate metrics such as the Average Daily Capacity (ADC) limited to those hours. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Reportable_Hours_by_Facility_Report **ASPM Efficiency: ATCSCC Metrics Report:** Provides historical data on metrics reported in the daily NAS AERO. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_ATCSCC_Metrics_Report **ASPM Efficiency: ATO (Air Traffic Organization) Efficiency Summary Report:** Provides detail by facility and date for a series of metrics grouped by the Departure, En Route, and Arrival phases of flight. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_ATO_Efficiency_Summary_Report **Counts** **ASPM Efficiency: Operational Counts Report:** Provides information about the number of ASPM Efficiency Departures and Arrivals. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Operational_Counts_Report

Module Name	Reports
	ASPM Efficiency: System Counts Report: Provides counts of Metric, Efficiency, TFMS, and CountOps IFR and VFR arrivals and departures for the selected airport or set of airports. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_System_Counts_Report **Airport Adjusted Capacity** **ASPM Efficiency: Airport Adjusted Capacity Report:** Provides information about airport adjusted capacity (AAC) at a selected airport or group of airports. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Airport_Adjusted_Capacity_Report **ASPM Efficiency: AAC Distribution Report:** Provides information on the rules governing determination of the Adjusted Departure Capacity, Adjusted Arrival Capacity, and Airport Adjusted Capacity by hour for each airport by hour. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_AAC_Distribution_Report **ASPM Efficiency: Unscheduled Flights Report:** Provides an estimate of the number of unscheduled arrivals and departures at an airport. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Unscheduled_Flights_Report **Configuration:** **ASPM Efficiency: Runway Configuration Report:** Provides various airport performance metrics by airport configuration. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Runway_Configuration_Report **ASPM Efficiency: Daily Configuration By Hour Report:** Provides hourly data on the runway configuration, scheduled and actual traffic, weather, and taxi times for specified airports. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Daily_Configuration_By_Hour_Report **ASPM Efficiency: Daily Weather By Hour Report:** Provides information about daily weather and visibility conditions at specified airports, and the runway configuration and arrival and departure acceptance rates in effect at the time. The weather data are acquired daily from the National Oceanic and Atmospheric Administration database. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Daily_Weather_By_Hour_Report **ASPM Efficiency: Actual Runway Configuration Report:** Provides the runway configuration provided by each facility and standardized versions of those configurations. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Efficiency:_Actual_Runway_Configuration_Report
Throughput Analysis: Contains data on actual airport throughput (number of arrivals and departures) in a defined period of time. This module uses Efficiency Flights, which includes all traffic reported by TFMS and any additional flights from ARINC or ASQP that were missing from TFMS (typically very few). All IFR flights, and some but not all VFR flights, are included. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Throughput_Analysis_Manual	**ASPM Throughput Analysis: Standard Report:** Provides maximum actual hourly arrivals, departures, and total operations, and the total number of operations for a specified airport, weather conditions (IMC or VMC), in a defined time period. The Operations reported are Efficiency Flights -- all traffic reported by TFMS and any flights reported by ARINC or ASQP that were missing from TFMS (typically very few). It includes all IFR flights and may include some, but not all VFR flights. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Throughput_Analysis:_Standard_Report **ASPM Throughput Analysis: Percentile Report:** Provides the maximum, median, mean, and 90th and 75th percentile number of actual departures and arrivals and total operations for a specified airport, weather condition (IMC or VMC), and time period. The Operations reported are Efficiency Flights -- all traffic reported by TFMS and any flights reported by ARINC or ASQP that were missing from TFMS (typically very few). It includes all IFR flights and may include some, but not all VFR flights. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Throughput_Analysis:_Percentile_Report

Module Group: Enroute

Module Name	Reports
City Pair Enroute: Provides enroute time and distance information on selected routes/flights. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_City_Pair_Enroute_Manual	**ASPM: Enroute: Flight Identification:** Provides flight level and enroute calculations for selected city pairs. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Flight_Identification **ASPM: Enroute: Detail:** Provides a list of individual flight reports detailing enroute metrics at specified flight segments. URL: http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Detail **ASPM: Enroute: Summary:** Provides averages of enroute metrics for the selected city pairs. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Summary **ASPM: Enroute: Statistical**: Provides City Pair Enroute statistics. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Statistical **ASPM: Enroute: Comparison Detail:** Provides comparison of enroute metrics at selected city pairs. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Comparison_Detail **ASPM: Enroute: Comparison Summary:** Provides comparison averages of enroute metrics at selected city pairs.

Module Name	Reports
	URL: http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Comparison_Summary **ASPM: Enroute: Unimpeded:** Provides unimpeded City Pair Enroute statistics. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Unimpeded **ASPM: Enroute: Graphs:** Provides cumulative graphs, histograms, and box plots summarizing enroute data for the selected flights. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Graphs **ASPM: Enroute: Weather Maps:** Displays satellite maps indicating weather conditions in the United States on the selected date(s). **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Weather_Maps **ASPM: Enroute: Flight Count:** Displays identification codes, counts, and percent of arrivals, carriers, and aircraft at the selected city pairs. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Flight_Count
Arrival Airport Enroute: Provides enroute time of all flights of 300 miles or more arriving at a selected airport or group of airports. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Arrival_Airport_Enroute_Manual	**ASPM: Enroute: Arrival Airport Summary:** Displays averages of enroute metrics for the selected city pairs. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Arrival_Airport_Summary **ASPM: Enroute: Arrival Airport Comparison Detail:** Provides comparison of enroute metrics at selected airports over different dates or time periods. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Arrival_Airport_Comparison_Detail **ASPM: Enroute: Arrival Airport Comparison Summary:** Provides comparison of averages of enroute metrics at selected airports over different dates or time periods. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Arrival_Airport_Comparison_Summary **ASPM: Enroute: Arrival Airport Ranking:** Provides ranking of enroute metrics at selected airports according to the user's ranking criteria. **URL:** http://aspmhelp.faa.gov/index.php/ASPM:_Enroute:_Arrival_Airport_Ranking

Module Group: Dashboards

Module Name	Reports
AERO: Provides links to the NAS AERO and Facility AERO reports. These are dashboard style reports primarily intended for providing a next day overview of Core airport performance. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_AERO_Manual	**ASPM AERO: NAS AERO Report Full:** Displays Core Airport daily performance with context on one sheet. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_AERO:_NAS_AERO_Report_Full **ASPM AERO: NAS AERO Report Lite:** Displays Core Airport daily performance with context on one sheet. It runs more quickly than the NAS AERO Report full and does not contain the individual box graphs which are displayed on the Full report. Otherwise it is identical to the NAS AERO Report Full. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_AERO:_NAS_AERO_Report_Lite **ASPM AERO: Facility AERO Report:** Displays Core Airport daily performance of a single facility with context on one sheet. Facility detail information is provided by clicking on the facility's code as hyperlink. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_AERO:_Facility_AERO_Report

Module Group: Other

Module Name	Reports
Weather Factors: Categorizes and reports on the severity of weather impact by airport by hour as: None, Minor, Moderate, or Severe, based on the historical relationship between the weather and percent on-time arrivals at that airport. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Weather_Factors_Manual	**ASPM Weather Factors: Delays Report:** Provides information about arrivals and departures (scheduled and actual), and delays (arrival, departure, taxi-out, and airborne), associated with varying weather impact levels (None, Minor, Moderate, Severe, and All) for the weather factor specified. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Weather_Factors:_Delays_Report **ASPM Weather Factors: On-Time Report:** Provides percentages of scheduled operations and on-time departures and arrivals associated with varying impact levels (None, Minor, Moderate, Severe, and All) for the weather factor specified. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Weather_Factors:_On-Time_Report **ASPM Weather Factors: Efficiency Report:** Provides data about efficiency counts, average hourly actuals, average hourly rates, SAER, and TAER at each impact level (None, Minor, Moderate, Severe, and All) for the selected weather factor. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Weather_Factors:_Efficiency_Report **ASPM Weather Factors: SAER/TAER Report:** Provides data about SAER and TAER rates associated with varying impact levels (None, Minor, Moderate, Severe, and All) at selected airport for the chosen weather factor **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Weather_Factors:_SAER/TAER_Report **ASPM Weather Factors: Percent Report:** Provides data about the number and percentages of operations associated with varying impact levels (None, Minor, Moderate, Severe, and All) for the selected weather factor.

Module Name	Reports
	URL: http://aspmhelp.faa.gov/index.php/ASPM_Weather_Factors:_Percent_Report **ASPM Weather Factors: Capacity Report:** Provides the number of time periods associated with varying impact levels (None, Minor, Moderate, Severe, and All) for the chosen weather factor, and the sum of Airport Departure Rate and Capacity Airport Arrival Rates during those periods. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Weather_Factors:_Capacity_Report **ASPM Weather Factors: Details Report:** Provides data about the impact of weather factors per selected date (multiple reports are displayed on the same page when a range of dates is selected). **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Weather_Factors:_Details_Report **ASPM Weather Factors: Scenario Report:** Provides data about the impact of weather factors per each selected airport. Dates, grouping, and filter options are not available for this report. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Weather_Factors:_Scenario_Report **ASPM Weather Factors: Frequency Report:** Provides data about the impact of weather factors per each selected airport for total of scheduled operations. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Weather_Factors:_Frequency_Report
Diversions Manual: Provides information on flight diversions as detected by an algorithm. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Diversions_Manual	**ASPM Diversions: Detail Report:** Provides flight-specific information about flights that were diverted from their intended destination due to adverse conditions at the intended arrival airport or a situation on board the aircraft that required the flight to land at a nearby airport. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Diversions_:_Detail_Report **ASPM Diversions: Summary Report:** Provides counts of diversions by date, by airport, or other specified grouping. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Diversions_:_Summary_Report
Advisories Manual: Provides information on advisories for traffic management initiatives, operations plans, and other notices found in the National Traffic Management Log Data Warehouse. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Advisories	There are three sections within the Advisories module: **Advisories Search Utility**: Allows users to search all advisories in the NTML data warehouse using dates, keywords, and Boolean operators. **Advisories Summary Report**: Displays summary reports of Ground Delay Programs and Ground Stops (GDP and GS), or Airspace Flow Programs, Collaborative Trajectory Options, and Re-Routes, with drill-down capability to individual advisories. **Customer Comments**: Allows users to search customer comments using dates and keywords and Boolean operators
Data Download Manual: Allows users to retrieve larger amounts of data more quickly than can easily be generated from the standard reporting interface. Access to this module is restricted. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Data_Download_Manual	**ASPM Data Download: Detail By Hour:** Provides airport delay information (compared with on-time flight statistics) by local hour (0 to 23). **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Data_Download:_Detail_By_Hour **ASPM Data Download: Detail By Quarter Hour:** Provides airport delay information (compared with on-time flight statistics) by quarter hour. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Data_Download:_Detail_By_Quarter_Hour **ASPM Data Download: ETMS/Demand:** Provides ETMS counts by user group and by equipment for the selected airport or set of airports. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Data_Download:_ETMS/Demand **ASPM Data Download: Flight Level Data:** Provides detailed information on scheduled and actual times and delays for individual flights. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Data_Download:_Flight_Level_Data **ASPM Data Download: Derived Canceled Flights:** Provides an estimation of flight cancellations. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Data_Download:_Derived_Canceled_Flights
Actual Weather Manual: Provides reports on individual weather factors based on the severity of the weather phenomenon and reports actual observed values for each weather factor at selected airports by hour. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Actual_Weather_Manual	**ASPM Actual Weather: Standard Report:** Provides information about the number of hours of none, minor, moderate, and severe weather conditions per selected airport(s) and date(s), for the following weather factors: wind, ceiling, visibility, nearby thunderstorms, and local weather phenomena such as snow and mist. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Actual_Weather:_Standard_Report **ASPM Actual Weather: Percent Report:** Provides information about the percent of hours of none, minor, moderate, and severe weather conditions per selected airport(s) and date(s), for the following weather factors: wind, ceiling, visibility, nearby thunderstorms, and local weather phenomena such as snow and mist. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Actual_Weather:_Percent_Report **ASPM Actual Weather: Scheduled Operations Report:** Provides information about the number of scheduled operations during hours of none, minor, moderate, and severe weather conditions per selected airport(s) and date(s), for any of the following individual weather factors: wind, ceiling, visibility, nearby thunderstorms, and local weather. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Actual_Weather:_Scheduled_Operations_Report

Module Name	Reports
	ASPM Actual Weather: Local Weather: Hours Report: Provides information about the number of hours that local weather phenomena occurred, and the overall local weather severity level (none, minor, moderate, severe, and combined) at selected facilities. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Actual_Weather:_Local_Weather:_Hours_Report **ASPM Actual Weather: Local Weather: Percent of Hours Report:** Provides information about the percentage of hours that local weather phenomena occurred, and the overall local weather severity level (none, minor, moderate, severe, and combined) at selected facilities. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Actual_Weather:_Local_Weather:_Percent_of_Hours_Report **ASPM Actual Weather: Local Weather: Scheduled Operations Report:** Provides information about the number of scheduled operations during periods experiencing local weather phenomena and the number by overall severity of the local weather (none, minor, moderate, severe, and combined). **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Actual_Weather:_Local_Weather:_Scheduled_Operations_Report **ASPM Actual Weather: Local Weather: Percent of Scheduled Operations Report:** Provides information about the percentage of scheduled operations during periods experiencing local weather phenomena and the percentage by overall severity of the local weather conditions (none, minor, moderate, severe, and combined). **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Actual_Weather:_Local_Weather:_Percent_of_Scheduled_Operations_Report **ASPM Actual Weather: Actual and Impacted Percent Comparison Report:** Provides comparison of the actual and impact values of the overall weather on the airport(s) for each weather severity level (none, minor, moderate, and severe). **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Actual_Weather:_Actual_and_Impacted_Percent_Comparison_Report **ASPM Actual Weather: Scenario Report:** Provides minimum and maximum values used for classification of each weather factor (wind, ceiling, visibility, thunderstorms within 50 miles) as none, minor, moderate, or severe. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Actual_Weather:_Scenario_Report **ASPM Actual Weather: Weather Detail Report:** Provides information about actual observed values by local hour for the weather factors of wind, ceiling, visibility, nearby thunderstorms, and local weather, at specified facilities on selected dates. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Actual_Weather:_Weather_Detail_Report **ASPM Actual Weather: On-Time & Efficiency Report:** Provides weather based On-time and Efficiency reports. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Actual_Weather:_On-Time_%26_Efficiency_Report
Operational Performance Review Manual: Provides Managers of Tactical Operations (MTOs), Service Area Managers, and individual facility managers the ability to monitor a variety of performance measures on a daily and quarterly basis. **URL:** http://aspmhelp.faa.gov/index.php/ASPM_Operational_Performance_Review	NA

Abbreviations and acronyms used without definitions in TRB publications:

A4A	Airlines for America
AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FAST	Fixing America's Surface Transportation Act (2015)
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
MAP-21	Moving Ahead for Progress in the 21st Century Act (2012)
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TDC	Transit Development Corporation
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation

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