Terminal Flight Data Manager User Guide

A Handbook for Collaborative Surface Management

Quick Start Guide

Document Summary

This user guide provides an overview of Terminal Flight Data Manager (TFDM)'s Surface Management & Metering, as well as Surface Collaborative Decision Making (S-CDM). TFDM is the FAA's future tower-based surface management solution and is scheduled to be deployed to 49 airports and Air Traffic Control Towers (ATCTs) across the National Airspace System (NAS) starting in 2022. The primary focus of this document is TFDM's Surface Metering Program (SMP) functionality.

Refer to the Executive Summary for a more detailed summary

Document Audience

The intended audience for this user guide includes all of the conventional surface operations stakeholders at each participating TFDM surface metering airport, such as: ATCT facilities, airport operators (often state, county, and municipal airport authorities), flight operators, ramp operators, ramp control (entities charged with the oversight of pushbacks and taxiing within the Non-Movement Areas), and general aviation Fixed-Base Operators (FBOs). Additionally, the intended audience further includes off-surface stakeholders who are directly affected by surface operations, such as: the Air Traffic Control System Command Center (ATCSCC), Air Route Traffic Control Center (ARTCC) facilities, Terminal Radar Approach Control (TRACON) facilities, and Flight Operations Center (FOC) facilities for each participating airline. The roles for each of these TFDM surface metering stakeholders are described in Section 3.

Document Purpose

The purpose of this user guide is to provide stakeholders involved in TFDM surface metering with the information they need to successfully participate in the implementation and use of TFDM and local TFDM surface metering stakeholder community, and to be prepared to participate in collaboration and data exchange processes. Certain sections will be more relevant to some stakeholders than others; however, all stakeholders are still encouraged to read every section.

TFDM surface metering procedures for each Airport will be developed as part of a Local Letter of Agreement between FAA and local Stakeholders. Any local Letter of Agreement (LOA) procedures supersede any of the roles and responsibilities provided in this user guide.

Document Navigation

If you are a **flight operator**, you should focus on Sections 3.1, 6, 7, and 8.

Refer to page 9 and pages 33 through 43

If you are a **pilot**, you should focus on Sections 3.2, 6, 7, and 8.

Refer to page 10 and pages 33 through 43

If you are a **ramp operator** or **ramp control**, you should focus on Sections 3.3, 6, 7, and 8.

Refer to page 11 and pages 33 through 43

If you are an **airport operator**, you should focus on Sections 3.4, 6, 7, and 8.

Refer to page 12 and pages 33 through 43

If you are a **general aviation and business aviation operator** or **FBO**, you should focus on Sections 3.5, 6, 7, and 8.

Refer to page 13 and pages 33 through 43

If you are an **FBO**, you should focus on Sections 3.6, 6, 7, and 8.

Refer to page 14 and pages 33 through 43

If you are **ATCT personnel**, including a **traffic manager (TM)**, specifically concerned with understanding your role in TFDM surface metering and local collaboration, you should focus on Sections 3.7, 4, 6, 7, and 8.

Refer to pages 15, pages 16 through 25, and pages 33 through 43

If you are a stakeholder specifically concerned with **TFDM surface metering and S-CDM data**, you should focus on Sections 4.3 and 5, and Appendix B.

Refer to page 23, pages 26 through 32, and pages 51 through 52

Document Layout

After the introduction, Sections 2 and 4 of the TFDM surface metering user guide provide an **overview of TFDM, surface scheduling, and SMPs**, explaining the benefits and how the surface operations initiatives function within the airport operation. Section 3 provides descriptions of the **roles for each stakeholder** as referenced above.

Refer to pages 3 through 25

Since the exchange of information between stakeholders is at the core of TFDM surface metering, the user guide continues in Section 5 with an overview of **TFDM surface metering data exchange**, including the sharing of data from non-FAA stakeholders to FAA stakeholders and vice versa. This exchange of data includes flight metadata, flight substitution notifications, flight delay data, airport status information, traffic management restrictions, and surface metering data.

Refer to pages 26 through 32

The user guide subsequently continues in Sections 6, 7, and 8 with the **SMP execution timeline**, which represents most of this document. This timeline is divided into three distinct phases, each one specifically detailing the roles of each local stakeholder throughout the entire SMP event:

- The **SMP pre-event strategic planning** phase (forecasting and coordinated preparation)

  Refer to pages 33 through 35

- The **SMP tactical planning and execution** phase (implementation, monitoring, and adjusting)

  Refer to pages 36 through 41

- The **SMP post-event analysis** phase (exiting the SMP and coordinated review)

  Refer to pages 42 through 43

The user guide then concludes in Sections 9 and 10 with content that examines **local considerations**, **best practices**, and **various other factors** not covered in the preceding sections.

Refer to pages 44 through 49

Additionally, to supplement the above sections, the user guide also contains several appendices that define **program-specific terms**, **acronyms**, and **TFDM data elements**.

Refer to pages 50 through the end of the document

Executive Summary

This user guide provides an overview of Terminal Flight Data Manager (TFDM) Surface metering and the Federal Aviation Administration's (FAA) future tower-based surface management solution, TFDM, scheduled to be deployed to 49 airports and Air Traffic Control Towers (ATCTs) across the National Airspace System (NAS) starting in 2022. TFDM will provide tower controllers new automation and displays designed to improve surface operational efficiency, improve situational awareness of airport traffic and conditions, replace outdated legacy systems, and improve surface collaborative decision making between NAS users and the FAA. The user guide provides an overview of TFDM, services provided to the FAA and non-FAA stakeholders, as well as details on Surface metering Programs (SMP). The user guide provides information on roles and responsibilities, data exchange, and processes to establish surface metering, executing SMPs, and best practices for maintaining collaboration in the surface environment.

TFDM will provide improvements to flight data coordination and management for ATCT users, as well as enhanced surface traffic flow management capabilities. TFDM will replace ATCT paper flight strips with electronic flight strips, provide automation for electronic flight and airport data management, and interface with other NAS systems to share electronic flight data. In addition, TFDM will provide a suite of capabilities designed to improve traffic flow management, including new surface scheduling capabilities, surface traffic visualization tools, and operational metrics. These tools will aid ATCT and non-FAA stakeholders in improving efficiency on the surface and immediate airspace surrounding the airport, while maintaining safe operations.

Surface metering will be enabled by a new partnership between the FAA and non-FAA stakeholders (e.g., airport operators, flight operators, and ramp operators, pilots, fixed-base operators, etc.) to collaborate, exchange data, and execute surface metering. The surface metering concept has been an important topic for research and development by the FAA and its partners since the 2000s. In 2010, the Surface Collaborative Decision Making (CDM) Team (SCT), a joint government and industry collaboration group, formed and documented the FAA's S-CDM concept and vision. The goal of the concept was to improve the predictability and efficiency of surface operations in a collaborative manner and to incorporate and meet different stakeholders' objectives, constraints, and data needs. Because of TFDM's planned capabilities for electronic data exchange, traffic flow management, and surface scheduling, the surface metering concept was integrated into TFDM's automation capabilities.

Data exchange is the foundation of TFDM's surface scheduling and metering capabilities and coordination. There are three key data exchange activities that stakeholders need to engage in to achieve TFDM surface metering benefits. Users must provide intent data to the FAA via the TFMData System Wide Information Management (SWIM) Service. Users will also be responsible for receiving data from the FAA via the TFDM Terminal Publication (TTP) SWIM Service. Lastly, users will need to connect to the Flight Operator System (FOS) Collaboration Service (TFCS); this two-way, request/reply feed allows flight operators to request the substitution of flights during a SMP and share other non-movement area information, such as ramp closures.

Before a SMP is initiated, early engagement and collaboration between all stakeholders are prerequisites for successful SMP execution. SMP planning and coordination will be conducted via the mechanisms specified in the local Letter of Agreements (LOA) wherein stakeholders discuss the various SMP parameters, such as desired target queue lengths, expected local surface and airspace impacts and national impacts, if any, airport configuration, the type of SMP desired, and discussion of flight substitutions. Both FAA and non-FAA stakeholder responsibilities are discussed.

The tactical planning and execution phase of a SMP consists of four phases. The first phase begins with the SMP recommendations from TFDM based on when the system detects the potential need for a SMP. TFDM recommends a SMP when one or more departure queues exceeds the departure target queue length upper threshold parameter for a minimum amount of time. This prediction is made using TFDM's predicted runway schedule and forecasted departure demand along with the input parameters for the airport such as runway departure rates and target queue length thresholds. FAA and non-FAA stakeholder coordination responsibilities are defined with recommended SMP parameters for each phase of SMP execution including stakeholder coordination, SMP implementation, and SMP monitoring and adjustments.

During an active SMP, flight operators can substitute flights within a SMP subject to certain rules as outlined in this user guide. Substitution during a SMP allows flight operators to prioritize flights by substituting them with other flights controlled by the same flight operator or a regional carrier flying for the flight operator. Additionally, substitution allows flight operators to determine how they want to fill spots in the metering program vacated by other flights that have either been delayed or cancelled including flights that were marked for substitution prior to SMP activation.

Following the conclusion of a SMP, the user guide outlines the SMP exit strategy, post event analysis, FAA and non-FAA stakeholder coordination, and FAA and non-FAA stakeholder responsibilities during the exit phase. TFDM will recommend that SMP's be terminated or modified when pre-defined parameters are satisfied. Generally, the SMP be terminated when the queue length is predicted to fall below the departure target queue length lower threshold and when the unmetered queue will not exceed the departure target queue length upper threshold for the remainder of the scheduled SMP.

Post-SMP event analysis and metrics will be available to all stakeholders via the TFDM TTP feed. Stakeholders are expected to utilize this data as set out in the Airport Specific LOA. This collaboration will help the stakeholders understand the performance of a SMP and how it compares with previous SMP programs, as well as maintain awareness of overall airport operations, data accuracy, and benefits.

The user guide additionally provides SMP local considerations and best practices. The SMP framework as outlined in the user guide is not "plug-and-play", and there is not a "one-size-fits-all" template that can be implemented at each participating airport. Every airport has its own set of unique characteristics relating to number of runways, layout of runways, layout of taxiways, and size of ramps. The user guide is intended to provide guidance to SMP stakeholders regarding what questions should be asked during the localization phase of planning an airport's SMP implementation and also to describe a variety of best practices to be debated and considered by local SMP stakeholders—all of which is intended to assist stakeholders in the optimization of their SMP and enable successful completion of its core objectives.

Version History

Version 0.1	**Initial Working Draft**
Version 0.2	**Updates to programmatic timeline, capabilities, and Collaborative Decision Making principles**
Version 1.0	**Finalization of updates to programmatic plans, timeline, and Surface Metering Program/Surface Working Group processes and procedures**

The MITRE Corporation's Center for Advanced Aviation System Development (MITRE CAASD) has developed this guide under contract with the FAA.

NOTE: This document may be updated to reflect TFDM changes that occur during development.

Table of Contents

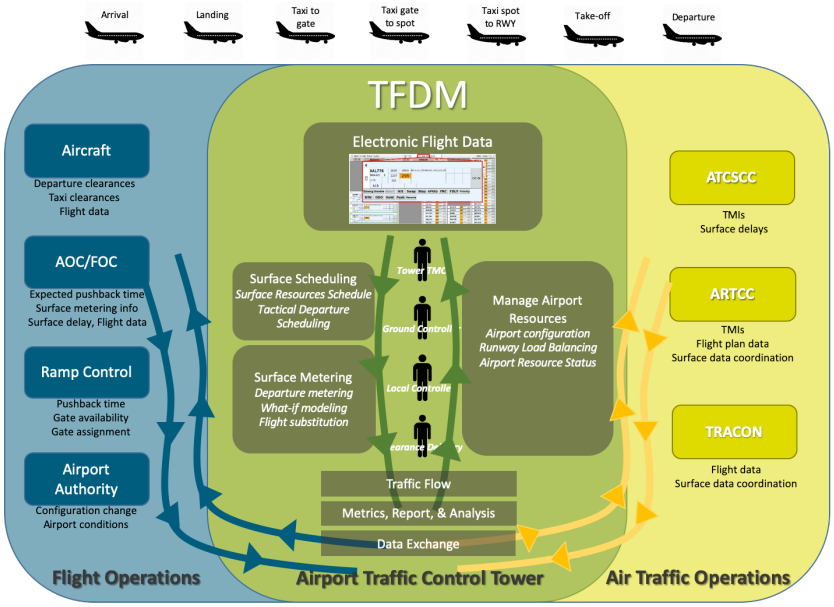
List of Figures

List of Tables

1 Introduction to Terminal Flight Data Manager & Surface Metering

Terminal Flight Data Manager (TFDM) is a Federal Aviation Administration (FAA) Next Generation Air Transportation System (NextGen) initiative and Trajectory Based Operations (TBO)-enabling system to improve surface efficiency and stakeholder collaboration. TFDM is the FAA's future surface management solution that will be deployed to 49 airports and Air Traffic Control Towers (ATCTs) across the National Airspace System (NAS) starting in 2022. TFDM is a tower-based system that will provide tower controllers automation and displays to improve efficiency in operations, improve situational awareness of airport traffic and conditions, and replace certain systems and guide operations utilized today.

TFDM will provide improvements to flight data coordination and management for ATCT users, as well as enhance surface traffic flow management (TFM) capabilities. TFDM's objectives include improved surface management and efficiency, reduction of taxi delays, carbon emissions and fuel burn, and increased sharing of surface information with other TFM systems in the NAS. The use of surface metering will be enabled by a new TFDM surface metering partnership between the FAA and non-FAA stakeholders (e.g., airport operators, flight operators, and ramp operators) to collaborate, exchange data, and execute surface metering.



Operational View of the TFDM System and Stakeholders:
TFDM provides ATCTs automation to increase tower and surface efficiency. TFDM relies on data exchange and collaboration with other FAA stakeholders and systems, as well as non-FAA stakeholders.

Figure 1. TFDM Operational View

The purpose of this user guide is to provide all stakeholders with the information they need to successfully participate in local TFDM surface metering-related activities. Certain sections will be more relevant to some stakeholders than others, however all stakeholders are still encouraged to read every section. For instance, the data elements described in Section 5 are most relevant to those concerned with TFDM surface metering data, whereas operational stakeholders will want to focus their attention on Sections 4, 6, 7, and 8, which focus on Surface Metering Program (SMP) execution. Sections 3, 6, 7, and 8 explicitly list the roles of FAA and non-FAA stakeholders during each phase of the SMP lifecycle to make it easy for users to find what is expected of them. All users are encouraged to become experts with their roles and knowledgeable of what others are expected to do as well.

2 Overview of Terminal Flight Data Manager & Surface Metering

Surface metering is enabled using the TFDM system and local collaboration processes, procedures, and policies that help flight operators, ramp operators, airport operators, and other stakeholders efficiently use available airport surface capacity. Surface metering allows flights to absorb delays normally taken on the movement areas at the gate[1]. This can lead to a reduction in fuel burn, engine emissions, and cycles, while improving stakeholder situational awareness and providing predictability of surface use to the ATCT.

The FAA's surface metering concept has been an important topic for research and development by the FAA and its partners since the 2000s. In 2010, the Surface CDM Team (SCT), a joint government/industry collaboration group, formed and documented the FAA's Surface metering concept and vision. The goal of the concept was to improve the predictability and efficiency of surface operations in a collaborative manner to incorporate and meet different stakeholders' objectives, constraints, and data. The FAA established operational increments (OIs) to ensure this goal was met through development of automation to support surface metering and exchange of information between FAA and non-FAA stakeholders. Due to TFDM's existing planned capabilities for electronic data exchange, TFM, and surface scheduling, the concept was integrated into the system's automation capabilities.

"Surface CDM is the sharing of flight movement and related operational information among Airport Operators, Flight Operators, Flight Service Providers, and FAA Stakeholders to improve demand and capacity predictions, thereby enabling those who practice the Surface CDM concept to maximize the use of available airport and airspace capacity, while minimizing adverse effects on Stakeholders, passengers, and the environment."

Surface Collaborative Decision Making (CDM) Concept of Operations (ConOps) in the Near-term (FAA), 2013.

TFDM's surface metering functionality provides the ability to tactically manage departure queues based on predicted demand and available surface capacity. Surface metering relies on TFDM's predicted schedule to identify periods where departure queues continuously exceed desired queue length. Surface metering processes, tasks, and responsibilities will span three phases of a SMP "lifecycle", depicted in Figure 2. For these periods, TFDM recommends a SMP, during which flights will receive metering times to assist in maintaining desired queue lengths and reduce the time spent in the queue by the flight. TFDM provides these recommendations and program details to all stakeholders, both FAA and non-FAA, to create common situation awareness for surface operations. The system will also provide stakeholders monitoring and analysis capabilities during and after SMP events.

[1] "Gate" and "Stand" are used interchangeably throughout this document to refer to an aircraft parking or hold location, e.g., physical gate, hard stand, or location in non-movement area.

Surface Metering Timeline

- ***Strategic Planning:*** *Forecasting collaboration and data exchange*
- ***Tactical Execution:*** *Management of queues and resources*
- ***Post Event:*** *SMP performance evaluation and future planning*

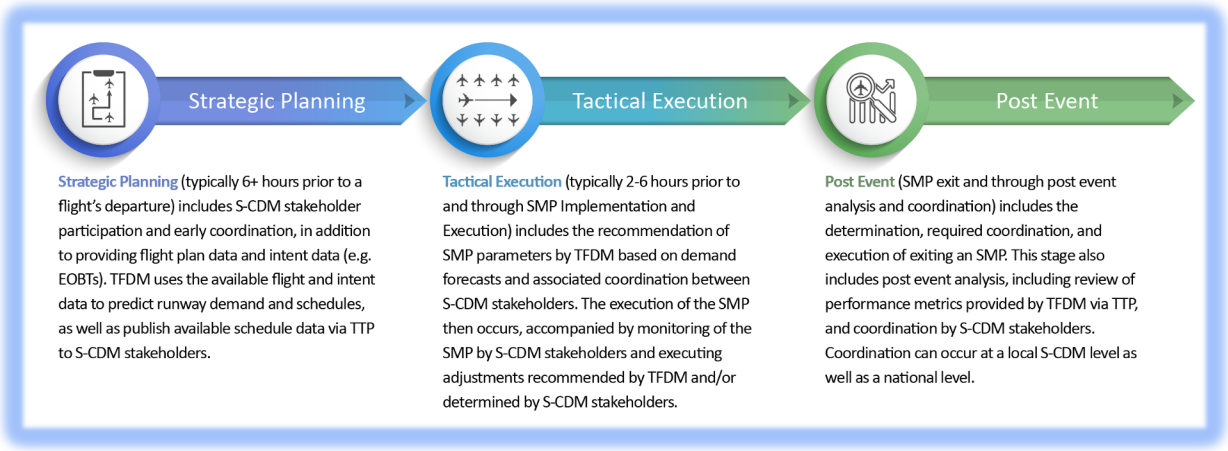


Figure 2. SMP Timeline and Phases

The use of TFDM's surface metering functionality relies on stakeholder agreement for local processes, procedures, and policies (P3). This includes local policies to establish the use of surface metering at TFDM airports and local processes and procedures to implement SMPs, as well as national-level policies and procedures. Local surface metering agreements are necessary due to the differences between operations and stakeholders across the TFDM airports. These agreements can be satisfied by local Letters of Agreement (LOAs) established by local stakeholders and may include processes for implementing SMPs, policies for post-event analysis, and procedures for certain operational events. National-level surface metering P3 will assist in governing available data, national delay reporting policies, and processes for performing operations that do not differ across local operations (e.g., substitution rules).

Goals of Surface Metering

- *Manage queue lengths to reduce excess delay spent actively taxiing on the surface.*
- *Reduce fuel burn and emissions associated with longer queue wait times.*
- *Improve predictability on the surface for both FAA and non-FAA stakeholders.*
- *Provide automation capabilities to support surface metering.*

TFDM will distribute surface schedule and operational data amongst stakeholders involved in surface metering, including flight operators, ramp control facilities, and local stakeholders via System Wide Information Management (SWIM). This data publication allows stakeholders to have a shared view of surface operations beyond just SMPs. The operational data includes current and predicted operations, airport performance, traffic management initiatives (TMIs) affecting flights, SMP information, and other data for the TFDM airport and flights operating to and from the airport. Additionally, TFDM will ingest data provided by these stakeholders, as well as other FAA systems, to improve surface predictions, inform an estimated surface schedule, and enable strategic and tactical TFM planning. This data sharing will enable collaborative decision making between the FAA and non-FAA stakeholders regarding the airport surface, departure, and arrival operations.

Pathway to Surface Metering Implementation

Leading up to the use of TFDM surface metering, as described in this document, key activities should occur by and between the stakeholders. This page describes these activities and expectations prior to TFDM implementation and surface metering usage.

FAA Stakeholder Activities

Prior to implementation of the TFDM system at an airport, the FAA will engage in several key activities, including **training**, **local adaptation development**, **and local procedural development**. The FAA will also perform **system and interface testing** to ensure surface metering functions and data exchange capabilities are performing as expected.

Non-FAA Stakeholder Activities

Leading up to the implementation of the TFDM system, non-FAA stakeholders should determine necessary **internal business and system changes necessary for surface metering**. This includes establishing practices for determining and submitting data, expected involvement in **pre-implementation local activities**, and **utilizing available FAA interface testbeds** to ensure connectivity and data submission.

Joint Stakeholder Activities

Collaborative Site Implementation Team (CSIT): Approximately 12-18 months prior to the implementation of TFDM at an airport, the FAA will engage with the local community via CSIT meetings. These multi-day meetings are meant to bring local stakeholders, both FAA and non-FAA, together to begin discussions on the local needs and specificities for the implementation of the TFDM system and to prepare for the use of surface metering.

Local LOAs: Utilizing the collaboration during the CSIT meetings and this user guide, it is expected that local agreements, in the form of LOAs, will be developed to establish policies, procedures, and processes for the use of surface metering at an airport. This agreement will serve as governance for topics including collaboration methods and timing, local stakeholder roles and responsibilities, and SMP parameters for initial use.

Establish local collaboration & user groups guidelines: Collaboration between stakeholders prior to, during, and following surface metering usage is critical to the successful realization of surface metering benefits by all stakeholders. Prior to implementation of TFDM, local agreements should be made to determine topics including, but not limited to: local stakeholder roles, local scorecard parameters, scorecard usage, frequency and method of local collaboration, and off-nominal event and collaboration management.

Define Surface Adaptation: Prior to the implementation of TFDM, local stakeholders will need to work with the FAA to define the locations on the surface of the airport (e.g., gates, spots, holding resources). These will be displayed in the TFDM map view and used in surface scheduling.

2.1 Key Terminal Flight Data Manager Capabilities

TFDM provides four core capabilities as part of the automation suite, identified in Figure 3.

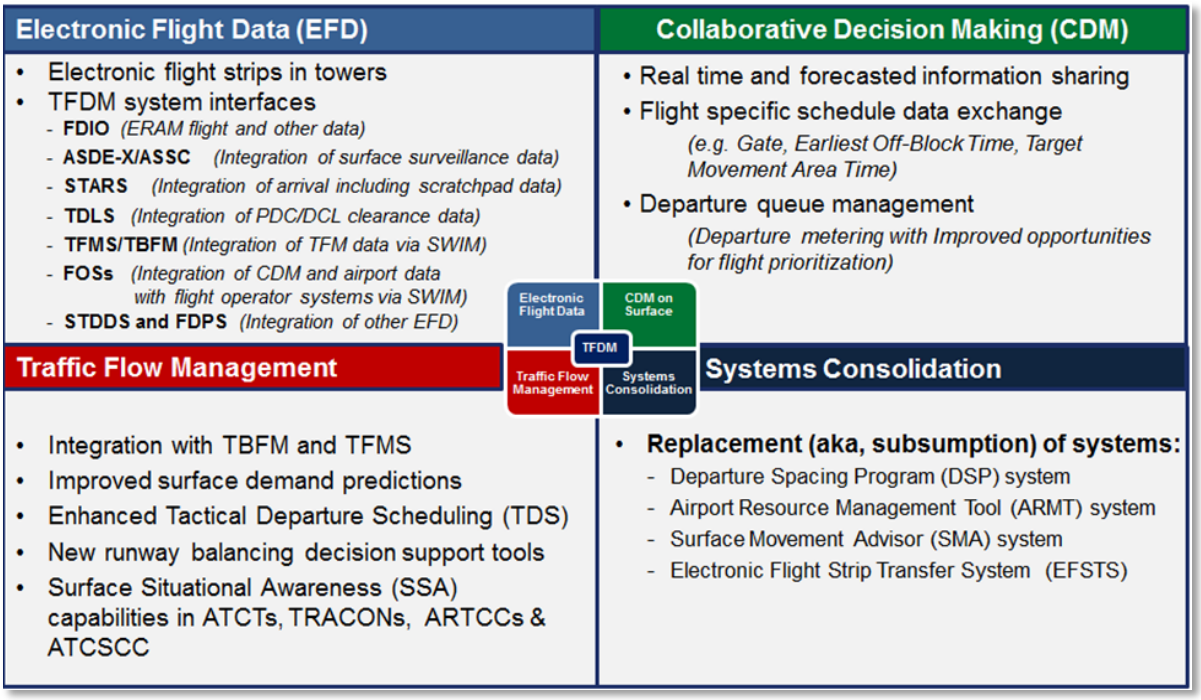


Figure 3. TFDM Capabilities Overview

1. **Electronic Flight Data (EFD):** TFDM will replace ATCT paper flight strips with electronic flight strips, provide automation for electronic flight and airport data management, and interface with other NAS systems to share electronic flight data. Key subcomponents of EFD include:

    a. **Electronic Flight Strips (EFS):** TFDM will provide software, displays, and interface mechanisms (e.g., mouse, keyboard) to replace paper flight strips used in ATCTs today. EFS will utilize flight data from existing FAA systems and data sourced from TFDM, non-FAA stakeholders (e.g., flight operators), and other FAA systems (e.g., Tower Data Link Services [TDLS]) to provide flight data to ATCT controllers and managers. EFS will provide real-time updates of flight data to controllers, reduce guide flight strip actions (e.g., guide runway notations), and provide enhanced situational awareness about flight intent and airport conditions to controllers and managers.

    b. **Airport Resource Management:** TFDM will provide ATCTs with improved electronic management and coordination of airport resources. This function will allow electronic scheduling and management of airport configurations, including managing in-use runways and associated rates, and distribute this information to users at the airport and to other NAS systems via the TFDM Terminal Publication (TTP) SWIM service. TFDM will also provide ATCTs with enhanced automation to better manage airport resource efficiency through modeling tools to improve runway throughput management.

c. **Electronic Flight Data Management:** TFDM will utilize SWIM to consume and distribute FAA and non-FAA data amongst stakeholders. TFDM will ingest data from other TFM systems (e.g., Traffic Flow Management System [TFMS], and Time-Based Flow Management [TBFM]) and stakeholders (e.g., flight operators) to inform TFDM components, including electronic flight strips displayed data, modeling tools, and airport resource management tools. TFDM will distribute metric data, airport resource statuses, estimated schedule information, and other predictive and tactical surface information via SWIM interfaces.

2. **TFM:** TFDM will provide a suite of capabilities designed to improve TFM, including:

   a. **Surface Scheduling:** New surface scheduling capabilities will improve the strategic surface demand predictions that are provided to NAS automation systems and flight operators. TFDM will utilize adapted rules, data from external systems and stakeholders, historical data captured by TFDM, and controller input to generate a predicted airport surface schedule and runway schedule for each available runway. The schedule information, including estimated time of takeoff for each flight, will be published for use by other NAS systems and non-FAA stakeholders.

   b. **Runway Load Balancing:** This tool's capabilities will assist controllers in balancing demand when multiple departure runways are in use at busy airports. This tool will increase efficiency of runways and support the ATCT in meeting available runway capacity and reducing delay to the airport demand.

   c. **Surface Situational Awareness (SSA):** This capability (hosted on TFMS displays) will provide insight into surface operations for Terminal Radar Approach Control (TRACON) and Air Route Traffic Control Center (ARTCC) facilities with a visual representation of the surface movement area with live flight traffic depicted, associated traffic flow metrics, and departure flight lists. SSA will utilize both TFMS and available TFDM data to provide insight into the airport environment to facilitate better collaborative decision making between FAA facilities.

   d. **Electronic Call for Release (CFR) Coordination:** TFDM will provide controllers and managers with the ability to use TFDM to automatically request release times from TBFM. This capability will streamline the guide request process used today and improve efficiency in coordination between the surface and en route schedules and constraints.

3. **Surface Management & Metering:** TFDM will provide a departure queue management capability (a.k.a., surface metering) to allow for more efficient strategic scheduling and metering of the airport surface. Surface metering benefits are achieved by providing Target Movement Area Entry Times (TMATs) to flight operators to better manage the flow of traffic on the surface. This capability will provide enhanced data sharing between the FAA and flight operators allowing flight operators to provide more information to the FAA in return for the FAA providing more predictable surface scheduling and metering data.

4. **Systems Consolidation:** TFDM will subsume end-of-life ATCT systems including the Airport Resource Management Tool (ARMT), Departure Spacing Program (DSP), and the ATCT portion of Electronic Flight Strip Transfer System (EFSTS) ensuring those legacy system capabilities are still provided to facilities and integrated with other NAS systems.

3 Surface-Collaborative Decision-Making Key Stakeholder Roles and Responsibilities

The success of TFDM surface metering relies on stakeholders conducting key actions during the three phases of SMP planning, execution, and post-event analysis. These actions include submission of key data elements, coordination with other stakeholders, and other processes and activities necessary to ensure SMPs provide benefit to all stakeholders involved. The following subsections detail the roles and responsibilities and key actions, including relevant data submission, that should be undertaken during the three phases.

Non-FAA Stakeholder: Flight Operations Center (FOC)/Flight Operator (FO) Personnel: *Typically associated with conducting commercial flight operations. Includes personnel involved with the aircraft operations, dispatchers, and aircraft maintenance.*

Non-FAA Stakeholder: Pilot-in-Command (PIC): *The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft. This section applies to commercial, business, and general aviation PICs operating aircraft at airports employing surface metering.*

Non-FAA Stakeholder: Ramp Operator/Ramp Control: *Entity responsible for handling pushback in a designated ramp area and managing traffic operations in the non-movement area. This role may be performed by an airport operator, a flight operator, or third party; flights controlled should be established by pre-defined agreements between the parties.*

Non-FAA Stakeholder: Airport Authority/Airport Operator: *Some airports employ airport management personnel to conduct the duties of ramp and airport management. This also includes personnel who are responsible for construction and maintenance activities on the airport surface, including ramps and movement areas.*

Non-FAA Stakeholder: General Aviation (GA)/Business Aviation (BA): *Refers to individual(s) responsible for handling the pushback and/or managing ramp operations for GA flights typically in ramp areas designated for GA. To the extent feasible, GA should operate their aircraft in compliance with the SMPs and may participate in the coordination of SMPs.*

Non-FAA Stakeholder: Fixed Base Operators (FBO): *Entities operating at an airport to provide services to operators (commercial, GA, or BA) including fueling, parking, maintenance, and equipment.*

Local Air Traffic Control Tower and Other FAA Stakeholders: *All local and national FAA stakeholders involved in the planning, execution, and post-event review of SMPs. This includes local ATCT personnel (Ground Control, Local Control (LC), Traffic Managers, etc.), overhead facilities (TRACON, ARTCC), and ATCSCC.*

3.1 Non-FAA Stakeholder: Flight Operations Center (FOC)/Flight Operator (FO) Personnel

During the Strategic Planning Phase, the FOC/FO Personnel's key role is providing the FAA flight intent information as well as participating in surface metering coordination with the FAA and other stakeholders, as defined in local procedures or as necessary.

Key Data Submission

- Flight Plans
- Flight Intent, including but not limited to Earliest Off Block Time (EOBT)
- Substitution Intent

Key Actions and Responsibilities

- Provide the FAA information that can affect SMP performance, including expected off-nominal operating conditions (e.g., informal de-icing, extensive cancellations).
- Review locally established SMP parameters and/or TFDM provided recommended-SMP parameters (if applicable) and determine if parameters (e.g., start/stop time, queue length) meet business needs.
- Coordinate with FAA stakeholders on SMP parameters that do not meet business needs.

During the Tactical Execution Phase, the FOC/FO Personnel's key role is maintaining a flight's flight plan data to match the business intent of the flight. Additionally, the FOC/Flight Operator Personnel should work towards meeting surface metering compliance times.

Key Data Submission

- Update Flight Plans
- Maintain Flight Intent, including but not limited to EOBT
- Gate assignments
- Substitution Requests

Key Actions and Responsibilities

- Provide the FAA information that can affect SMP performance, including expected off-nominal operating conditions (e.g., informal de-icing, extensive cancellations).
- Review locally established SMP parameters and/or TFDM provided recommended-SMP parameters (if applicable) and determine if parameters (e.g., start/stop time, queue length) meet business needs.
- Coordinate with FAA stakeholders on SMP parameters that do not meet business needs.

During the Post SMP Stage, the FOC/FO Personnel's key role is reviewing their compliance with SMP times as well as determining if business needs were met during the SMP and providing feedback to local stakeholders, as applicable, per local agreements.

Key Data Review

- TMAT Compliance Metrics
- Controlled Time of Departure (CTD) Compliance Metrics
- SMP Queue Length Performance
- SMP Parameters

Key Actions and Responsibilities

- Monitor the SMP performance and provide input, as necessary, to FAA personnel for SMP termination, compression, or extension; coordinate outcome with organization stakeholders (e.g., pilots, ramp crews).
- Provide feedback to FAA and/or other local stakeholders on SMP parameters and execution, including ability to meet business and operational objectives and needs.
- Provide recommendations for future SMP adjustments (parameters, timeframe, etc.).
- Representative participates in regularly scheduled post event review meetings with the surface stakeholder group.

3.2 Non-FAA Stakeholder: Pilot in Command (PIC)

During the Strategic Planning Phase, the Pilot in Command (PIC) is responsible for understanding how an SMP may impact the flight. This includes coordination with company operations for commercial and/or business/general aviation pilots.

Key Data Submission

- Flight Plans
- Conditions that may impact flight intent, including but not limited to EOBT

Key Actions and Responsibilities

- Commercial PICs should provide relevant information and operating conditions to their FOC personnel as determined by business needs and practices.
- Business/general aviation PICs should provide flight plan data to the FAA; additionally, they should provide early intent data to the FAA through flight plan submission or other electronic means (e.g., mobile applications).
- PICs should remain aware of airports subject to SMPs and review local operating procedures, as needed.

During the Tactical Execution Phase, the PIC should maintain awareness of SMP execution, local procedures prior to, during, and following SMPs, as well as operate their aircraft in compliance with surface metering times when feasible.

Key Data Exchange

- Receive TMATs
- Maintain up to date EOBTs and flight plan data, as relevant

Key Actions and Responsibilities

- Commercial PICs should provide FOC, ramp, and other personnel (as applicable) updates to operating conditions and events that can impact EOBT.
- Receive and work to comply with surface metering compliance times (Note: mechanism (e.g., electronic flight bag, verbal communication) to receive surface metering times may vary based on operating procedures).
- Provide ramp and ATCT personnel movement intentions to meet TMAT compliancy, including intent to absorb metering hold in the active movement area.
- Provide ATCT personnel other movement intentions (e.g., return to gate) that can impact SMP performance.

During the Post SMP Stage, it is expected that PICs will have limited involvement in the surface metering post-event analysis and coordination. PICs should provide feedback about SMP execution, parameters, and any compliance issues to their FOC and/or FBO, or to other local stakeholders based on local procedures.

Key Data Exchange

- SMP performance from flight perspective

Key Actions and Responsibilities

- Provide feedback on SMP execution which affected flight-specific performance and/or ability to meet surface metering goals (e.g., ability to push back on time, ramp congestion issues, etc.).
- Receives regularly scheduled feedback on SMP compliance and procedures.

3.3 Non-FAA Stakeholder: Ramp Operator/Ramp Control

During the Strategic Planning Phase, the Ramp Operator/Ramp Control should provide the FAA ATCT personnel information, either electronically or via verbal coordination, regarding ramp area operations that can influence SMP planning and/or impact SMP performance.

Key Data Submission

- Flight Intent, including but not limited to EOBT
- Substitution Intent
- Planned ramp closures
- Non-movement area resource closures or restrictions

Key Actions and Responsibilities

- Ramp Operators/Control should provide the FAA situational information regarding ramp operations that can affect SMP performance. This includes, but is not limited to planned ramp closures, planned gate closures, expected/planned de-icing operations, construction, and special aircraft movements.
- Maintain early intent data submission (e.g., EOBTs, gate assignment) and substitution intent data, as necessary.
- Provide recommendations to SMP parameters, as set by local procedures.

During the Tactical Execution Phase, the Ramp Operator/Ramp Control is responsible for submitting flight intent data (e.g., EOBTs) reflective of operations and ramp operation conditions (e.g., Ramp Gridlock Status), coordinating with the FAA to support effective SMP execution, and conduct ramp operations to meet surface metering compliance times (TMATs).

Key Data Submission

- Flight Intent updates
- Gate assignments
- Substitution requests
- Planned ramp closures, including temporary weather closures
- Non-movement area resource closures or restrictions

Key Actions and Responsibilities

- Provide the FAA updates to situational information regarding ramp operations that can affect SMP performance, including aircraft parking and/or movement constraints, gate conflicts, and ramp constraints.
- Monitor for SMP recommendations and coordinate with local stakeholders, as needed, on SMP parameters in order to meet ramp operational and business needs.
- Provide updates to early intent data submission (e.g., EOBTs, gate assignment) and submit substitution requests, as necessary.
- Conduct ramp operations to comply with TMATs, as feasible, to meet SMP goals; work to meet TOBTs, as feasible, for flights affected by a CTD.
- Provide electronic intent information, as necessary, including intent to hold messages, de-icing information, and ramp status.
- Monitor the SMP performance and provide input, as necessary, to FAA personnel for SMP termination, compression, or extension; coordinate outcome with sub-stakeholders (e.g., pilots, ramp crews).

During the Post SMP Stage, the Ramp Operator/Ramp Control is responsible for transitioning ramp operations out of surface metering operations and coordinating with ramp crew/personnel as necessary. They should review their compliance with SMP times and provide feedback to local stakeholders, as applicable, per local agreements.

Key Data Review

- TMAT Compliance Metrics
- CTD Compliance Metrics
- SMP Queue Length Performance
- SMP Parameters Feedback

Key Actions and Responsibilities

- Provide feedback to FAA and/or other local stakeholders on SMP parameters and execution.
- Participate in regularly scheduled post event review meetings with the surface stakeholder group.

3.4 Non-FAA Stakeholder: Airport Operator/Airport Authority

Note: If a local airport operator/airport authority is providing ramp control services, these stakeholders will be responsible for roles and responsibilities described in Section 3.3.

During the Strategic Planning Phase, the Airport Operator/Airport Authority is responsible for coordinating airport conditions that can impact surface metering planning and execution (e.g., taxiway construction, equipment outages).

Key Data Submission

- Planned airport resource closures or restrictions
- Airport operating conditions
- Ramp Operator Data (Section 4.3) if operating in that role

Key Actions and Responsibilities

- Provide the FAA situational information regarding airport surface conditions, equipage status, and operating environment conditions (e.g., expected de-icing) that can affect SMP performance.
- Coordinate with local stakeholders (e.g., FBOs, external stakeholders, military operations, cargo operators) recommended SMPs, as necessary.
- Submit early intent data updates, de-icing, and substitution requests, if applicable based on local procedures.
- Maintain awareness of recommended SMPs and provide recommendations to SMP parameters, as set by local procedures.

During the Tactical Execution Phase, the Airport Operator/Authority is responsible for continued coordination of airport conditions that can impact surface metering planning and execution (e.g., taxiway construction, equipment outages, de-icing procedures).

Key Data Submission

- Airport resource closures or restrictions
- Airport operating conditions
- Ramp Operator Data (Section 4.3) if operating in that role

Key Actions and Responsibilities

- Airport Operator/Authority should provide the FAA situational information regarding airport surface conditions, equipage status, and operating environment conditions (e.g., expected de-icing) that can affect SMP performance.
- Submit early intent data updates, de-icing, and substitution requests, if applicable based on local procedures.
- Maintain awareness of recommended SMPs and provide recommendations to SMP parameters, as set by local procedures.

During the Post SMP Stage, the Airport Operator/Authority should review their compliance with SMP times and provide feedback to local stakeholders, as applicable, per local agreements.

Key Data Review

- Airport operating conditions which impacted SMP performance
- SMP Parameters Feedback

Key Actions and Responsibilities

- Review the SMP performance and provide the FAA airport surface and operating environment performance information that impacted SMP.
- Participate in regularly scheduled post event review meetings with the surface stakeholder group.
- Provide recommendations for future SMP adjustments (parameters, timeframe, etc.).

3.5 Non-FAA Stakeholder: General Aviation (GA) / Business Aviation (BA)

During the Strategic Planning Phase, the GA/BA operators are responsible for providing their pilots information regarding SMP operations, as well as submitting early intent data on behalf of their flights if the pilots are unable to do so.

Key Data Submission

- Flight Plans
- Flight Intent, including but not limited to EOBT
- Substitution Intent

Key Actions and Responsibilities

- Provide pilots and GA/BA operators information on the local procedures and processes for conducting SMPs. This should include awareness of the importance of EOBT time submission, TMAT, and the principals of TFDM surface metering (e.g., reducing delay taken on the surface in queue).
- Submit early intent data submission (e.g., EOBTs, gate assignment) and substitution intent data, as necessary, either through a flight planning service provider application or via operator.
- Provide FAA information on expected operations volume, including periods of expected increased operations (e.g., special events, Super Bowl events).

During the Tactical Execution Phase, the GA/BA operators should operate flights and provide pilots with necessary information (e.g., TMATs) to comply with the SMP, as operationally feasible. Early intent and flight data updates should be provided, as necessary.

Key Data Submission

- Update flight plans
- Flight Intent updates
- Gate/ramp assignments
- Substitution requests
- Planned ramp closures, including temporary weather closures
- Non-movement area resource closures or restrictions

Key Actions and Responsibilities

- Provide the FAA updates to situational information regarding GA/BA operations and volume that can affect SMP performance.
- Monitor for SMP recommendations and coordinate with local stakeholders, as needed, on SMP parameters in order to meet ramp operational and business needs.
- Provide updates of early intent data submission (e.g., EOBTs, gate assignment) and submit substitution requests, as necessary.
- Provide FAA information regarding ramp status, including aircraft parking and/or movement constraints.
- Provide electronic intent information, as necessary, including intent to hold messages, de-icing information, and ramp status.

During the Post SMP Stage, the GA/BA operators should coordinate with pilots and local personnel on the exit of the SMP. They should review their compliance with SMP times and provide feedback to local stakeholders, as applicable, per local agreements.

Key Data Review

- TMAT Compliance Metrics
- SMP Parameters Feedback

Key Actions and Responsibilities

- Provide feedback to FAA and/or other local stakeholders on SMP parameters and execution, including ability to meet business and operational objectives and needs.
- Provide recommendations for future SMP adjustments (parameters, timeframe, etc.).
- Participate in regularly scheduled post event review meetings with the surface stakeholder group.

3.6 Non-FAA Stakeholder: Fixed Base Operators (FBOs)

During the Strategic Planning Phase, the FBO is should provide GA/BA pilots information regarding SMP operations. The FBO should also provide the FAA planning information, including if any off-nominal volume is expected.

Key Data Submission

- Expected operations volume

Key Actions and Responsibilities

- Provide pilots and flight operators with information on the local procedures and processes for conducting SMPs. This should include awareness of the importance of EOBT time submission, TMAT, and the principals of TFDM surface metering (e.g., reducing delay taken on the surface in queue).
- Encourage the submission of early intent data submission (e.g., EOBTs, gate assignment) and substitution intent data, as necessary.
- Provide FAA information on expected operations volume, including periods of expected increased operations (e.g., special events, VIP movements).

During the Tactical Execution Phase, the FBO should operate flights and provide pilots with necessary information (e.g., TMAT information) to comply with SMP times, as operationally feasible. The FBO should encourage the provision of intent and flight data updates by pilots, as necessary.

Key Data Submission

- Planned ramp closures, including temporary weather closures
- Non-movement area resource closures or restrictions

Key Actions and Responsibilities

- Provide the FAA updates to situational information regarding FBO ramp operations and volume that can affect SMP performance.
- Monitor for SMP recommendations and coordinate with local stakeholders, as needed, in order to meet ramp operational and business needs.
- Encourage pilots submit updates to early intent data (e.g., EOBTs, gate assignment) and submit substitution requests, as necessary.
- Provide FAA information regarding ramp status, including aircraft parking and/or movement constraints.

During the Post SMP Stage, the FBO should coordinate with pilots and local personnel on the exit of the SMP. They should review the compliance with SMP times and provide feedback to local stakeholders, as applicable, per local agreements.

Key Data Review

- TMAT Compliance Metrics
- SMP Parameters Feedback

Key Actions and Responsibilities

- Provide feedback to FAA and/or other local stakeholders on SMP parameters and execution, including ability to meet business and operational objectives and needs.
- Provide recommendations for future SMP adjustments (parameters, timeframe, etc.).
- Participate in regularly scheduled post event review meetings with the surface stakeholder group.

3.7 Local Air Traffic Control Tower and Other FAA Stakeholders

During the Strategic Planning Phase, the ATCT is responsible for conducting airport ATC operations. The ATCT TM, or other designee, is responsible for reviewing TFDM SMP recommendations, coordinating with local and FAA stakeholders, and understanding local and national FAA operating plans and goals and impact of planned SMPs.

Key Data Review

- TFDM Predicted Schedule
- Current and Scheduled Airport Configuration
- Airport and airspace demand and restrictions
- TFDM SMP Recommendations

Key Actions and Responsibilities

- Ensure updates to NAS operating plans, local scheduled configurations, and other local constraint information (e.g., taxiway closures,) are submitted promptly to allow TFDM to update runway and airport schedules.
- Collaborate with other FAA stakeholders (e.g., overhead TRACON/ARTCC facilities, ATCSCC) to strategical identify the need for additional TMIs (e.g., Miles-In-Trail [MIT], Ground Delay Program [GDP]) that may affect the use of the SMP.

During the Tactical Execution Phase, the ATCT is responsible for executing the TFDM SMP, monitoring the performance of the SMP (e.g., queue length), and working to meet surface metering compliance times as feasible and determined by local operating procedures.

Key Data Review

- TFDM Predicted Schedule
- Current and Scheduled Airport Configuration
- Airport and airspace demand and restrictions
- TFDM SMP Recommendations

Key Actions and Responsibilities

- Update TFDM input parameters to reflect operational conditions (e.g., update runway configuration, Runway Departure Rate (RDR) values, Target Queue Lengths).
- Review recommended SMP parameters, assess recommendation against pre-coordinated acceptable parameters; coordinate with local stakeholders on parameters, as necessary.
- Accept a recommended SMP, ensuring local stakeholders receive program information electronically and/or verbally.
- Periodically evaluate the effectiveness of the current parameters (queue length) while considering any modifications that might improve the effectiveness (reduce gate conflicts, increased runway usage).
- Coordinate with local stakeholders on SMP adjustments to meet stakeholders' business needs (increased/decrease AMA holding, gate conflicts, etc.).

During the Post SMP Stage, the ATCT is responsible for monitoring the SMP performance and determining exit strategy in coordination with local stakeholders. The FAA will also provide SMP performance metrics to stakeholders and conduct post-event reviews of SMP execution. when to accept termination, compression, or extension recommendations.

Key Data Review

- TFDM SMP Program Recommendations
- SMP Performance Metrics (target queue, delay, holding, gate conflicts)

Key Actions and Responsibilities

- Determine SMP termination, compression, or extension based on TFDM recommendations; coordinate with stakeholders as needed.
- Produce SMP performance metrics (Section 8.2 and 8.3).
- Conduct local post-event reviews (section 8.3) based on local procedures.
- Participate in regularly scheduled post event review meetings with the surface stakeholder group.

4 Surface Metering Overview

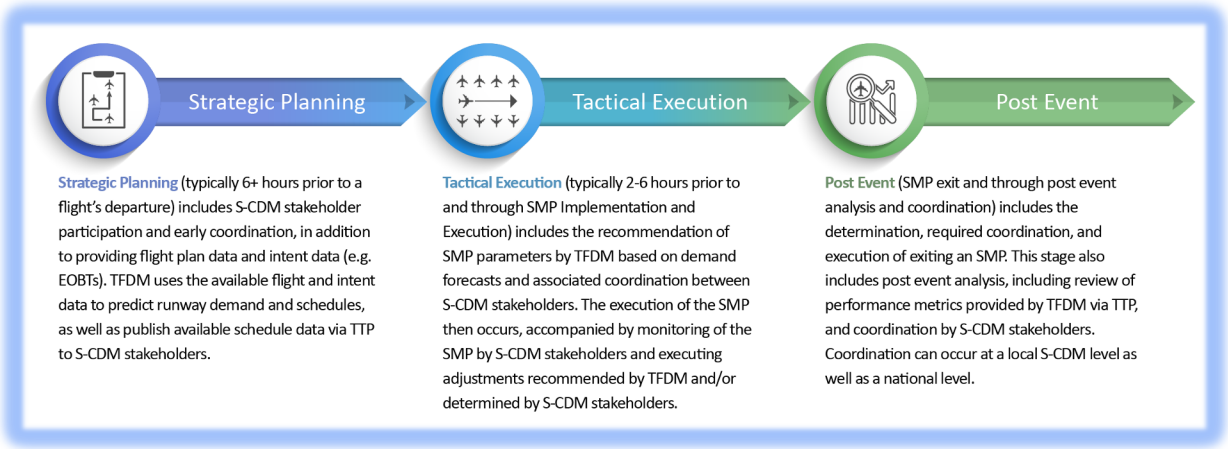
4.1 Surface Metering Program Execution Timeline

SMPs require actions, data exchange, and collaboration prior to, during, and following the implementation of the SMP. Activities in the Strategic-Planning Phase focus on pre-SMP execution coordination between surface metering stakeholders and exchange of flight data (e.g., flight plans) and intent data (e.g., EOBTs and intent to de-ice). The Tactical Execution phase includes the determination of the need for a SMP by TFDM, its implementation and necessary adjustments, as well as the stakeholder coordination immediately prior to during the program execution. The final phase, SMP Exit and Post Event, includes the activities occurring as a SMP ends, as well as the data and collaboration necessary for the review of the SMP performance by all stakeholders.

Note: The FAA and non-FAA responsibilities described in this, and the following sections of this document, are provided as a guide only. These responsibilities are non-binding and are subject to any local LOAs and/or other federal regulations, policies, or national procedures that will override this user guide.

Surface Metering Timeline

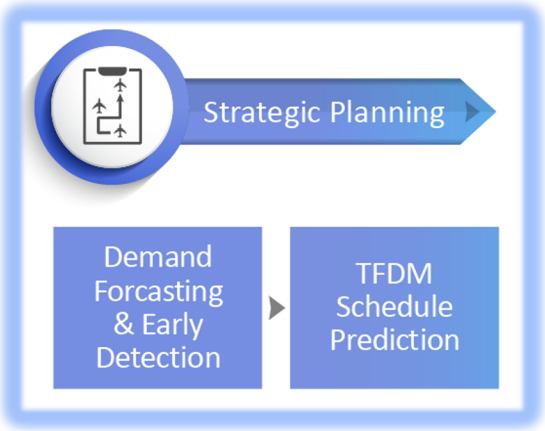
- ***Strategic Planning:*** *Forecasting collaboration and data exchange*
- ***Tactical Execution:*** *Management of queues and resources*
- ***Post Event:*** *SMP performance evaluation and future planning*



4.1.1 Strategic/Planning Period

The primary focus of this period is prediction of capacity and demand imbalance(s), as well as surface metering stakeholder collaboration on solutions to address the imbalance(s). While TFDM is generating a surface schedule, non-FAA stakeholders should be providing flight intent data reflective of their business decisions and intent on how to operate their flights. FAA stakeholders should be considering

local surface and terminal airspace operational conditions and constraints, as well as be aware of other impacting conditions, including local and national initiatives.



Demand Forcasting & Early Detection

Schedule Planning and Strategic Coordination

- *Flight operators provide and update forecasted demand via flight and intent data*
- *Surface metering stakeholders conduct coordination for SMP planning and expected execution (as determined by local policy)*
- *FAA stakeholders conduct preliminary SMP modeling using TFDM What-If Modeling Capabilities*

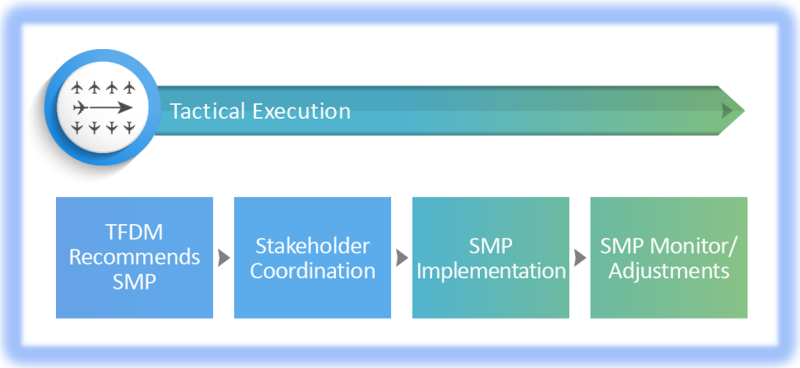
TFDM Schedule Prediction

TFDM Schedule Prediction and Monitoring

- *TFDM uses available flight and intent data to predict demand and runway schedule(s)*
- *TFDM publishes surface schedule information via the TFDM TTP SWIM feed for use by surface metering stakeholders for planning and further coordination purposes*
- *Flight operators continue to provide and update flight and intent data and determine strategic substitution plans*
- *FAA and appropriate stakeholders coordinate additional TMIs affecting the airport, other than local SMPs*

4.1.2 Tactical Planning and Surface Metering Program Execution Period

This period includes tactical planning following TFDM's recommendation of a SMP and associated stakeholder coordination necessary in response to the recommendation. The period continues through the implementation of the SMP as well as the surface metering stakeholders' monitoring of the SMP and adjustments to SMP parameters, flight intent data, and/or surface conditions as needed.



TFDM Recommends SMP

SMP Recommendation

- *Using predicted runway schedules, TFDM identifies when predicted queues exceed upper bound target queues*
- *TFDM provides recommendation for SMP, including program parameters*
- *The recommended program and its parameters are distributed via the TFDM TTP SWIM feed*

Stakeholder Coordination

Stakeholder Coordination

- *Following the recommendation, the stakeholders may coordinate about the SMP and its parameters as necessary*
- *Based on the tactical coordination, the FAA may adjust the SMP and its parameters as needed*

SMP Implementation

SMP Affirmation

- *FAA ATCT, using TFDM, implements the SMP with parameters determined by the TFDM system and/or surface metering stakeholders*
- *TFDM surface metering stakeholders work to meet SMP goals (e.g., meet metering times) as determined by local LOAs*

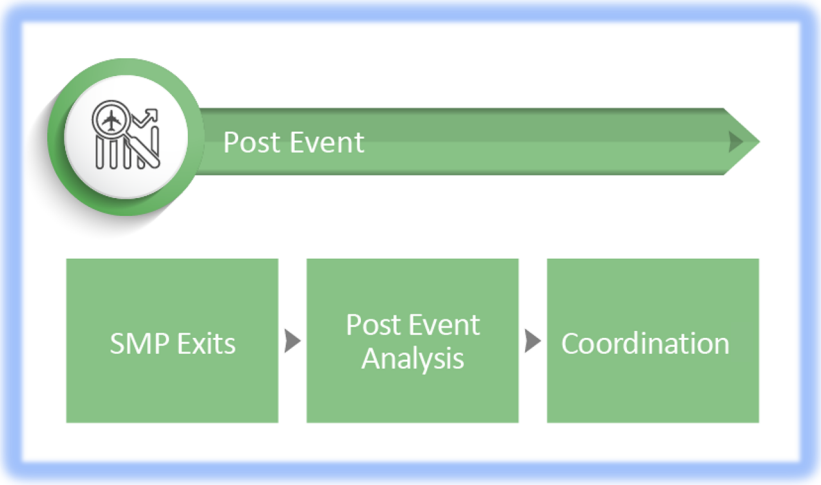
SMP Monitor/ Adjustments

SMP Execution/Monitor/Adjustments

- *Non-FAA Stakeholders monitor compliance and performance of SMP (via TFDM TTP SWIM feed)*
- *FAA Stakeholders monitor compliance and performance of SMP (via TFDM TTP SWIM feed), including but not limited to the following metrics: Queue length*
- *TFDM system and/or surface metering stakeholders may execute and recommend adjustment to SMP parameters (e.g., end time, queue length)*

4.1.3 Post Event Period

During this phase, the SMP exit strategy is determined and agreed-upon, as necessary, by surface metering stakeholders. Review of the SMP performance by stakeholders, individually and/or collectively, occurs. This review measures how well the SMP addressed the local surface issue and met stakeholder objectives (e.g., maintained target queue length, reduced taxi delay, and met gate conflict objectives). The collaborative review may occur immediately after a SMP ends or is delayed to a future time, mutually agreed upon by local stakeholders (e.g., monthly review meeting).



SMP Exits

SMP Exit Strategy

- *SMP ends at TFDM recommended or stakeholder-agreed upon time*
- *Queue lengths are no longer managed by TFDM surface metering*
- *TMATs not published for departing flights entering movement area following the SMP end time*

Post Event Analysis

Post Event Analysis

- *SMP performance metric development*
- *Surface metering stakeholder review of event-specific performance metrics*

Coordination

Post Event Coordination and Collaboration

- *Coordination of SMP performance using SMP performance metrics*
- *Develop lessons learned for future events*

4.2 Surface Metering Program Parameters

For each SMP, a series of parameters can be set by the ATCT Front Line Managers (FLM)/Traffic Management Coordinator (TMC) to affect the performance of the SMP and the assignment of TMATs, see Table 1. These parameters are configurable and will be adapted locally. The TMC/FLM will be responsible for managing these parameters in collaboration with stakeholders, per the local surface metering LOA.

Table 1. Key SMP Parameters

Data Field Name / Configuration Parameter	Description	Importance to Stakeholders
Average Metering Hold Threshold parameter	Configurable percentage of change in metering hold time associated with a rejected SMP required to generate a new recommended SMP.	ATCT TM sets this parameter so future recommended SMPs are significantly different from past rejected SMPs.
Airport Metering Model parameter	Indicates single-airport queue or multiple-runway queue metering whereby both current and future parameter values can be established. When metering to a single airport queue, all departures taxiing in the Airport Movement Area (AMA) are part of the queue.	ATCT TM sets this parameter so recommended SMPs will match the agreed to means of departure demand management at the airport.
Compression Automatic Affirmation parameter (See Section 7.4 for more on Compression)	Configurable option to allow for automatic affirmation of a recommended compression.	ATCT TM sets this value to automatically accept SMP compressions to respond quickly to changes in departure demand and improve SMP performance.
Compression Minimum TMAT Adjustment Time parameter (See Section 7.4 for more on Compression)	Configurable value that specifies the minimum amount of TMAT time reduction that flight operators prefer during a compression SMP.	ATCT TM will set an agreed upon appropriate value so that only changes to TMATs above that value would trigger a compression.
CTD Buffer	Additional time buffered into the calculation of a TMAT for departures with a CTD to ensure flights arrive at the departure runway in compliance with their CTD.	ATCT TM needs to be adjust this parameter to ensure flights can meet CTDs, while not increasing it so much that flights arrive at the runway too early.

Data Field Name / Configuration Parameter	Description	Importance to Stakeholders
Departure Target Queue Length	Number of departures in the departure queue considered optimal for the local airport during metering. The TMC / FLM is expected to coordinate initial values with all Stakeholders and maintains the authority to amend as appropriate to reflect current airport surface operations.	This value is agreed to and set to ensure that there are minimal missed departure opportunities.
Departure Target Queue Length Lower Threshold	Number of departures in the departure queue below the departure target queue length used to determine need for compression or termination of a SMP. The TMC/FLM is expected to coordinate initial values with all stakeholders and maintains the authority to amend as appropriate to reflect current airport surface operations.	ATCT TM must monitor this value to ensure that SMPs are not active longer than necessary, while minimizing missed departure opportunities.
Departure Target Queue Length Upper Threshold	Number of departures in the departure queue above the departure target queue length used to determine need for a SMP and reassignment of TMATs.	ATCT TM must monitor this value because a SMP or reassignment of TMATs will be recommended when the Departure Target Queue Length Upper Threshold is reached.
Designated Metering Resources	A surface resource that may be metered and is designated to be monitored for metering through the local adaptation. Metering resources include the airport as a single queue, departure runways, and in-trail restricted resources, such as a departure fix, departure fix group, destination airport, or jet route with an in-trail restriction.	Surface CDM Stakeholders should be aware of all possible designated metering resources and which resources are currently being metered.
SMP Deferral Lead Time	Configurable length of time before a proposed SMP start time within which a SMP can be deferred.	ATCT TM should be aware of time he/she has to defer a SMP.
SMP Lead Time	Time in advance of a SMP that stakeholders desire notification.	All Surface CDM Stakeholders will know how much time they have to prepare for a SMP.
Exempt CFR Flights from Metering Hold Parameter	Indicates that CFR flights will be exempt from departure metering on a per CFR basis. The default setting is that CFR flights will be included in departure metering. A reason for the exclusion must be provided.	The ATCT TM, Flight operators will want to know if CFR flights are exempt from metering hold so they can plan accordingly and know if CFR flights should expect a metering hold.

Data Field Name / Configuration Parameter	Description	Importance to Stakeholders
Extension Evaluation Frequency Parameter	Interval at which the need to extend a SMP that is already in effect is evaluated. Unit of measurement is minutes.	ATCT TM sets this value such that extensions to the current SMP are evaluated at an appropriate interval. Reducing the likelihood of SMP adjustments
Flight Suspension Time Parameter	Configurable length of time after the flight suspension warning notification indicating that if no action is taken, the TMAT will be reclaimed, and the flight will be removed from the demand list.	Flight Operators, GA, and FBOs need to work with the ATCT TM to select a value that gives flight operators enough time to take action to avoid having a flight's TMAT reclaimed.
Flight Suspension Warning Time Parameter	Configurable length of time after the initial missed TMAT notification indicating that if no action is taken by a specified time, the TMAT will be reclaimed, and the flight will be removed from the demand list.	Flight Operators, GA, and FBOs need to work with the ATCT TM to select a value that gives flight operators enough time to take action to avoid having a flight's TMAT reclaimed.
Flights Affected Threshold parameter	Configurable percentage of flights affected associated with a rejected SMP required to generate a new recommended SMP.	This value is set so TFDM only recommends future SMPs that affect at least this agreed upon number of flights.
Planning Horizon Parameter	Locally configurable amount of time within which flights expected to depart could be assigned surface metering times.	Surface CDM Stakeholders should expect to receive metering times for flights within the planning horizon timeframe.
Protection Period Parameter	Locally agreed upon time that a flight operator has to substitute a delayed or canceled flight before the TFDM automation can reclaim the allocated capacity.	ATCT TM should work with all flight operators to agree to an appropriate value that gives operators sufficient time to substitute a flight.
Runway Departure Rate (RDR) Mismatch Threshold Parameter	Percent difference between the actual and observed RDR, which when exceeded by the RDR Accuracy metric will trigger an RDR mismatch notification.	ATCT TM should set the value so that an alert is generated about an RDR mismatch when a significant mismatch is occurring.

Data Field Name / Configuration Parameter	Description	Importance to Stakeholders
Reassignment of TMATs Minimum TMAT Adjustment Window Parameter	Specifies the minimum amount of TMAT time reduction that flight operators prefer during a reassignment of TMATs.	ATCT TM, Flight Operators, GA, and FBOs should collaboratively choose a value that so that TMAT time reductions during a reassignment of TMATs are significant.
Reclamation Window Parameter	Period of time measured from the current time forward beyond which the TFDM automation will act on a canceled or delayed flight to reclaim capacity.	The ATCT TM will set this value and will inform Flight Operators, GA, and FBOs so they know how much time they have until TFDM will act to reclaim capacity.
Static Time Horizon Parameter	Configurable amount of time from current time used to limit TMAT changes to flights. An important parameter in assigning TMATs to unscheduled flights.	Surface CDM Stakeholders need to know when they can expect TMATs to remain relatively static.
TMAT Compliance Window parameter	Agreed to window, in minutes, around the TMAT within which flights are considered compliant.	Ramp Operators should be aware of the window around the TMAT for which compliance will be measured against.
Unscheduled Demand Buffer (UDB)	Number of unscheduled flights identified as potential demand by hour (historical or predicted) for the entire airport. UDB parameter is a table (matrix) listing the average number of unscheduled flights during each hour of the day that are expected to become known during that hour and each of the following hourly time bins.	ATCT TM sets this value to the anticipated number of unscheduled flights that will occur by the hour. This value provides the TFDM scheduler with a buffer needed to deal with unscheduled flights.

4.3 S-CDM Data Provision to the Federal Aviation Administration

This section lists the data exchange elements specifically for surface-focused activities that should be provided to the FAA. The FAA's TFMS SWIM service, TFMData, is the primary method for flight operators to submit data regarding surface operations. Data is submitted via the request-reply business function of the service. Data submitted falls into the categories below. The examples listed in Table 2 are a subset of the total data fields and are provided to give the reader a sense of the type of data in each category.

Table 2. Example TFMData Data Elements

Data Category	Example Data Fields	Use by TFDM
Actual Operational Times	Actual Off-Block Time (AOBT)	Provisions of these times improves the accuracy of the TFDM surface schedule and predicted times (e.g., Taxi time).
	Actual Take Off Time (ATOT)	
	Actual Landing Time (ALDT)	
	Actual In-Block (AIBT)	
Predicted Operational Times	Initial Off-Block Time (IOBT)	The initial schedule is built around the IOBT. The IOBT is set to the first EOBT.
	Earliest Off-Block Time (EOBT)	Provides an indication to the TFDM system of the earliest time a flight will be ready to push back from the departure stand. This time is used to calculate other important values in the TFDM surface schedule, like the TMAT.
	Airline Gate Time of Departure (LGTD)	Provides an indication to the TFDM system of when the flight will push back from the departure stand. This time is used for different business purposes than the EOBT, but can be the same time.
Aircraft Operational Information	Departure/Arrival Stand Assignment*	Indicates to ATC personnel which gate the flight should taxi to/from and allows TFDM to create an accurate surface schedule for each flight because different departure/arrival stands will require a different amount of time to taxi to/from.
	Departure/Arrival Intent To Hold in Non-Movement Area	Provides situational awareness to ATCT personnel and helps the stability of the surface schedule by allowing TFDM to factor in the intent to hold in the movement/non-movement area.
	Departure/Arrival Intent To Hold in Movement Area	
	Acceptable/Unacceptable Departure Runways[2]	Allows TFDM surface scheduler to accurately create a surface schedule and gives the ATCT situational awareness regarding which runways are acceptable and unacceptable.
	Departure/Arrival Spot Information	Allows TFDM to accurately create a surface schedule and gives the ATCT situational awareness of which spot the flight intends to use.
	Intent to De-ice	Provides situational awareness to ATCT personnel and helps the stability of the surface schedule by allowing it to factor in the intent to de-ice or return to gate.
	Intent to Return to gate	

**Departure and Arrival Stand Assignments can be submitted via TFMS's TFMData service or TDLS.*

[2] TFDM is currently planning to only utilize unacceptable runways.

For further detail regarding these data fields, see Appendix B, Surface Focused Data Exchange Data Elements

4.4 Types of Surface Metering Programs

TFDM's surface metering functionality includes three SMP types: Runway SMP, Airport SMP, and In-Trail SMP. The type of SMP utilized during a local capacity and demand imbalance is driven by conditions including, but not limited to airport layout and operating conditions, pre-SMP execution CDM coordination, other TMIs affecting the airport, and forecasted demand. Additionally, the airport metering model parameter will drive the type of "surface-driven" SMP (airport or runway SMP). This parameter detailed further in Figure 4, is a local adaptation parameter set based on the local surface layout and operating conditions.

Figure 4 provides additional details on the three types of SMPs, including the purpose, goal, and mechanisms of the different SMPs. A single airport may have multiple SMPs in effect at a given time and stakeholders should utilize TFDM data and local information sharing mechanisms to understand which SMPs are in effect and how they are impacting the surface and affected flights.

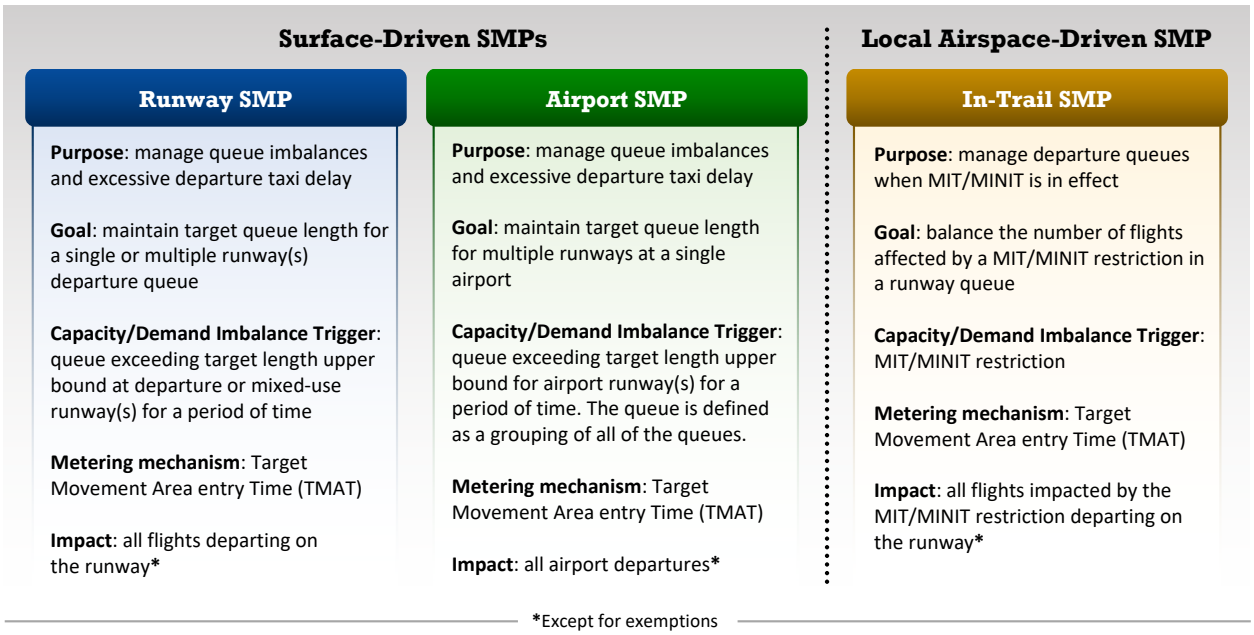


Figure 4. Types of SMPs

5 Surface-Collaborative Decision-Making Data Exchange

Data exchange is the foundation of TFDM surface metering and local collaboration. There are three key data exchange activities that stakeholders may need to engage in to achieve surface metering benefits.

Key Data Exchanges

1. **Surface Specific Data Provision from the FAA via the TTP SWIM Service:** A publish-subscribe (pub-sub) web service that provides updates to TFDM data. This includes multiple data feeds that cover specific TFDM business functions:
   a. Flight Data
   b. Flight Delay Data
   c. Airport Information Data
   d. Traffic Management Restriction Data
   e. Surface Metering Program Data
   f. Operational Metrics Data
2. **TFDM Flight Operator System (FOS) Collaboration Service (TFCS):** A request-reply service to enable SMP substitution-related data exchange as well as other non-movement area data exchange, such as ramp closures.

5.1 Surface Specific Data Provision from the Federal Aviation Administration

In addition to the TFMS data exchange, the FAA is providing surface-related data via the TTP SWIM service. The service is composed of the following six business functions listed in Table 3. See the following subsections for examples of fields in each business function.

Table 3. TTP Business Functions

Business Function	Description
TFDM Flight Data Service	The service returns all relevant flight-specific data along with subsequent updates to that data.
TFDM Flight Delay Data Service	The service returns all flight-specific delay information along with subsequent updates to that data.
TFDM Airport Information Service	This includes current and future runway configurations, departure and arrival rates, runway and taxiway closures, de-icing information and surface delays. The service returns all relevant information along with subsequent updates to that data for the specified airport.
TFDM Traffic Management Restrictions Service	This includes departure fix restrictions (e.g., MIT, Minutes-in-Trail [MINIT], fix closures), arrival and departure fixes metering information, and CFR information. The service returns all relevant information along with subsequent updates to that data.

Business Function	Description
TFDM SMP Service	This includes all SMP parameters and notifications related to SMPs. The service returns all relevant information along with subsequent updates to that data.
TFDM Operational Metrics Data	This includes TFDM preset Key Performance Indicators (KPI) generated reports. The service returns all relevant information for standard, pre-defined KPIs along with subsequent updates to that data.

The following sections highlight the surface information provided in the business function descriptions.

5.1.1 Terminal Flight Data Manager TTP Flight Data Elements

The TTP flight-data service provides flight-specific information for all flights departing from or arriving to the TFDM facility. Note, some data elements may not be published for all flights depending on current operations at the airport. For example, if a flight departing an airport that is not subject to a SMP, the TMAT data element will not exist. Examples of the TFDM TTP Flight data elements are shown in Table 3.

Table 3. Example TTP Flight Data Elements

Data Element	Description	Importance to Stakeholders
Target Off Block Time (TOBT)	Target time to push back from a gate or taxi from parking stand for a flight to make its TMAT. It is equal to the TMAT minus the Ramp Transit Time (RTT). No compliance is associated with this time.	Indicates to the Ramp Tower/PIC/others involved in managing pushbacks when the surface scheduler recommends the aircraft should push back from the departure stand.
Target Movement Area Entry Time (TMAT)	Target time for a flight to reach/enter the movement area to meet SMP goals and manage queue length. This time is managed by non-FAA stakeholders (e.g., airline, ramp towers, airport authority) based on local and organizational agreements.	Indicates the time the aircraft should enter the movement area according to the surface scheduler. The PIC, GA, FBOs, ramp operator, and airport authority, if applicable, should work together to meet this time.
Estimated Take Off Time (ETOT)	The predicted takeoff time of a metered flight. The prediction should take into account all available information such as predicted taxi times, RDR, and other departure demand. No compliance is associated with this time. ETOT implies no recommended sequence to ATC.	This can be used by flight operators, GA, and FBOs for planning purposes and indicates to ATCT personnel what time the aircraft should depart.
Total Estimated Taxi-Out Time (EXOT)	The total estimated taxi-out time from the stand to take-off.	Used by flight operators, ramp operators/airport authority, GA, and FBOs for planning purposes (crew, ramp and surface movements, etc.) and for post-event analysis.

Data Element	Description	Importance to Stakeholders
Predicted Departure Queue Waiting Time	The predicted length of time for the flight in a departure queue.	Used by flight operators, GA, and FBOs for planning and awareness purposes, as well as for post-event analysis.

For a complete listing of all the data elements contained in the TTP Flight Data service, please refer to the TTP Flight Data Java Message Service Description Document (JMSDD) [1].[3]

5.1.2 Terminal Flight Data Manager TTP Flight Delay Data Elements

The TTP Flight Delay service provides flight-specific information about the current delays for all flights departing from or arriving to the TFDM facility. See Table 4, for examples of the TFDM TTP Flight Delay data elements.

Table 4. Example TTP Flight Delay Data Elements

Data Element	Description	Importance to Stakeholders
Aircraft Departure Delay Start Time	The delay start time.	TFDM will provide information regarding TMIs and delays, including the reason for the delay and the facility that it is attributed to it. Non-FAA Stakeholders can use this information for awareness of the impacts of NAS initiatives on individual flights. The information can also be used for flight planning purposes (crew planning, aircraft movement planning, etc.), making strategic and tactical coordination efforts with the FAA (e.g., Command Center for reroutes), and post-event analysis.
Aircraft Departure Delay End Time	The delay end time.	
Impacting Condition	The reason for the delay.	
TMI	The identified TMI cause, if applicable.	
Charge To	The facility the delay is attributed to.	
Remarks	Additional information to explain the conditions or causes associated with the delay.	

For a complete listing of all the data elements contained in the TTP Flight Delay service, please refer to the TTP Flight Delay JMSDD [2].

5.1.3 Terminal Flight Data Manager TTP Airport Information Data Elements

The TTP Airport Information service provides airport information, such as the current runway configuration, for stakeholders' situational awareness. See Table 6, for examples of the TFDM TTP Airport Information data elements.

[3] For the latest version of this document, and all TTP documents, see the TTP sections of the NAS Service Registry and Repository (NSRR). The NSRR website is https://nsrr.faa.gov/ and requires registration.

Table 6. Example TTP Airport Data Elements

Data Element	Description	Importance to Stakeholders
Current Airport Configuration	Current airport configuration data items including runway(s) currently in use for departures and arrivals.	Provides situational awareness to all stakeholders. Indicates which runways flights are using to depart and arrive and what rates can be expected.
Airport Arrival Rate	The airport arrival rate declared by the facility expressed in number of aircraft per hour.	Provides situational awareness to all stakeholders about the planned arrival rate.
Airport Departure Rate	The airport departure rate declared by the facility expressed in number of aircraft per hour.	Provides situational awareness to all stakeholders about the planned departure rate.
Actual Departure Queue Length	The actual departure queue length for the airport.	Provides situational awareness to the ATCT personnel, flight operators, and the PIC that can be used for planning purposes and post-event analysis.

For a complete listing of all the data elements contained in the TTP Airport Information service, please refer to the TTP Airport Information JMSDD [3].

5.1.4 Terminal Flight Data Manager TTP Traffic Management Restrictions Data Elements

The TTP Traffic Management Restrictions service provides information regarding traffic management restrictions, such as if CFR or MIT restrictions are in place, for all flights departing from or arriving to the TFDM facility. See Table 5, for examples of the TFDM TTP Traffic Management Restrictions data elements.

Table 5. Example TTP Traffic Management Restrictions Data Elements

Data Element	Description	Importance to Stakeholders
Approval Request Data	Data item providing approval request (CFR) information. Data elements include the NAS element being controlled and a list of flights affected by the CFR.	Provides situational awareness to all stakeholders that approval requests may be required for certain aircraft.
MIT Data	Data item providing MIT information. Data elements include the NAS element with MIT in place, the start and end time of the MIT restriction, and the MIT spacing (e.g., 30 nautical miles [NM]).	Provides situational awareness to all stakeholders that MIT restrictions are present. Can be used by flight operators, GA, and FBOs for planning purposes.
MINIT Data	Data item providing MINIT information. Data elements include the NAS element with MINIT spacing, the start and end time of the MINIT spacing, and the MINIT spacing value (e.g., 5 minutes).	Provides situational awareness to all stakeholders that MINIT restrictions are present. Can be used by flight operators, GA, and FBOs for planning purposes.

Airport Departure Stop	Data item providing departure stop information for an airport. Data elements include the start time and end time of the departure stop, and the departure stop reason.	Provides situational awareness to all stakeholders that a departure stop is in effect. Can be used by flight operators, GA, and FBOs for planning purposes.

For a complete listing of all the data elements contained in the TTP Traffic Management Restriction service, please refer to the TTP Traffic Management Restriction JMSDD [4].

5.1.5 Terminal Flight Data Manager TTP Surface Metering Program Data Elements

The TTP SMP service provides all information about any current or future SMPs including information about the start and stop time of the program and parameters used to establish the SMP. See Table 6, for examples of the TFDM TTP Surface Metering Program data elements.

Table 6. Example TTP SMP Data Elements

Data Element	Description	
SMP Start Time	The start time for the SMP.	Provides situational awareness to all stakeholders of when a SMP will start. Can be used by all stakeholders for planning purposes.
SMP End Time	The end time for the SMP.	Provides situational awareness to all stakeholders of when a SMP is scheduled to end. Can be used by all stakeholders for planning purposes.
SMP Reason	The reason for the SMP.	Provides situational awareness to all stakeholders of the reason for a SMP. Can be used by all stakeholders for planning purposes and post-event analysis.
SMP Constraint	The constraint for the SMP (e.g., airport, runway, meter fix).	Provides situational awareness to all stakeholders of the constraint that is being metered. Can be used by all stakeholders for planning purposes.
SMP Status	The status for the SMP (e.g., affirmed, deferred, terminated).	Provides situational awareness to all stakeholders of the SMP status. Can be used by all stakeholders for planning purposes.
Number of Flights Affected	The number of flights affected by the SMP.	Provides situational awareness to all stakeholders of the number of flights affected by the SMP.

For a complete listing of all the data elements contained in the TTP SMP service, please refer to the TTP SMP JMSDD [5].

5.1.6 Terminal Flight Data Manager TTP Operational Metrics Data Elements

The TTP Operational Metrics service provides a set of established metrics (or KPIs) to indicate how well the TFDM airport is operating including the metrics used to evaluate the performance of SMPs. Operational Metrics will be produced for specified time intervals. See Table 7, for examples of the TFDM TTP Operational Metrics data elements.

Table 7. Example TTP Operational Metrics Data Elements

Data Element	Description	Importance to Stakeholders
Airport Arrival Demand KPI	The arrival demand count for the specified time interval.	KPI for all stakeholders to monitor to maintain awareness of the airport arrival demand and make informed planning decisions.
Airport Departure Demand KPI	The departure demand count for the specified time interval.	KPI for all stakeholders to monitor to maintain awareness of the airport departure demand and make informed planning decisions.
Metering Time Compliance KPI	The percentage of departures where the absolute value of the flight's start of taxi for departure time minus its TMAT is less than or equal to the metering time compliance window parameter.	KPI for all stakeholders to monitor to maintain awareness of metering time compliance. When metering time compliance is below the optimal level, stakeholders should work together to improve it.
Calculated Fuel Burn KPI	The amount of fuel burn provided in gallons calculated for the time interval requested.	KPI for flight operators, GA, and FBOs to monitor to be aware of aircraft fuel burn.
Queue Length Accuracy KPI	Comparison of the actual departure queue length to the target queue length.	KPI ATCT TM will monitor to determine if the queue length parameters are being adhered to.

For a complete listing of all the data elements contained in the TTP Operational Metrics service, please refer to the TTP Operational Metrics JMSDD [6].

5.2 Terminal Flight Data Manager Flight Operator System Collaboration Service

TFDM provides the TFCS request-reply service to allow flight operators to request the substitution of flights during a SMP. This service provides a path for both the request for substitution message to TFDM as well as a reply from TFDM indicating if the request was accepted by TFDM's automation. In addition, this interface provides a request-reply service for ramp operators to indicate when non-movement areas are closed or reopened, as well as to indicate when non-movement areas have reached gridlock status. Examples of these messages are provided in Table 8.

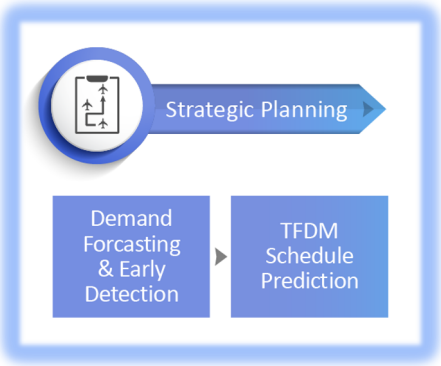
Table 8. Example SMP Substitution Related Data Elements

Message Type	Description	Importance to Stakeholders
Flight Substitution Request Message	Message from the flight operator to the TFDM system that includes the identification of the SMP involved in the substitution request, flights being requested for substitution, and flags for specific flights that are being cancelled and/or having their TMAT relinquished (or marked for future substitution) by the flight operator.	Message that flight operators can use to request a substitution for their flights. Gives flight operators flexibility to prioritize departures.
Flight Substitution Response Message	Message from the TFDM system to the flight operator that provides a response of either success or error for any substitution request. For flights with a success response, the new TMAT will be provided. For flights with an error response, the reason for the error (or rejection) will be provided.	Response message returned to flight operators after they send a Flight Substitution Request Message. Will indicate that the request has been accepted or if there was an error.
Closure Request Message	Message from the flight (or ramp) operator to create, activate, deactivate, update, or remove a closure request for a resource in the non-movement (or ramp) area.	Allows flight and ramp operators to advise other stakeholders of a closure in the non-movement area.
Closure Response Message	Message from the TFDM system indicating whether a closure request was successfully received by TFDM.	Response message returned to the submitter of the closure request message indicating if it was accepted or if there was an error.
Gridlock Request Message	Message from the flight (or ramp) operator to create, update, or remove a gridlock request for a resource in the non-movement (or ramp) area.	Allows flight and ramp operators to advise other stakeholders of gridlock in the non-movement area.
Gridlock Response Message	Message from the TFDM system indicating whether a gridlock request was successfully received by TFDM.	Response message returned to the submitter of the gridlock request message indicating if it was accepted or if there was an error.

For a complete listing of all the messages and the data elements contained in the TFCS request-reply service, please refer to the TFCS JMSDD [7].

6 Pre-Surface Metering Program Coordination

This section provides additional details for the Strategic Planning portion of the surface metering process.



6.1 Demand Forecasting and Early Coordination

Early engagement and collaboration between all stakeholders are prerequisites for successful SMP execution. As early as possible, flight operators should provide forecasted demand information with flight and intent data messages (EOBT, etc.) via the TFMData SWIM interface. This data should be updated, via electronic submission, if changed to provide accurate demand predictions to TFDM, as well as other ATC stakeholders (e.g., overlying facilities, including ARTCC and TRACON, and ATCSCC) and systems (e.g., TFMS, TBFM) utilizing the data.

SMP planning and coordination will be conducted via the mechanism specified in the local LOA. During these planning and coordination meetings, topics that should be discussed include, but are not limited to:

- **Desired target queue length that meets surface, NAS, and surface metering stakeholders' needs:** Target queue length, and associated upper and lower bounds, for the SMP(s) are a critical parameter. The queue length dictates how many flights can be in the queue for the metered resource at a given time. This parameter is responsible for assisting in managing queue lengths, associated taxi and queuing times, and thus benefits saved through reduced fuel burn, reduced emissions, and reduced surface congestion. Subsequently, the queue length also drives the length of time a flight will absorb queuing time at the gate and thus potential gate conflicts. Since each stakeholder may have operational and business needs that differ from one another (e.g., airline stakeholders prefer minimizing gate conflicts through greater lengths, FAA ATCT stakeholders prefer shorter lengths to decrease surface congestion), it is important that collaboration occurs to agree upon lengths that satisfy all stakeholders. Additionally, off-nominal conditions (e.g., closed taxiway) may require special coordination amongst stakeholders, even when local agreement on queue length exists in LOAs.
- **Expected SMP parameters (See Table 1):** In addition to the target queue length parameter, other parameters require agreement between stakeholders prior to SMP implementation. These will be published via TFDM TTP upon recommendation and can either be governed by local LOAs and/or adjusted real-time via stakeholder coordination prior to FAA stakeholders accepting a recommendation.

- **Expected local surface and airspace impacts:** It is important for the stakeholders to not only assess impact on the queue length and taxi times when considering and planning SMPs. Prior to the start of a SMP, local stakeholders (including overlying facilities) may need to assess impacts of the SMP on the airport as well as immediate airspace. This includes an assessment of the expected queue lengths, taxi times, any expected delays, and amount of congestion. The FAA stakeholders may consider determining the impact on airspace departure resources with the overlying TRACON and airspace metering (arrival and/or departure) with the TRACON and ARTCC.
- **Operational factors impacting surface planning (e.g., airport configuration, resource assignment and usage):** When planning and collaborating for a SMP, stakeholders should also assess the impact of local operating conditions on the SMP. This includes the occurrence and timing of an airport configuration change, impact of other existing or planned SMPs, surface resource usage (e.g., metering hold areas), and informal de-icing. The stakeholders should also assess if other TFM tools can be used to alleviate queue lengths (e.g., runway capacity and throughput management via runway assignment, adjusting runway-fix mapping).
- **Expected national impact (if any):** Other national TMIs and initiatives may impact the performance of a SMP. This includes Ground Delay Programs (GDPs), Airspace Flow Programs (AFPs), and/or Ground Stops (GSs), through TFMS, that can impact the demand on the runways and/or airport. If an AFP is forecasted for an airspace resource that is heavily utilized by the surface traffic, the SMP could be impacted by the associated expect departure clearance times (EDCTs). Additionally, reroute advisories may cause fluctuations in the TFDM surface schedule. Coordination with the FAA ATCSCC is critical to ensure that all local stakeholders are aware of impacts to these national initiatives and their impact on the SMP performance. The FAA will be responsible for coordinating, within the FAA stakeholders and with non-FAA stakeholders as needed, national operating plans and strategic TMIs (e.g., GDPs) that can affect local SMP parameters, execution, and performance.
- **Local operational conditions that can impact SMP parameters:** Local operational conditions can impact the decision making and/or need for adjustment of SMP parameters. Examples include: availability of movement area holding resource(s) (limited availability may drive longer queue length parameters), use of informal de-icing (may drive shorter queue length parameters), multiple departure metering programs (informs the decision to exempt or not exempt CFR flights), and even weather (longer queue lengths to avoid gate conflicts). The FAA will be responsible for utilizing TFDM What-If Modeling capabilities to identify potential scenarios that can affect capacity and demand forecasts as well as identify potential solutions with or without utilization of SMPs.
- **Type of SMP desired (e.g., runway, airport):** Following TFDM's recommendation for a SMP, local stakeholders may need to strategize on the use of an alternate type of SMP based on collaboration of items listed above. Stakeholders may feel that an alternate type of SMP may better alleviate or address certain operational and/or business needs that TFDM is otherwise unaware of.
- **Discussion of flight substitutions:** Non-FAA stakeholders (e.g., airline stakeholders, ramp control stakeholders) may need coordination on the use of substitution tools and input to TFDM. This can be achieved via local agreements, on an as-needed basis, or routinely based on recommended SMPs. Marking flights for substitution (strategic substitution information) allows the airlines to maintain Ration By Schedule (RBS) priority for a flight that the airline intends to delay and/or cancel. The marked flight can be substituted with another flight later without

losing the RBS priority for the original flight, providing greater flexibility to airline stakeholders for planning while encouraging TFDM schedule accuracy and stability. (See Section 7.5 for additional Substitution information).

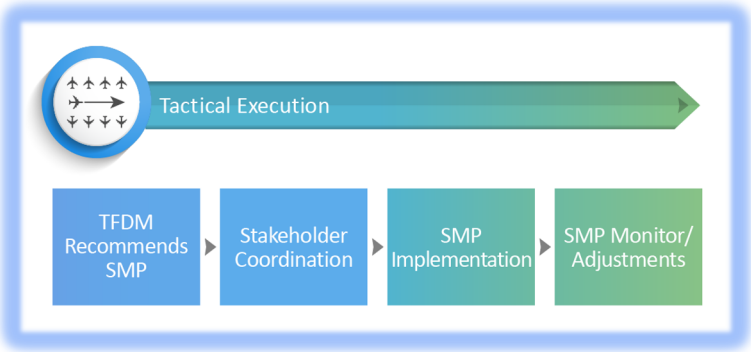
6.2 Terminal Flight Data Manager Schedule Prediction and Monitoring

TFDM uses available flight and intent data to predict demand and runway schedules. TFDM determines a schedule for each runway to be utilized per ATC-entered scheduled airport configuration. The runway schedule reflects forecasted demand, available capacity on the runways, impacts of local and national constraints known by TFDM, and other factors. Using the runway schedules, TFDM calculates the amount of time flights will spend in queue and the queue lengths for each runway and/or the airport over time. This predicted runway schedule and the predicted queue lengths will serve as inputs to the determination of a SMP recommendation by TFDM. TFDM will publish these schedules via the TFDM TTP SWIM feed for use by subscribers for planning purposes. Operational KPIs are also published on the TTP feed and can be monitored to stayed informed of airport and SMP performance.

During the schedule prediction phase, TFDM will update the schedule based on any new and updated information provided. Updated or new information could include updates to flight intent data by FOCs, updates to scheduled airport configurations (including runway rates), or new TMIs affecting departures. All stakeholders should provide updated and new data as early as possible to promote stability to TFDM's runway and airport predicted schedule.

7 Surface Metering Program Execution

This section of the user guide provides additional details for the Tactical Planning for and Execution of a SMP.



7.1 Terminal Flight Data Manager Recommends a Surface Metering Program

As indicated by the red circle in Figure 5, the TFDM System detects the potential need for a SMP when one or more departure queues exceeds the *Departure Target Queue Length Upper Threshold* parameter for a minimum amount of time. This prediction is made using TFDM's predicted runway schedule and forecasted departure demand along with the input parameters for the airport (e.g., *Runway Departure Rates, Target Queue Length Thresholds*).

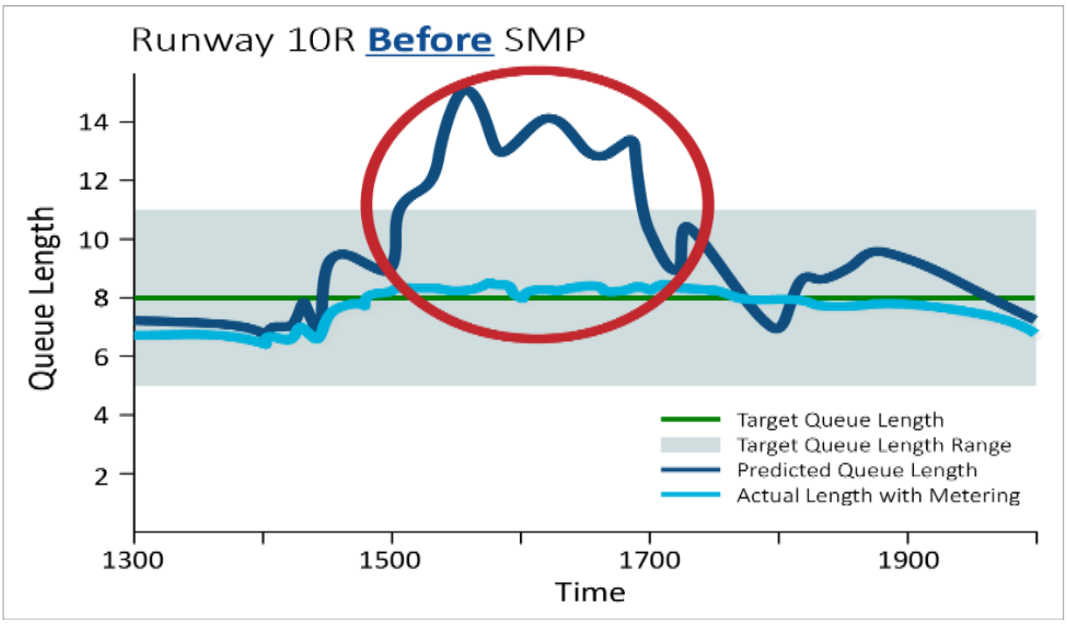


Figure 5. TFDM Predicts an Excessive Queue Length

Based on the input parameters selected and the duration of the time that predicted demand exceeds the *Target Queue Length Thresholds*, the TFDM system will recommend a SMP. The recommended SMP will contain the following data elements for review by both the FAA and stakeholders:

- SMP Identifier
- SMP Constraint Type (e.g., Runway, Airport, Airspace)
- SMP Start Time
- SMP End Time
- Number of Flights Affected
- Flight List (list of flights affected by the recommended SMP)
- Average Metering Hold[4]
- Maximum Metering Hold[4]
- Average Time in Queue (with and without a SMP)
- Predicted Gate Conflicts (with and without a SMP)
- SMP Reason (reason for recommending the SMP)
- Probability of SMP Extension (High, Medium, Low)
- Parameter Values Used to recommend the SMP (e.g., Target Queue Length)

All the data for the recommended SMP will be published by the TFDM system utilizing the TTP SWIM service. For more information on the TTP SWIM service, see the TTP sections of the NAS Service Registry and Repository (NSRR) and the TTP JMSDDs listed in the refence section, which are also available on the NSRR [9].

7.2 Stakeholder Coordination and Collaboration

After TFDM recommends a SMP, the FAA and non-FAA stakeholders should collaborate to determine if a SMP is desired or if the recommended SMP parameters need to be changed. This collaboration could take the form of a local stakeholder's teleconference, electronic coordination via email, or could be pre-coordinated based on an established local LOA between stakeholders at the airport (e.g., FAA ATCT, flight operators, airport authority).

During the collaboration and coordination process for a recommend SMP, stakeholders should consider:

- If a SMP is the desired way to manage the capacity/demand imbalance
- Recommended SMP parameters (e.g., average metering hold with and without the SMP, # of predicted gate conflicts)
- Changes to the recommended SMP program (e.g., changing start and stop times, SMP parameters) that are operationally needed
- Additional impacts not recognized by the TFDM system (e.g., weather impacts)

[4] For SMPs recommended when no other SMP is currently active. If a runway SMP is recommended when an airport SMP is active, or an in-trail SMP is recommended when an airport or runway SMP is active, Average Metering Hold/Maximum Metering Hold with and without the newly recommended SMP will be displayed for comparison purposes.

- Impacts of other local and/or national TMI programs (e.g., GDP, AFP) affecting departure and/or arrival flights
- Stakeholder limitations (e.g., lack of gates or holding areas for metering flights, ramp closures, etc.)

After collaboration and coordination with the stakeholders is complete, the FAA will have the following four options:

1. **Affirm** the recommended SMP with no changes
2. **Modify** the recommended SMP to incorporate changes based on collaboration
3. **Defer** the recommended SMP to allow for further collaboration or additional data prior to affirming the SMP
4. **Reject** the recommended SMP

Once the FAA implements one of the options above, updates about the recommended SMP will be provided to stakeholders via the TFDM TTP service including any changes to the program and changes to the status of the program (i.e., status changed from *recommended* to *affirmed* or *deferred* or *rejected*). Note, that while the FAA is responsible for collaborating with stakeholders per any local LOA, the FAA has the ultimate authority to decide when and by what parameters the SMP will be implemented.

7.3 Surface Metering Program Implementation

Once the SMP recommendation has been put forth, stakeholders will then have the option to discuss the SMP-at-large and whichever parameters determined to need tactical re-evaluation under the current circumstances. The FAA may then adjust the SMP and its parameters per this coordination.

Subsequently, after making any necessary parameter adjustments requested by surface metering stakeholders and approved by the FAA, the implementation of the SMP via TFDM will officially begin. At this point in the process, the focus for all parties becomes fulfillment of SMP objectives (e.g., successful execution of targeted metering times) as stipulated in the respective LOA. As the SMP continues operating, both FAA and non-FAA stakeholders will monitor compliance and performance measurements using information transmitted via the TFDM TTP SWIM feed. Either the TFDM system itself or stakeholders monitoring the SMP may recommend modifications or adjustments to parameters, such as extending the end time or increasing the runway queue length.

7.4 Surface Metering Program Execution/Monitor/Adjustments

Upon affirmation of the SMP, the focus of the Surface Working Group (SWG) moves onto the ongoing SMP performance. During the SMP, TFDM publishes surface schedule information via the TFDM TTP SWIM feed for use by stakeholders for planning and coordination purposes. This feed includes several surface data elements, such as the TMAT. See section 5.1 for further description of the TFDM TTP SWIM feed.

Four possible adjustments (see Figure 6) to the SMP that TFDM may recommend are:

1. **TMAT Reassignment:** Recommended when the departure queue length is predicted to go above target queue length upper threshold. Prevents congestion on surface (e.g., large number of unscheduled flights).

2. **Compression:** Recommended when the departure queue length is predicted to go below target queue length lower threshold. Prevents queue from running dry (e.g., flight delays due to baggage system failure).
3. **Extension:** Recommended when the departure queue length is predicted to exceed the target queue length upper threshold past the current SMP end-time. An extension shall not exceed the planning horizon.
4. **Termination:** Recommended when the goals of the SMP have been met and the departure queue is predicted to drop below the target queue length lower threshold for an extended period.

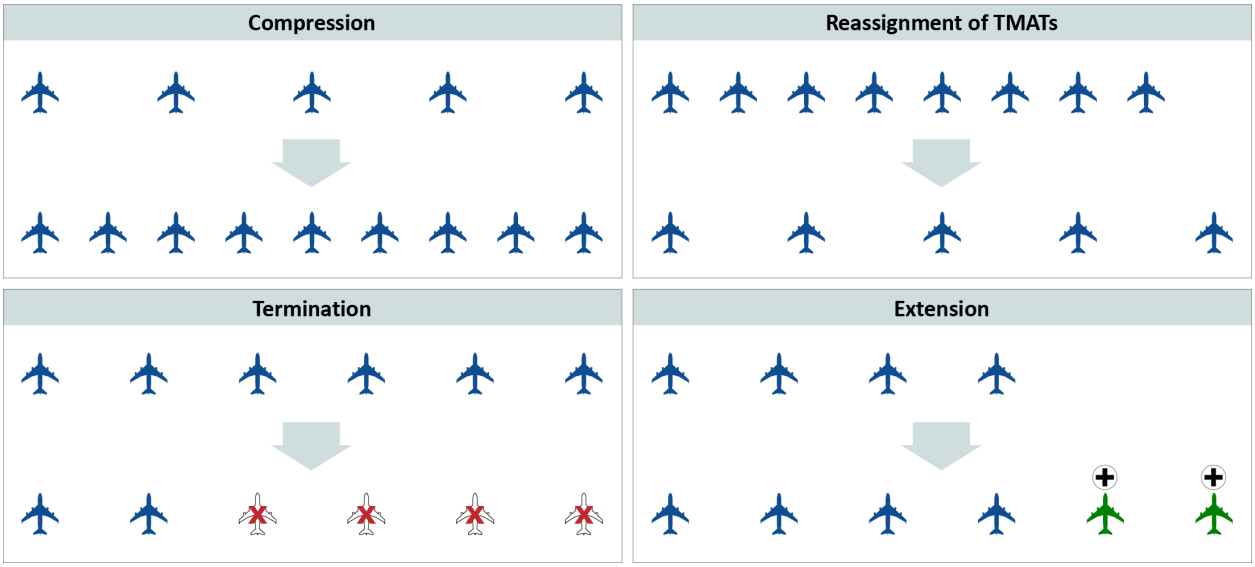


Figure 6. Possible SMP Adjustments

Tactical coordination of such adjustments may be necessary, as laid out in the airport specific LOA.

7.4.1 FAA Monitoring of SMP and Response to Adjustment Recommendations

FAA stakeholders will monitor control time compliance and performance of SMP (via TFDM TTP SWIM feed) as operationally practicable. This monitoring will include but is not limited to the following SMP metrics:

- **SMP Target Queue Length:** Working with SWG the FAA sets the number of aircraft that should be queuing within the airport configuration, for a given Airport Metering Model
- **Arrival Stand Conflicts:** The number of arrival aircraft that are unable to get to their assigned stands at landing
- **Holding in AMA:** The number of aircraft that are holding in the AMA. This holding can be for adherence to metering times (departure) or gate contention (arrival)
- **Ability to Meet Advertised Runway Rates:** Working with overarching facilities and within the facility the FAA will work to accurately predict the runway throughputs for the advertised configurations

Should the TFDM program recommend an adjustment, the FAA may:

- Update impacting TMI information in a timely manner, to reflect the impacting condition, value of impact, and TMI start and end times
- Ensure that the active configuration and schedule of configuration is reflective of operations and expected weather impacts

7.5 Substitution

During an active SMP, flight operators can substitute flights within a SMP subject to certain rules. Substitution during a SMP allows flight operators to prioritize flights by substituting them with other flights controlled by the same flight operator or a regional carrier flying for the flight operator. Additionally, substitution allows flight operators to determine how they want to fill spots in the metering program vacated by other flights that have either been delayed or cancelled. This includes flights that were marked for substitution prior to SMP activation.

For flights outside of the *Static Time Horizon*, TFDM automation will automatically move flights from the same flight operator into slots that have been vacated due to a flight cancellation or delay using RBS logic. Flight operators do not need to use substitution in this case.

Five Substitution Steps:

1. During an active SMP, the flight operator identifies flights that they want to substitute.
2. The flight operator submits a substitution request message via the TFCS interface (see Section 5.2 for more information on TFCS).
3. TFDM automation receives the substitution request message and evaluates the substitution request. TFDM automation conducts checks to ensure the request is permissible (see below for substitution rules).
4. TFDM automation sends a reply to the flight operator via the TFCS interface. This reply will notify the flight operator if their request has been approved or rejected. If rejected, the flight operator will also receive a reason for the rejection.
5. If the substitution request was accepted, the TFDM automation will also publish the new metering times (TOBT, TMAT, and TTOT) associated with all flights that were affected by the substitution request. Note, these updated times are received from the TTP Flight Data service.

Rules for Substitution:

There are five certain rules that govern the substitution process to ensure schedule integrity via RBS and equitable treatment of all flight operators. Substitution requests that violate these rules will be rejected by the TFDM automation.

1. Flights requested for substitution must be part of the same SMP.
2. Flight operators may only substitute flights they directly operate or regional affiliate flights they have direct control over. TFMS Airline Definition Files manage the alignment of flight operators to regional flights which they have direction control over.
3. Flights requested for substitution must not have taxied across their metering control point. For SMPs, the metering control point is the spot where a TMAT has been assigned (the entrance to the movement area). If a flight is actively taxiing in the AMA, the TFDM automation will reject a substitution request.

4. Flights with a CTD from other FAA systems (e.g., EDCT from TFMS), diversion recovery, and flights being controlled by GS are exempt from rationing in a SMP and thus are not eligible for substitution.
5. Flights requested for substitution must have TMATs that exactly match or inexactly match such that any substituted flight will receive a TMAT that is equivalent or later than the original TMAT.

Other Substitution Considerations

The amount of time flight operators have to substitute for a delayed or canceled flight is based on two SMP parameters: Reclamation Window and the Protection Period, (see Figure 7). These parameters provide a balance among the competing objectives of flexibility, stability, and minimizing the risk of missed departure opportunities:

1. The **Reclamation Window** is a period of time measured from the current time forward beyond which TFDM will not act on a canceled or delayed flight to reclaim capacity, regardless of whether it is marked for substitution or not. The intent is to allow the flight operators to submit intent information for the cancelled or delayed flight as soon as possible, while also providing flexibility and additional time to operators in making decisions regarding substituting another flight. This also maintains stability in the schedule during this time period.
2. The **Protection Period** is the amount of time after the TMAT of a canceled or delayed flight enters the reclamation window before TFDM will act on the flight to reclaim capacity. If a flight's TMAT is inside the reclamation window when a delay or cancellation is announced, the protection period begins immediately. The same applies for marked delayed or canceled flights already in the reclamation window when they receive TMATs during the initiation of a SMP.

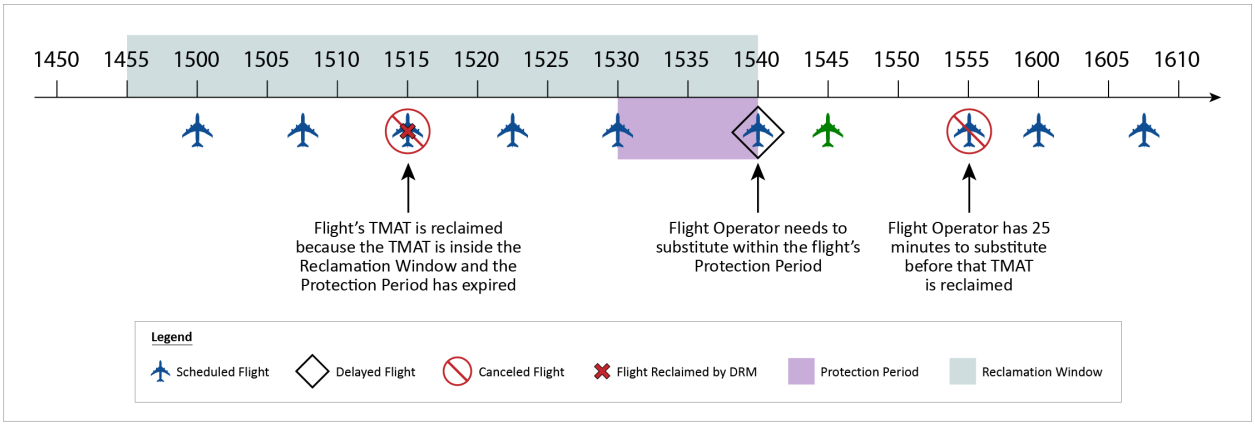
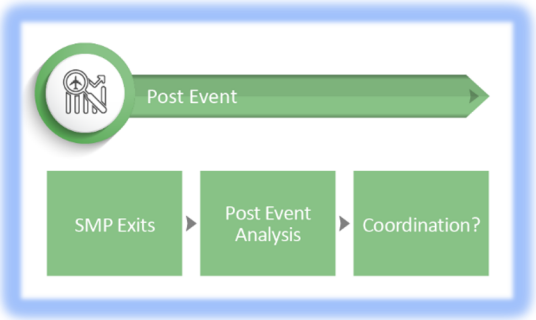


Figure 7. Reclamation Window and Protection Period

The flight operator will be notified of the approaching reclamation when a flight enters the protection period to allow the flight operator a final opportunity to substitute. If no action is taken and the flight's allocation is reclaimed, the flight operator will be notified of the reclamation via TTP Service.

8 Post Event

This section of the user guide provides additional details for the process of exiting of a SMP and the activities that follow.



8.1 Surface Metering Program Exit Strategy

TFDM will recommend the SMP be terminated when the queue length is predicted to fall below the target queue length lower threshold and when the unmetered queue will not exceed the target queue length upper threshold for the remainder of the scheduled SMP. If, on the other hand, the queue length is predicted to fall below the target queue length lower threshold, but then later exceed the target queue length upper threshold before the end of the SMP, then TFDM will recommend compression to shorten the SMP. Alternatively, TFDM could recommend a SMP extension. A final possibility is that TFDM recommends a SMP reassignment, which alters the time period the SMP is active. It is important to remember that TMATs are not published for departing flights entering movement area following the SMP end time.

Note: Even without an SMP, TFDM will still generate TOBTs for flights with a Controlled Time of Departure.

8.2 Post Event Analysis

The contents of this section are still under development in conjunction with AJR-G. It will be updated as the post event analysis is further defined.

This section will reflect the development of SMP performance dashboards and associated metrics. The data from these dashboards will be accessible to all stakeholders, via the AJR-G platform (ASPM). Stakeholders will use these dashboards and metrics when they collaborate as set out in the airport specific LOA, following a locally-determined process (see Section 8.3 for a description of roles and responsibilities). This collaboration will help the stakeholders understand the performance of a SMP and how it compared with previous programs (possibly even including filtering based on similar conditions).

The FAA will provide reports via nationally accessible means. The report could include some of the metrics published over TTP and discussed in Section 5.1.6. An example of a metric that could be included is the Metering Time Compliance KPI, which would inform stakeholders of how well aircraft are meeting their metering times. This information could be used to identify areas that require more attention in the future to ensure that most aircraft are meeting their metering times. Other possible discussion topics are the number of stand conflicts that occurred during the SMP and if the target queue lengths are set

appropriately. The topics discussed in post-SMP reports should evolve over time to meet stakeholder needs.

It is expected that non-FAA stakeholders will read and understand FAA-provided reports and analysis; additionally, non-FAA stakeholders may wish to develop and assess their own internal metrics and reports to address operational/business needs. Identified methods to improve SMP, changes to local procedures, and/or recommendations for future SMPs should be provided back to and coordinated with other local stakeholders, including the FAA, per local agreements. It is imperative that non-FAA stakeholders inform the FAA if SMPs are preventing the stakeholder from meeting their operational goals. This assists the local TFDM surface metering community plan and execute SMPS that provide stability to future SMPs and benefit to all stakeholders involved.

8.3 Post Event Coordination

Performance monitoring is a necessary component to ensure TFDM, and particularly SMPs, are performing well. At stakeholder meetings, participants should plan on how to deal with adverse events and when those plans would be executed. After the plans were executed, the stakeholders would review the performance of the plan and decide what went well and what could be improved upon. This would inform future plans and training could be developed to address any performance issues. The focus of the SMP post-event activities would be on the Review, Train, and Improve phases of this process. The exact nature of the post event collaboration should be addressed within the airport specific LOA.

It is expected that the FAA will conduct stakeholder review meetings that involve the discussion of performance monitoring on a frequent and regular basis to ensure the timely discussion and dissemination of information. The airport specific LOA will establish the occurrence of stakeholder review meetings. The FAA should facilitate a discussion of SMP performance, such as how many adjustments were required during a program. If there are any issues regarding how SMPs have been implemented in the past, those should be discussed and resolved during the meetings. The TTP feed provides several metrics that can be analyzed and discussed to supplement these performance conversations. See Section 5.1.6 for examples of the metrics that will be published over TTP. Upcoming special events that could impact the airport, such as sporting events or an approaching snowstorm, should also be discussed, and a plan for how to deal with the event should be established by consensus.

Non-FAA stakeholders should participate in the stakeholder review meetings. Non-FAA stakeholders should share their experiences and opinions on SMP performance. Any upcoming operational changes or issues that could affect surface operations should also be surfaced and discussed at these meetings so the FAA and other stakeholders can be prepared.

9 Surface Metering Program Local Considerations and Best Practices

The SMP framework as outlined in this document is not "plug-and-play"—i.e., there is not a "one-size-fits-all" template that can be implemented at each participating airport. Every airport has its own set of unique characteristics relating to number of runways, layout of runways, layout of taxiways, size of ramps (i.e., airline, cargo, GA, military, and special use ramps), number and orientation of concourses, layout of gates, layout of alleyways on each ramp, number of flight operators, number of arrivals and departures, the presence or absence of "banks" (i.e., an intentional "ebb and flow" pattern of traffic), status as a hub or spoke facility, and various other factors collectively referred to as "local considerations." All these unique local factors need to be taken into consideration as stakeholders begin planning and staging a SMP solution that will be the most effective implementation for their airport's operation.

Additionally, the committee of local stakeholders providing SMP oversight are advised to determine such things as how ramp operating entities will receive pertinent SMP data, which stakeholder is responsible for creating the SMP scorecard, which stakeholder will be the facilitator of SMP meetings, and various other oversight details such as these.

This section of the User Guide is intended to provide some guidance to SMP stakeholders regarding what kinds of questions should be asked during the localization phase of planning an airport's SMP implementation and also to describe a variety of best practices to be debated and considered by local SMP stakeholders—all of which is intended to assist stakeholders in the optimization of their SMP and enable successful completion of its core objectives.

9.1 Surface Metering Program Local Considerations

SMP local considerations are classified into four categories, as follows:

1. Airport Infrastructure
    a. Number of runways
    b. Layout of runways
    c. Layout of taxiways
    d. Number and location of movement area aprons / pads
    e. Number and size of ramps
        1) Airline ramps
            a) Jet bridge ramps
            b) Adjacent hardstand ramps
            c) Remote hardstand ramps

2) General aviation ramps (FBO)
    a) Business jet ramps
    b) Light aircraft ramps
    c) Flight school ramps
    d) Hangar ramps
    e) Helicopter pads
3) Cargo / freight ramps
4) Aircraft maintenance ramps
5) Military ramps

f. Number, location, size, and orientation of terminals / concourses
g. Layout of gates at terminals / concourses
h. Layout of alleyways on airline ramps
i. Number and location of non-movement area aprons / pads
j. Typical traffic flow patterns on airline ramps
k. Location and number of ground control handoff spots
l. Ramp control domain(s) / boundaries
m. Noise abatement restrictions
n. De-icing operations

2. Traffic Density
    a. Number of flight operators
    b. Number of arrivals and departures
    c. Presence or absence of banks
    d. Weekend variances
    e. Status as hub with connections or spoke with turnarounds
3. Ramp Operator Logistics
    a. Adequate availability of non-movement area aprons / pads for SMP (if necessary)
    b. Adequate number of pushback tractors for SMP
    c. Adequate number of ramp operations personnel for SMP
    d. Adequate technology to support SMP

4. Stakeholder Agreements (as determined by the Local LOA)
    a. Definition of overall expectations
    b. What will the frequency be for stakeholder meetings?
    c. Which stakeholder will be the meeting facilitator?
    d. How frequently will the SMP scorecard be produced?
    e. Which stakeholder will produce the SMP scorecard?
    f. Which of the standard SMP data fields will be shared across stakeholders?
    g. How specifically will SMP data be shared (i.e., technological specifications)?
        1) What format will be utilized for SMP data transmission?
    h. How often will SMP data be transmitted (e.g., one, two, or five minutes)?
    i. What SMP data usage restrictions should be specified in stakeholder LOAs?
    j. What is the most logical TMAT window (i.e., upper and lower bounds)?
    k. Local policy question: Will ground control be exercising their right to refusal of handoffs from ramp control at the spot for flights that call for taxi prior to the TMAT window?

The local considerations listed in the Airport Infrastructure, Traffic Density, and Ramp Operator Logistics sections should assist stakeholders in determining the necessity, feasibility, and scope of a SMP at their airport. For example, although flights departing GA, cargo, and military ramps may not be included in the active SMP for the airport in question, contribution to overall ground traffic from these ramps and how external factors such as these might affect flights within the SMP will still need to be carefully considered during the evaluation and planning stages. These lists of local considerations should help guide the stakeholder conversations necessary for project success and spark constructive debate regarding factors that may not have initially been considered.

9.2 Surface Metering Program Best Practices

Perhaps the most important—and likely the most obvious—best practice encouraged for all stakeholders is to stay with the SMP and resist all internal and external pressures to deviate from it. At the heart of a SMP, ramp operations managers are encouraged to not allow various other time pressures—such as internal D+0 and A+14 targets—steer their respective operations away from the airport's overall SMP mission objective. SMP is very much a "win together" effort. At times it will be difficult to see the benefits in real-time, but when one takes a step back and no longer sees long queues at departing runways, no longer sees countless passengers unfairly trapped for long periods of time on movement area aprons, and no longer sees ground control gridlock, then the SMP's success becomes apparent. Furthermore, beyond all that stakeholders no longer see, if they begin seeing flights arriving earlier than they would have using the first-come-first-served paradigm, then the payoff and positive reinforcement are even more evident.

Additional best practices include setting a stakeholder meeting frequency that best aligns with the airport operation. Operational volume, degree of complexity in operations (including weather events), frequency of special events, and stakeholder profile are reasons airports may wish to hold more frequent meetings to discuss and review surface management and SMPs. Stakeholders will have to collaborate and decide what frequency works best for all parties.

Stakeholders should consider the possible confusion that could occur for pilots and ramp operations when activating a SMP. When the standard operating procedures at an airport change, confusion is inevitable. Stakeholders should consider human factors while assessing recommended SMPs, understand the risks of changing airport operations, and take the proper steps to mitigate them.

Additionally, when deciding whether to activate a SMP for all runways or just a specific subset of runways, stakeholders need to carefully analyze the airport's physical characteristics as listed in the airport infrastructure local considerations above. At many airports, there is not a logical correlation between runways and alleyways; therefore, implementing a SMP for a subset of runways could potentially cause more negative results than positive results. For example, if an airline ramp has an interlaced mix of northbound and southbound departures on a concourse with limited alleyway movement options, and only the south subset of runways is included in the active SMP, pushbacks for the north runway departures not included in the SMP will likely cause interference with the south runway departures, which could likely result in missed TMATs.

10 Other Surface Management Considerations

TFDM's additional surface management capabilities can impact operations with and without surface metering. The following are considerations that the surface metering stakeholders should be aware of.

10.1 Controlled Time of Departure-Target Off Block Time

For flights affected by a TBFM and/or TFMS TMI (e.g., TBFM metering, TBFM departure scheduling, TFMS GDP, etc.), TFDM will assign a runway departure time that will allow the flight to meet the CTD (e.g., CFR, EDCT). TFDM will also calculate a recommended TOBT based off the estimated runway departure time. Stakeholders can expect to receive the TOBT via the TFDM TTP SWIM feed when a CTD is affecting the flight, regardless of whether a SMP is active and affecting the flight. Stakeholders are not required to comply with and are not penalized for missing a TMAT, unless a SMP is also occurring. If the flight is impacted by the TBFM and/or TFMS TMI, in addition to the SMP, the TOBT will satisfy both constraints and will remain after the end of the SMP. If the TBFM and/or TFMS TMI is cancelled or the flight is no longer subject to the CTD and the flight is not subject to an SMP, the TOBT is no longer valid and will not be published further.

A flight will receive a TOBT if one or more of the following occurs:

- *Flight is subject to an SMP (Runway, Airport, and/or In-Trail)*
- *Flight is subject to a CFR Control Time of Departure*
- *Flight is subject to an EDCT Control Time of Departure*

10.2 Surface Scheduling

TFDM's surface scheduling capabilities will provide surface metering stakeholders improved surface predictions and actual event information. TFDM will utilize current airport configurations, scheduled airport configurations, adapted rules, data from external systems and stakeholders, historical data captured by TFDM, and controller input to generate a predicted airport surface schedule and runway schedule for each available runway. For each flight scheduled to depart, TFDM will estimate a departure time and publish this Estimated Takeoff Time (ETOT) via the TFDM TTP SWIM feed. Stakeholders can access this data and use it for flight planning purposes; at the same time, other FAA NAS systems such as TBFM and TFMS, will ingest the ETOTs from TFDM-equipped airports to improve their own scheduling capabilities and reach the FAA's TBO operational vision. In addition, TFDM will use other FAA NAS system information, such as the estimated time of arrival to an airport provided by TBFM, to generate arrival times (estimated time of landing [ELTD]) for publication via the TFDM TTP SWIM feed.

10.3 What-if Modeling Capabilities

The following two TFDM capabilities provide ATCT stakeholders what-if modeling capabilities to manage airport traffic flows strategically to increase throughput and efficiency. ATCT stakeholders both execute the use of the tools, as well as review the results.

10.3.1 Runway Load Balancing

Runway Load Balancing is a TFDM-provided capability available to ATCT TFDM users. The functionality will assist controllers in strategically balancing demand when multiple departure runways are in use at busy airports. The goal of the strategic shift in demand is to reduce surface-incurred delay due to taxi

and queue times, as well as increase the throughput on the runways. The TFDM capability provides the ATCT a list of recommended flights to shift from one runway to other available departure runway(s). The user can accept or remove specific flights from the list of recommended flights based on the ATCT needs and operating plans, potentially in coordination with other stakeholders. Upon accepting the recommendations, TFDM reassigns the affected flights' runway and TFDM recalculates runway schedules for runways in which demand was removed from or added to. The new ETOTs are published to stakeholders via the TFDM TTP SWIM feed. The tool will not recommend this balancing for flights with CTDs unless the flight can comply with the existing CTD.

10.3.2 What-if Configuration tools

An additional TFDM-provided modeling capability provides ATCT TFDM users the ability to model airport configuration changes prior to implementing new configurations. ATCT users can enter the parameters that are changing (e.g., departure rates, arrival rates, runways in use, runway closures) and a time for the configuration change to occur. TFDM then provides modeled runway schedules, changes to airport throughput rates, runway throughput rates, impacts to SMP parameters, and impact to delays, amongst other TFM results. TFDM also provides ATCT users recommended configuration implementation times to minimize impact on efficiency. Multiple "what-if" scenarios can be executed by the ATCT user and compared at once to find the optimal solution. If the ATCT affirms a modeling result, the airport configuration is scheduled; TFDM will calculate new runway schedules, recommend SMP adjustments as necessary, and publish relevant schedule and airport information to stakeholders via the TFDM TTP SWIM feed.

10.4 Influence of Other Traffic Management Initiatives on Surface Metering Programs

TFDM surface scheduling capabilities ingest TMI information from other FAA systems, including TBFM and TFMS. TFDM also provides the ability for an ATCT to enter local traffic management initiatives, including MIT and MINIT restrictions. The system will use this data to inform the surface schedule, aligning airspace and surface schedules and increasing the ability for controllers to meet compliance times and restriction needs. This will improve local and NAS efficiency and allow the FAA to achieve tactical constraint and strategic NAS-level goals.

TFDM will provide TBFM and TFMS increased predictability for departures, including improved ETOTs. TFDM's surface schedule will enable enhanced predictability for assignment of control times and meeting local restrictions (e.g., MIT/MINIT) as well as increase the collaborative opportunity for schedule compliance and improved TFM decision making. For flights affected by a TBFM and/or TFMS program, TFDM will assign and adjust surface metering times that reflect the CTD (CFR, EDCT).

10.5 Gate/Stand Data Submission

The accuracy of the TFDM surface scheduler is reliant on receiving accurate information from flight operators, including gate/stand assignment. The TFDM surface scheduler is aware of gate/stand locations and calculates estimated taxi times and take-off times based on the gate/stand location and expected surface traffic. Gate/stand assignment should be provided and kept updated to allow TFDM to estimate accurate times. TFMS's TFMData service or TDLS can be used to provide gate/stand assignment to TFDM. Gate/stand assignments need to be formatted properly and match local TFDM adaptation.

Appendix A References

[1] Leidos Innovations Corporation, "Terminal Flight Data Manager (TFDM) Terminal Publication (TTP) Flight Data Service," 15 June 2018. [Online]. Available: https://aviationsystemsdivision.arc.nasa.gov/publications/atd2/tech-transfer1/2_Phase_1_Knowledge_and_Technology_Artifacts/2.2-07%20Leidos_E41_TTP_FlightData_DRAFT_18-0213.pdf. [Accessed 15 May 2019].

[2] Leidos Innovations Corporation, "Terminal Flight Data Manager (TFDM) Terminal Publication (TTP) Flight Delay Service," 15 June 2018. [Online]. Available: https://aviationsystemsdivision.arc.nasa.gov/publications/atd2/tech-transfer1/2_Phase_1_Knowledge_and_Technology_Artifacts/2.2-08%20Leidos_E41_TTP_FlightDelay_DRAFT_18-0214.pdf. [Accessed 22 May 2019].

[3] Leidos Innovations Corporation, "Terminal Flight Data Manager (TFDM) Terminal Publication (TTP) Airport Information (AI) Service," 15 June 2018. [Online]. Available: https://aviationsystemsdivision.arc.nasa.gov/publications/atd2/tech-transfer1/2_Phase_1_Knowledge_and_Technology_Artifacts/2.2-06%20Leidos_E41_TTP_AirportInformation_DRAFT_18-0212.pdf. [Accessed 22 May 2019].

[4] Leidos Innovations Corporation, "Terminal Flight Data Manager (TFDM) Terminal Publication (TTP) Traffic Management Restrictions (TMR) Service," 15 June 2018. [Online]. Available: https://aviationsystemsdivision.arc.nasa.gov/publications/atd2/tech-transfer1/2_Phase_1_Knowledge_and_Technology_Artifacts/2.2-11%20Leidos_E41_TTP_TrafficMgmtRestrictions_DRAFT_18-0216.pdf. [Accessed 22 May 2019].

[5] Leidos Innovations Corporation, "Terminal Flight Data Manager (TFDM) Terminal Publication (TTP) Surface Metering Program (SMP) Service," 15 June 2018. [Online]. Available: https://aviationsystemsdivision.arc.nasa.gov/publications/atd2/tech-transfer1/2_Phase_1_Knowledge_and_Technology_Artifacts/2.2-10%20Leidos_E41_TTP_SurfaceMeteringProgram_DRAFT_18-0217.pdf. [Accessed 22 May 2019].

[6] Leidos Innovations Corporation, "Terminal Flight Data Manager (TFDM) Terminal Publication (TTP) Operational Metrics (OM) Service," 15 June 2018. [Online]. Available: https://aviationsystemsdivision.arc.nasa.gov/publications/atd2/tech-transfer1/2_Phase_1_Knowledge_and_Technology_Artifacts/2.2-09%20Leidos_E41_TTP_OperationalMetrics_DRAFT_18-0215.pdf. [Accessed 22 May 2019].

[7] FAA Air Traffic Organization Surface Operations Office, "U.S. Airport Surface Collaborative Decision Making (CDM) Concept of Operations (ConOps) in the Near-Term," 15 June 2012. [Online]. Available: https://faaco.faa.gov/index.cfm/attachment/download/33926. [Accessed 22 May 2019].

[8] Government Publishing Office, "Responsibility and authority of the pilot in command," [Online]. Available: https://www.ecfr.gov/cgi-bin/text-idx?rgn=div8&node=14:2.0.1.3.10.1.4.2. [Accessed 22 May 2019].

[9] FAA, "NAS Service Registry and Repository (NSRR)," [Online]. Available: https://nsrr.faa.gov/.

Appendix B Surface Focused Data Exchange Data Elements

Data Element	Description
Aircraft Registration Mark	The unique alphanumeric string that identifies an aircraft. Sharing the unique registration number will allow the Surface system to identify possible turn-around conflicts and other departure problems.
Actual Off-Block Time (AOBT)	The actual time at which a flight has sent a "block out" message from the gate or parking location. This information will be used to help determine the accuracy of light operators' Earliest Off Block Time (Currently known as OUT time).
Actual Take Off Time (ATOT)	The time at which a flight lifts off from the runway as reported by the CDM Member via a CDM message. If the CDM member sends more than one value, the most recently submitted time is contained in this field. Otherwise, the value is null. (Currently known as the OFF time).
Actual Landing Time (ALDT)	The Actual time the flight has landed on the runway. Sharing arrival information provides essential information to facilitate gate conflict and demand/capacity imbalance predictions. (Currently known as the ON time).
Actual In-Block (AIBT)	The Actual time the flight has blocked in at the gate. Sharing arrival information provides essential information to facilitate gate conflict and demand/capacity imbalance predictions for both gate and departure predictions on availability. (Currently known as the IN time)
Earliest Off-Block Time (EOBT)	Time when the flight operator plans for an aircraft to push back from its assigned gate. The system can forecast surface demand vs. capacity based on flight operator's best estimation of push back time. The fidelity of EOBT is required for proper surface predictions and process.
Initial Off-Block Time (IOBT)	The initial off-block that a flight provided. Used to save the original Off-Block time of the flight. Useful for flight data matching. (Currently known as IGTD).
Departure Stand Assignment*	The stand at which an aircraft is assigned at the originating aerodrome prior to commencement of the flight (i.e., prior to taxi-out and take-off). Stand information will lead to more accurate ramp transit time (RTT) calculations and therefore more accurate Estimated Time of Departure (ETD).
Arrival Stand Assignment*	The stand at which an aircraft is assigned at the destination aerodrome upon completion of the flight (i.e., after landing and taxi-in).
Arrival Stand Availability	The availability status for the stand assigned to the arriving flight. In some cases, an arrival stand may still be occupied by a departing aircraft that is experiencing a delay or perhaps is still there resulting from a ramp operator planning error.

Data Element	Description
Acceptable Departure Runways[5]	List of departure runways that are cohesive with a departing aircraft's flight plan routing or operational limitations.
Unacceptable Departure Runways	List of departure runways that are not cohesive with a departing aircraft's flight plan routing or operational limitations.
Departure Readiness	The readiness status of a planned departing flight. Readiness can be affected by aircraft maintenance activities, flight crew and cabin crew having not yet reported for duty, aircraft fueling, boarding of passengers, loading of baggage and cargo, and various other factors.
Arrival Intent to Hold in Non-Movement Area	Communication of intent to hold the arriving flight in the non-movement area immediately after landing.
Departure Intent to Hold in Non-Movement Area	Communication of intent to hold the departing flight in the non-movement area prior to receiving take-off clearance.
Arrival Intent to Hold in AMA	Communication of intent to hold the arriving flight in the AMA immediately after landing.
Departure Intent to Hold in AMA	Communication of intent to hold the departing flight in the AMA prior to receiving take-off clearance.
Intent to be De-Iced	Communication of intent for a departing aircraft to be treated with de-icing and/or anti-icing fluid in order to prevent build-up of ice on leading edges, wings, fuselage, and control surfaces during taxi, take-off, and ascent during cold climate precipitation.
Intended De-Icing Location	Communication of intended location where de-icing fluid and/or anti-icing fluid will be applied to the departing aircraft. This location is typically either the departure gate, a designated apron in the non-movement area, or a designated apron in the movement area.
Intended Departure Spot	Communication of intended departure ramp alleyway spot at which the departing aircraft will transition from ramp control in the non-movement area to ground control in the movement area.
Intended Arrival Spot	Communication of intended arrival ramp alleyway spot at which the arriving aircraft will transition from ground control in the movement area to ramp control in the non-movement area.
Gate Return Intent	Communication of intent to return to the departure gate (may or may not be the exact same gate this aircraft initially departed from). This could be for a variety of reasons including mechanical issues with the departing aircraft, a flight crew member has exceeded their duty time restrictions, passenger medical issue, passenger security issue, re-routing requires additional fuel, need for additional de-icing/anti-icing.

**Departure and Arrival Stand Assignments can be submitted via TFMS's TFMData service or TDLS.*

[5] TFDM is currently planning to only utilize unacceptable runways.

Appendix C Local Letter of Agreement Template

Below is a template for establishing a local Letter of Agreement for all stakeholders at an airport that is implementing TFDM surface metering and local processes and procedures. This template is not meant to be used verbatim, but rather modified to meet the needs of each airport. Some template language may not be applicable to all airports.

PLACEHOLDER for LOA

Appendix D Glossary

Term	Definition
Aircraft Stand	A designated area on an apron intended to be used for parking an aircraft. Use interchangeably with “gate” in this document.
Airport Configuration	Information which includes the active runways and their use for arrivals and/or departures, nominal runway assignment rules (runway-fix mapping), airport surface holding areas, and associated nominal surface resource capacities and rates. Nominal values are stored in the adaptation and are used for planning purposes such as after a configuration change has been scheduled or during what-if modeling. Upon implementing a configuration, nominal values are updated as needed to reflect current conditions. Final "called" capacities and rates (AAR and ADR), will be provided in real-time based on demand and meteorological information and collaboration with overlying facilities (TRACON, ARTCC, Air Traffic Control System Command Center (ATCSCC).
Airport Configuration Schedule	A schedule of one or more airport configurations. The first airport configuration in the airport configuration schedule is the current airport configuration, i.e., the airport configuration that is active at the current time. If there is only one airport configuration in the airport configuration schedule, then that airport configuration is considered active for the full-time horizon of the system. If there is more than one airport configuration in the airport configuration schedule, then those after the first one (i.e., after the current airport configuration) are scheduled airport configurations. Each scheduled airport configuration includes the user-specified time that the system assumes the airport configuration will be implemented (i.e., become the current configuration). Scheduled airport configurations are ordered by their scheduled times. Scheduled airport configurations are added to the airport configuration schedule by the user. Scheduled airport configurations become the current configuration based on user input; they do not automatically become the current configuration at their scheduled time.
Airport Departure Rate (ADR)	A TFM operational parameter specifying the number of aircraft which can depart an airport and the airspace can accept per hour.
Airport Operating Conditions	An ATC parameter that defines the meteorological conditions at the airport, e.g., visual meteorological conditions, marginal visual meteorological conditions, and instrument meteorological conditions.
Airport Movement Area (AMA)	Airport Movement Area. Also referred to as the Active Movement Area.
Actual Movement Area entry Time (AMAT)	The actual time when a flight taxis from the spot and enters into the movement area.
Arrival Stand	The stand at which an aircraft arrives at the destination airport on completion of the flight. This data element is associated with the AIXM "Aircraft Stand" data element.

Term	Definition
Assigned Departure Runway	Flight-specific assignment provided by ATC of which runway a flight will use to depart.
Average Metering Hold	Average metering hold incurred by flights near a specific flight within the schedule. It is the average of metering holds of flights within the same SMP that have Initial Off Block Times (IOBTs) within 15 minutes of a specific flight's IOBT. It is used to calculate metering times for an unscheduled flight or for a flight no longer affected by a ground stop, ramp closure, or route closure.
Call for Release (CFR)	Wherein the overlying ARTCC requires a terminal facility to initiate verbal coordination to secure ARTCC approval for release of a departure into the en route environment.
Call For Release (CFR) Flights Exempt from Metering	Indicates that CFR flights will be exempt from departure metering on a per program basis. The default setting is that CFR flights will be included in departure metering. A reason for the exclusion must be provided.
Call For Release (CFR) Compliance Window	The window of time that a CFR flight would be compliant. The beginning of the CFR time window is the earliest runway time that a CFR flight is considered compliant.
Compliance	An indication of whether a flight has departed within a specified time frame of the assigned departure time (EDCT, Controlled Departure Time [CDT]).
Compression Automatic Affirmation	Configurable option to allow for automatic affirmation of a Recommended SMP Compression.
Compression Minimum TMAT Adjustment Time	Configurable value set by the TMC/OS/CIC and applicable to all Flight Operators, is used to increase the stability of TMATs during compression. It prevents multiple small adjustments to a flight's TMAT from occurring by requiring that any updated TMAT must differ from the prior TMAT by more than the Compression Minimum TMAT Adjustment Time. If an adjustment to an existing TMAT would be less than the Compression Minimum TMAT Adjustment Time, the TMAT is left unchanged.
Controlled Time of Departure (CTD) Buffer	A configurable SMP Parameter that may be applied to flights with EDCTs and assigned CFR times to provide additional time to account for the uncertainty that exists in surface operations and reduce the risk of missing the EDCT or CFR.
Current Airport Configuration	The airport configuration that is active at the current time. The current airport configuration determines such things as the active departure and arrival runways, the active runway assignment rules, and the runway and airport arrival rates. There is always a current airport configuration. The current airport configuration is selected from among the airport configurations in the system adaptation. The user can modify certain airport configuration default values from the adaptation, such as the runway and airport arrival rates and the active runway assignment rules.
Demand	The set of flights that are scheduled to use the airport resources.

Term	Definition
Demand/Capacity Imbalance	When the queue length for a metering resource is predicted to exceed the target queue length's upper threshold for that metering resource.
Departure Metering	This is a traffic flow management (TFM) initiative to provide controlled departure times in order to manage flows of one or multiple airports to/over defined points in the airspace. This initiative is managed by the Time-Based Flow Management (TBFM) automation system.
Departure Queue	When in multiple runway metering mode, all flights lined up for departure at the end of the runway or behind a flight lined up for departure at the end of the runway are in the queue for that runway. When in single airport metering mode, all flights in the movement area with intent to depart are in the departure queue.
Departure Stand	The stand from which an aircraft departs on commencement of the flight. This data element is associated with the AIXM "Aircraft Stand" data element.
Departure Target Queue Length	Number of departures in the departure queue considered optimal for the local airport during metering. The TMC/OS/CIC is expected to coordinate initial values with all stakeholders and maintains the authority to amend as appropriate to reflect current airport surface operations.
Departure Target Queue Length Lower Threshold	Number of departures in the departure queue below the departure target queue length used to determine need for compression or termination of a SMP. The TMC/OS/CIC is expected to coordinate initial values with all stakeholders and maintains the authority to amend as appropriate to reflect current airport surface operations.
Departure Target Queue Length Upper Threshold	Number of departures in the departure queue above the departure target queue length used to determine need for a SMP and reassignment of TMATs.
Designated Metering Resource (DMR)	A surface resource that may be metered and is designated to be monitored for metering through the local adaptation. Metering Resources include Airport as a single queue, departure runways, and In-trail restricted resources, such as a departure fix, departure fix group, destination airport, or jet route with an in-trail restriction.
EDCT Compliance Window	The window of time that an EDCT flight would be compliant. The beginning of the EDCT compliance window is the earliest runway time that an EDCT flight is considered compliant.
Earliest Feasible Takeoff Time (EFTT)	The earliest time an aircraft could take off from its assigned runway based on the flight operator provided EOBT, plus the expected ramp transit time, taxi time and time spent (if any) in the runway queue.
Earliest Off Block Time (EOBT)	Earliest Off Block Time data element provided by the Flight Operator.
Electronic Flight Data (EFD)	A TFDM capability that integrates data from multiple systems and stakeholders and provides an electronic means of coordination with Air Traffic.

Term	Definition
Expect Departure Clearance Time (EDCT)	The runway release time assigned to an aircraft in a traffic management program and shown on the flight progress strip as an EDCT.
Fix	A geographical position determined by visual reference to the surface, by reference to one or more radio NAVAIDS, by celestial plotting, or by another navigational device.
Flight Data	Flight data is any information related to flight. It will vary in the context such as ATCT, TRACON, ARTCC, ATCSCC, flight operator, flight operations center, and even customer service applications.
Flight Operator	A person or organization responsible for operating an aircraft. Flight operator types includes airline, general aviation, military, cargo, and others. Flight operator may refer to any entity within the above types of organizations, such as a Flight Operations Center (FOC), dispatcher, or pilot-in-command.
Flight Plan	Specified information relating to the intended flight of an aircraft that is filed orally or in writing with a Flight Service Station (FSS) or an ATC facility.
Flight State	Current flight condition based on a variety of data sources including surveillance data, flight data, flight operator data, and user input. This condition is required to consider various types of data including but not limited to Aircraft State on Surface, Resource Readiness Indications received from flight operators, and Clearances Issued State.
Flight Suspension Time	Configurable length of time after the Flight Suspension Warning notification indicating that if no action is taken the TMAT will be reclaimed, and the flight will be removed from the demand list.
Flight Suspension Warning Time	Configurable length of time after the initial Missed TMAT notification indicating that if no action is taken by a specified time the TMAT will be reclaimed, and the flight will be removed from the demand list.
Flights Affected Threshold	Configurable percentage of flights affected associated with a rejected SMP required to generate a new recommended SMP.
Flights Exempt from Rationing	A subset of flights that, if included in a SMP, receive metering times that are controlled by external restrictions or special rules as opposed to RBS principles. For instance, flights with assigned EDCTs or Diversion Recovery flights.
Flights Subject to Rationing	Flights that, if included in a SMP, receive metering times that are calculated based on Ration By Schedule (RBS) principles based on inclusion parameters (e.g., do not have a CFR). Flights in a SMP are either rationable or exempt from rationing. See RBS for further information.
In Queue	This is a flight state that indicates that a flight has taxied to its assigned runway and is awaiting take off clearance.

Term	Definition
Inexact Substitution	An inexact TMAT substitution is needed when a Flight Operator wishes to substitute a later flight with an earlier one, but the later one cannot move early enough to make use of the earlier flight's TMAT. In This case, the earlier flight assumes the TMAT assigned to the later flight and the later flight is assigned a TMAT with zero metering hold.
Initial Off Block Time (IOBT)	IOBT is the first EOBT received from a flight operator.
Interface	A point of interaction between components and is applicable at the level of both hardware and software.
In-trail Restricted Resource	Any resource such as departure fix, departure fix group, jet route, or destination airport that is restricted by a Miles-In-Trail or Minutes-In-Trail restriction.
Mark for Substitution	An indication from the flight operator that a flight should be handled by the automation in a certain manner. A flight that is marked for substitution is assigned a metering time based on its IOBT priority without consideration of the fact that it could be assigned a metering time that causes the flights TOBT to be earlier than its EOBT.
Metering Control Point	The location where a flight's compliance toward its metering time is measured. Spot, for flight metered in a non-de-icing SMP or Movement area entry, for flights that pushback directly into AMA, or holding area exit for flights that intend to hold in AMA.
Metering Hold	Amount of time a metered flight is expected to wait before pushing back in order to meet its metering time. The difference between a flight's EOBT and TOBT.
Metering Time	TMAT.
Multiple Runway Queue Metering Mode	One of the options to model the surface scheduling and metering. In this mode, each departure runway is modeled as a single-server queue with service rate equal to each runway's RDR. Only the flights predicted to use that runway are included in the schedule.
Notification	Information provided to the user signaling the occurrence of an event or warning the user of a situation. The notification may be provided visually and/or aurally. Notifications are subdivided by urgency into alarms, alerts, and prompts.
Off Block	This is a flight state where a flight has pushed back from the stand.
Planning Horizon	Configurable amount of time within which flights expected to depart could be assigned metering times.
Predict	Calculate an estimate of the future value of data. (Context: Predicted Runway Schedule)
Protection Period	Locally agreed upon time that a Flight Operator must substitute a delayed or canceled flight before the automation reclaims the allocated capacity.
Queue	The placement, integration, and segregation of departure aircraft in designated movement areas of an airport by departure fix, EDCT, and/or restriction.

Term	Definition
Queue Length	"The number of flights in the departure queue at any given time. It applies to all kinds of metering resources such as runway or departure fix. The predicted queue length is the number of flights that are modeled to have entered the queue but not have departed the queue at any given time.
Queue Waiting Time	Time a flight occupies a queue. The difference between the time a flight enters a queue and the time that it leaves the queue.
Ramp Transit Time (RTT)	The time for a flight to taxi from the stand or parking position to the spot or from spot to parking position.
Ration By Schedule (RBS) Priority	Priority of flights in order to receive a metering allocation. RBS priority for a flight is initially given by its IOBT, but if a flight is substituted for another in a guide substitution (Substitution requested by Flight Operators after TMATs are assigned), the flights exchange RBS priority.
Reassignment of TMATs Minimum TMAT Adjustment Time	Configurable value set by the TMC/OS/CIC and applicable to all Flight Operators, is used to increase the stability of TMATs during Reassignment of TMATs. It prevents multiple small adjustments to a flight's TMAT from occurring by requiring that any updated TMAT must differ from the prior TMAT by more than the Reassignment of TMATs Minimum TMAT Adjustment Time. If an adjustment to an existing TMAT would be less than the Reassignment of TMATs Minimum TMAT Adjustment Time, the TMAT is left unchanged
Reclamation Window	Period of time measured from the current time forward beyond which the automation will act on a canceled or delayed flight to reclaim capacity. Also used to send flight reclamation warning notification.
Release Time	A departure time restriction issued to a pilot by ATC (either directly or through an authorized relay) when necessary to separate a departing aircraft from other aircraft. The runway time assigned to an Approval Request (APREQ) flight.
Runway Arrival Rate (RAR) Schedule	Within the time (start time to end time) in the current airport or a scheduled airport configuration, a schedule for each arrival runway of one or more RARs. Each RAR schedule fully covers the time of the airport configuration, so that at any time between the start and end time for the airport configuration there is exactly one RAR for each arrival runway.
Runway Departure Rate (RDR)	Number of departures per hour from a single departure runway and the time period each rate will be in effect, assuming no "heavy" aircraft or other aircraft with special separation requirements are included. Each departure runway in a given configuration can have a different runway departure rate.

Term	Definition
Runway Departure Rate (RDR) Schedule	Within the time (start time to end time) in the current airport or a scheduled airport configuration, a schedule for each departure runway of one or more RDRs. Each RDR schedule fully covers the time of the airport configuration, so that at any time between the start and end time for the airport configuration there is exactly one RDR for each departure runway.
Runway Load Balancing Rule	A rule which determines which departures can be moved from their default departure runway to an alternate departure runway (or runways) to balance departure runway loading. The rules identify both the flights eligible and the runway(s) to which each can be moved.
Single Airport Queue Metering Mode	One of the options to model the surface scheduling and metering. In this mode, the entire airport is modeled as a single-server queue. All scheduled departures from the airport are included in the demand. All departures in the AMA with intent to depart are in the queue.
Spot	A location on the airport surface at which aircraft transition between the active movement area and the non-movement area. Spots are frequently defined locations at the intersection between ramps and taxiways. In some situations, where the active movement area extends such that an aircraft immediately enters the AMA upon movement off the stand (a.k.a. parking gate), spots are not generally defined within local letters of agreement. However, for the purpose of TFDM, spots will be defined at these locations so that every aircraft transitions between the AMA and non-movement area
Static Time Horizon (STH)	Configurable amount of time from current time used to limit TMAT changes to flights. An important parameter in assigning TMATs to unscheduled flights.
Surface Metering	This is a traffic flow management initiative to provide controlled pushback times in order to manage surface traffic to maintain constant pressure on runways and optimize departure queue lengths to gain efficiency for flight operators in terms of fuel consumption and time. This initiative is managed by the Terminal Flight Data Manager (TFDM) automation system.
Surface Metering Program (SMP) Deferral Lead Time	Configurable length of time before a proposed SMP start time within which a SMP can longer be deferred.
Surface Metering Program (SMP) Lead Time	Time in advance of a SMP that Stakeholders desire notification of a recommended SMP.
Surface Working Group (SWG)	The group of airport surface stakeholders that comes together to collaborate about surface metering decision making and execution.
Take Off Clearance	Clearance received from a tower position responsible for local control activities. This clearance communicates approval to depart the aircraft.
Taxi Time	Time required for an aircraft to move from one specified airport resource to another.
Taxiing	This is the flight state of an airplane that is moving under its own power on the surface of an airport.

Term	Definition
Target Movement Area Entry Time (TMAT)	Target Movement Area entry Time. It is a metering time assigned to flights that are subject to any SMP except de-icing SMP.
TMAT Compliance Window	Window around the TMAT within which flights are considered compliant.
Traffic Flow Management (TFM)	The regulation and organization of air traffic in order to expedite the stream of aircraft in a holistically efficient manner.
Traffic Management Initiative (TMI)	This is a generic term referring to actions taken by ATC personnel to manage air traffic, e.g., volume, spacing, routes. This term can refer to the following initiatives: Ground Stop (GS), Departure Stop (DS), Ground Delay Program (GDP), Airspace Flow Program (AFP), Collaborative Trajectory Options Program (CTOP), Miles-In-Trail (MIT), Minutes-In-Trail (MINIT), Capping, Tunneling, Metering (Departure, Arrival, and Surface), and APREQ (Call for Release). These actions are currently captured in the National Traffic Management Log (NTML).
Unscheduled Demand Buffer (UDB) Placeholder Flights	To provisionally reserve capacity for unscheduled flights, the TFDM System shall generate placeholder flights internal to the automation based on the UDB parameter values to be included in the demand for each departure runway. Number of UDB placeholder flights decay over time based on historical data and is independent of the unscheduled flights becoming known during the operations. The TFDM System shall update the UDB placeholder flights by removing and regenerating them at frequent time intervals.
Unmetered Queue	This is the queue for the resource if there was no metering. Unmetered queue length during metering is the predicted length of the queue for a resource if there was no metering program in effect.
Unscheduled Demand Buffer (UDB)	"Number of unscheduled flights identified as potential demand by hour (historical or predicted) for the entire airport. UDB parameter is a table (matrix) listing the average number of unscheduled flights during each hour of the day that are expected to become known during that hour and each of the following hourly time bins.
Unscheduled Flight	A flight that becomes known to the system as a departure from current airport after a SMP is affirmed for a metering resource that the flight is predicted to use.
Unscheduled Flights Lower Threshold	Number of unscheduled flights which, if below the UDB, triggers an Unscheduled Flights Low notification.
Unscheduled Flights Upper Threshold	Number of unscheduled flights which, if exceeds the UDB, triggers an Unscheduled Flights High notification.
What-If Modeling	The comparison of a model or models and how they vary with changes in input.
Zero Metering Hold	When a flight is assigned a metering time such that the flights TOBT is equal to its EOBT.

Appendix E Abbreviations and Acronyms

Acronym	Description
AAR	Airport Acceptance Rate
ADR	Airport Departure Rate
AFP	Airspace Flow Programs
AIBT	Actual In-Block Time
ALDT	Actual Landing Time
AMA	Airport Movement Area
AMAT	Actual Movement Area entry Time
AOBT	Actual Off Block Time
APREQ	Approval Request
ARM	Airport Resource Management
ARMT	Airport Resource Management Tool
ARTCC	Air Route Traffic Control Center
ATC	Air Traffic Control
ATCSCC	Air Traffic Control System Command Center
ATCT	Air Traffic Control Tower
ATOT	Actual Take off Time
BA	Business Aviation
CDM	Collaborative Decision Making
CDT	Controlled Departure Time
CFR	Call for Release
ConOps	Concept of Operations
CSIT	Collaborative Site Implementation Team
CTD	Controlled Time of Departure
CTOP	Collaborative Trajectory Options Program
DS	Departure Stop
DSP	Departure Spacing Program
EDCT	Expect Departure Clearance Time
EFD	Electronic Flight Data
EFS	Electronic Flight Strips

Acronym	Description
EFSTS	Electronic Flight Strip Transfer System
EOBT	Earliest Off Block Time
ETD	Estimated Time of Departure
EXOT	Taxi-Out Time
FAA	Federal Aviation Administration
FBO	Fixed-Base Operators
FBO	Fixed Base Operators
FLM	Front Line Manager
FO	Flight Operator
FOC	Flight Operations Center
FOS	Flight Operator System
GA	General Aviation
GDP	Ground Delay Program
IOBT	Initial Off-Block Time
JMSDD	Java Message Service Description Document
KPI	Key Performance Indicators
LC	Local Control
LGTD	Airline Gate Time of Departure
LOA	Letter of Agreement
MINIT	Minutes-In-Trail
MITRE CAASD	The MITRE Corporation's Center for Advanced Aviation System Development
NAS	National Airspace System
NextGen	Next Generation Air Transportation System
NTML	National Traffic Management Log
OI	Operational Increment
P3	Processes, Procedures, and Policies
PIC	Pilot In Command
RAR	Runway Arrival Rate
RBS	Ration By Schedule
RDR	Runway Departure Rate
RTT	Ramp Transit Time

Acronym	Description
S-CDM	Surface Collaborative Decision Making
SCT	Surface CDM Team
SMP	Surface Metering Program
SSA	Surface Situational Awareness
STH	Static Time Horizon
SWIM	System Wide Information Management
TBFM	Time-based Flow Management
TBO	Trajectory Based Operations
TDS	Tactical Departure Scheduling
TFCS	TFDM FOS Collaboration Service
TFDM	Terminal Flight Data Manager
TFM	Traffic Flow Management
TFMData	Traffic Flow Management Data
TFMS	Traffic Flow Management System
TM	Traffic Manager
TMC	Traffic Management Coordinator
TMAT	Target Movement Area Entry Times
TRACON	Terminal Radar Approach Control
TTOT	Target Take-Off Time TFC
TTP	TFDM Terminal Publication
UDB	Unscheduled Demand Buffer