

TFDM Tech Talk: Surface Metering Programs (Part 1)

Presented to: TFDM Industry Stakeholders

By: FAA TFDM Collaborative Site Implementation Team

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Introductions

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Agenda

- TFDM & Surface Management Programs (SMP) Overview
- Surface Predictions & SMP Recommendations
 - Prediction of Key Times & Surface Status
 - Setting SMP Parameters
 - SMP Recommendation
- SMP Execution
 - SMP Affirmation
 - SMP Adjustments
 - SMP Substitution
- Post-SMP Analysis
- Next Steps



TFDM Overview



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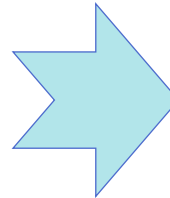
TFDM Program Overview

TFDM is the **surface management solution** for NextGen and iTBO.

https://www.faa.gov/air_traffic/technology/tfdm/

- TFDM will provide an integrated tower flight data automation system, which will improve controllers' common situational awareness.
- TFDM will improve efficiencies on the airport surface and terminal airspace by providing:

- Electronic Flight Strips in the Tower
- Collaborative Decision Making for the Surface
- Traffic Flow Management Integration
- Systems Consolidation



Key Benefits:

- Fuel Savings
- Carbon Emission Savings
- Improved Situational Awareness
- Pre-scheduling flights



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TFDM Program Roll-Out Overview

Build 1

Key Site - PHX

- Full hardware development to support the deployment of Build 1 & 2
- Improved Electronic Flight Data Exchange and Electronic Flight Strips
- Runway Assignment Predictions
- Maintenance tools for life cycle support
- B1 TTP Service Offered

- ❖ Initial Operating Capability: ~~June 2020~~
- ❖ In-Service Decision: ~~September 2020~~

Dates being replanned due to COVID-19 Impacts
B1 IOC will not occur before November 2021

Build 2

Key Site - CLT

In addition to the Build 1 capabilities

- Surface Scheduling
- Surface Metering
- Runway Load Balancing
- Metric Reporting & Analysis (MRA)
- B2 TTP and TFCS Services Offered

- ❖ Initial Operating Capability: ~~May 2021~~
- ❖ In-Service Decision: ~~September 2021~~

Dates being replanned due to COVID-19 Impacts
B2 IOC will not occur before November 2022



SMP Overview

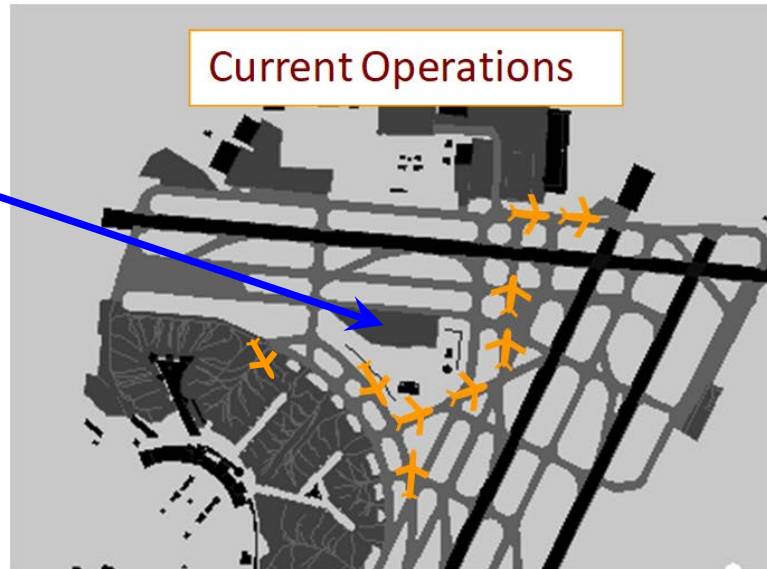


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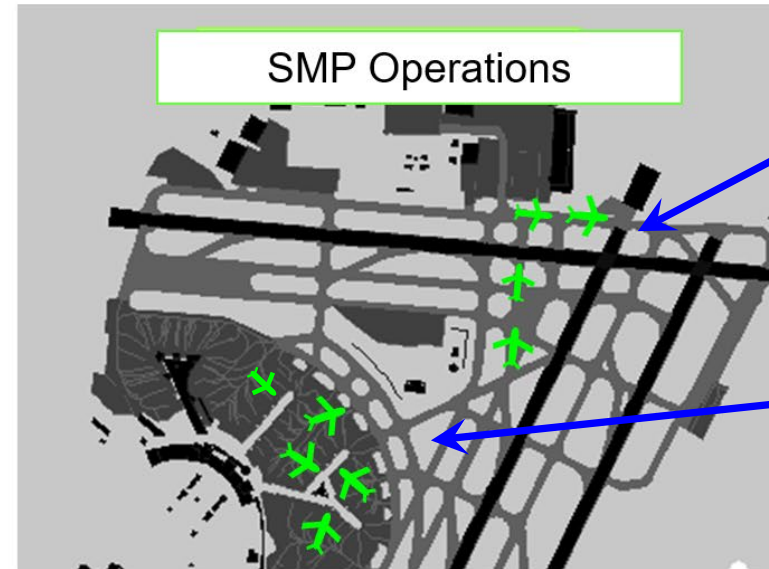
The TFDM SMP Concept

- Departure operations in the NAS are largely managed on a first come, first served basis
- The result is often long departure queues, surface congestion and excess fuel burn
- The goal of SMP operations is to manage the departure queue length by assigning equitable off block times without reducing departure throughput

Long departure queue develops as flights begin taxi as soon as they are ready



SMP Operations



SMP operations result in shorter queues...

...through the control of pushback times



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TFDM's Interface to Industry

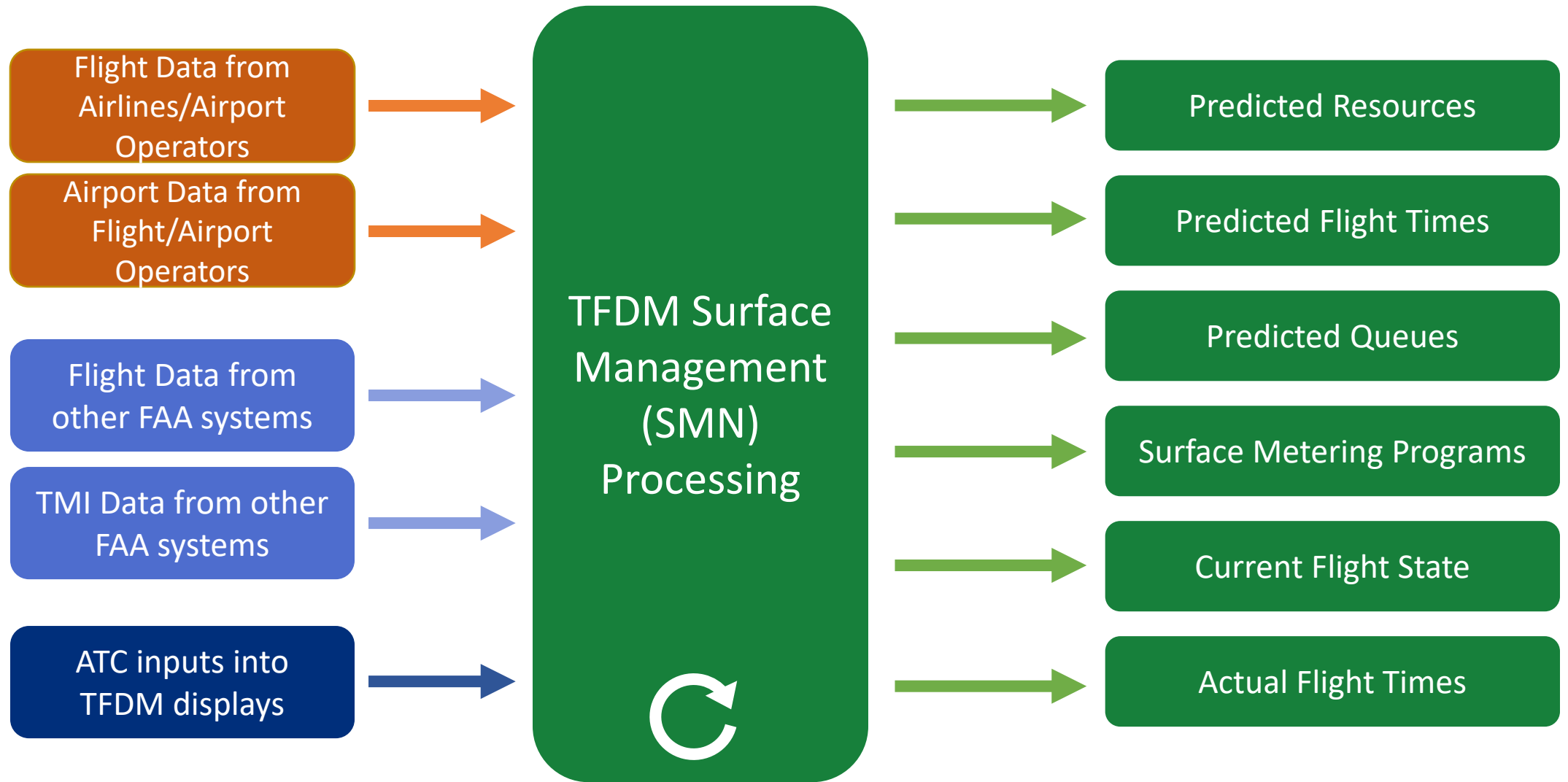
- To interact with TFDM, stakeholders will utilize two SWIM interfaces:
 - **TFDM Terminal Publication (TTP)** – Pub/sub service that provides all of TFDM's data across six business functions:
 - Flight Data
 - Airport Information
 - Flight Delay
 - Traffic Management Restrictions
 - Operational Metrics
 - Surface Management Programs
 - **TFDM FOS Collaboration Service (TFCS)** – Request/reply service that allows stakeholders to request substitution during surface metering and indicate ramp closures/gridlock events



Surface Predictions



TFDM Surface Predictions



Airport Configuration

- The current and scheduled configurations are set by ATC and available via TTP
- In TFDM a configuration consists of
 - Unique ID
 - Name
 - Start Time
 - A set of available runways and associated rates
 - Runway Departure Rate (RDR)
 - Runway Arrival Rate (RAR)
 - Metering Mode
 - Metering Resources and associated Target Queue Lengths (TQLs) and Thresholds
 - Rules used to for runway predictions



Current vs Scheduled Configuration

- A TFDM site will always have a current configuration (except on a cold start)
 - A TFDM site may or may not have scheduled configurations
- ATC must activate a scheduled configuration for it to become the current configuration
 - Scheduled configurations will not automatically be activated at the start time
 - NOTE: A scheduled configuration's start time could be in the past if it is not activated
- ATC can remove a scheduled configuration



TFDM Configuration Display

Surface Manager :: CHARLOTTE/DOUGLAS INTL

System Workspace Settings Tools Reporting

Legend Search

Airport Configuration

Status	Start Time	Name	Op Cond	Runway(s)	Blocking	Rwy Closure	RAR	RDR	RDR Obs	RDR Acc (%)	RwyUDB (%)	AAR	ADR	UDB (fts/hr)	Metering Mode	TQL	TQLLT	TQLUT
Active	271452	SMP_1_NOR	IMC	36C			35	12	--	--	0	105	24	0	RUNWAY	4	2	6
				36L			35	0	--	--	0					10	5	15
				36R			35	12	--	--	0					4	2	6

Edit Airport Configuration

Scheduled Start: 12/27/2020 14:52

Configuration Parameters

Name SMP_1_NORTH

Operating Condition IMC

Airport Arrival Rate 70

Airport Departure Rate 12

Unscheduled Demand Buffer (flights / hour) 0

Runway Configuration

Active	RAR	RDR	Blocking	UDB %
5	35	35		0
18C	35	35		0
18L	35	35		0
18R	35	35		0
23	35	35		0
36C	35	12		0
36L	35	0		0
36R	35	12		0

Runway Assignment Rules

Metering Modes

Resource Queue Percentages

Apply Changes

Save As Custom Predefined

Cancel

Activate Run RLB

Traffic Management Initiatives SMP Manager Airport Configuration Watch List Viewer

Schedule New Configuration Edit Remove

NOTE: All values are test values and are not intended for use in the operational system.



Example Airport Configuration Usage

- 13:00Z
 - Current Config: N_Normal (BEAVY5 flights take off from 36R)
- 13:05Z
 - Tower adds a configuration scheduled to start at 13:30Z
 - Scheduled Config: N_BE_A_T=36C (BEAVY5, ANDYS, and TREAL departures take off from 36C)
- 13:28Z
 - Tower activates scheduled config and N_BE_A_T=36C becomes the current config



Airport Configurations in TTP Airport Information Service (Pub/Sub)

 airportInformationData

AirportInformationType		
 aerodrome		ICAOAerodromeNameType
 currentAirportConfiguration	[0..1]	AirportConfigurationType
 scheduledAirportConfigurations	[0..1]	ScheduledAirportConfigurationList
 actualQueueLengths	[0..1]	ActualQueueLengthsType
 predictedQueueLengthList	[0..1]	PredictedQueueLengthListType
 airportPredictedGridlock	[0..1]	PredictedGridlockType
 amaPredictedGridlock	[0..1]	PredictedGridlockType
 nmaGridlock	[0..1]	NMAGridlockType
 closures	[0..1]	ClosureDataList
 notifications	[0..1]	NotificationsHolder
 demandInformationList	[0..1]	DemandInformationListType
 delays	[0..1]	DelayDataType

**Current
configuration
information**

**Scheduled
configurations list**

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Airport Configurations in TTP Airport Information Service (Pub/Sub)

DRAFT  AirportConfigurationType			
	configId		IdentificationKeyType
	configName		NameType
	configAction	[0..1]	ConfigActionType
	startTime	[0..1]	dateTime
	airportArrivalRate	[0..1]	AircraftRateType
	airportDepartureRate	[0..1]	AircraftRateType
	runwayArrivalRates		RunwayRateListType
	runwayDepartureRates		RunwayRateListType

Unique ID for this particular configuration

Configuration name (e.g. N_Normal, N_BE_A_T=36C)

ADD, UPDATE, or REMOVE

Start time of the config. This config is scheduled to run until the start time of the next config or until the end of the TFDM Prediction Horizon if there is no next config

AAR and ADR set in TFDM. Not used for scheduling or metering. Informational only. Not synced with the TFMS AAR used in GDPs

Lists of runways and associated RARs/RDRs. These values are used for scheduling and metering



TFDM Runways (Actual, Assigned and Predicted)

- Actual Runway
 - The runway actually landed on based on surveillance
 - TTP Flight Data Service
 - NasMessage/flight/departure/runwayActual
 - NasMessage/flight/arrival/runwayActual
- Assigned Runway
 - The runway shown on the electronic flight strips
 - Predicted based only on the current active configuration. Ignores scheduled configurations
 - User entries in TFDM or the STAR's scratchpad will override the prediction
 - Once a departure is in the AMA, only user entries can update this value
 - TTP Flight Data Service
 - NasMessage/flight/departure/runwayAssigned
 - NasMessage/flight/arrival/ runwayAssigned



TFDM Runways (Actual, Assigned and Predicted)

- Predicted Runway
 - The runway used in SMN scheduling predictions and metering calculations
 - Predicted based on both the current active configuration and scheduled configurations
 - User entries in TFDM or the STAR's scratchpad will override the prediction
 - TTP Flight Data Service
 - NasMessage/flight/departure/runwayPredicted
 - NasMessage/flight/arrival/ runwayPredicted



Predicted Stand and Spot

- Predicted stand
 - TFDM will use the airline/airport provided value if provided through TFMS
 - Otherwise, TFDM will use an adapted default value
 - TTP Flight Data Message
 - NasMessage/flight/departure/standInformation
 - NasMessage/flight/arrival/standInformation
 - Provenance source will be “TFMS” if the stand is airline provided; otherwise, source will be “TFDM” if the stand is the default value
- Predicted Spot
 - TFDM predicts the spot using a set of rules based on flight field like stand and runway
 - TTP Flight Data Message
 - NasMessage/flight/departure/standInformation
 - NasMessage/flight/arrival/standInformation



Prediction of Key Times & Surface Status

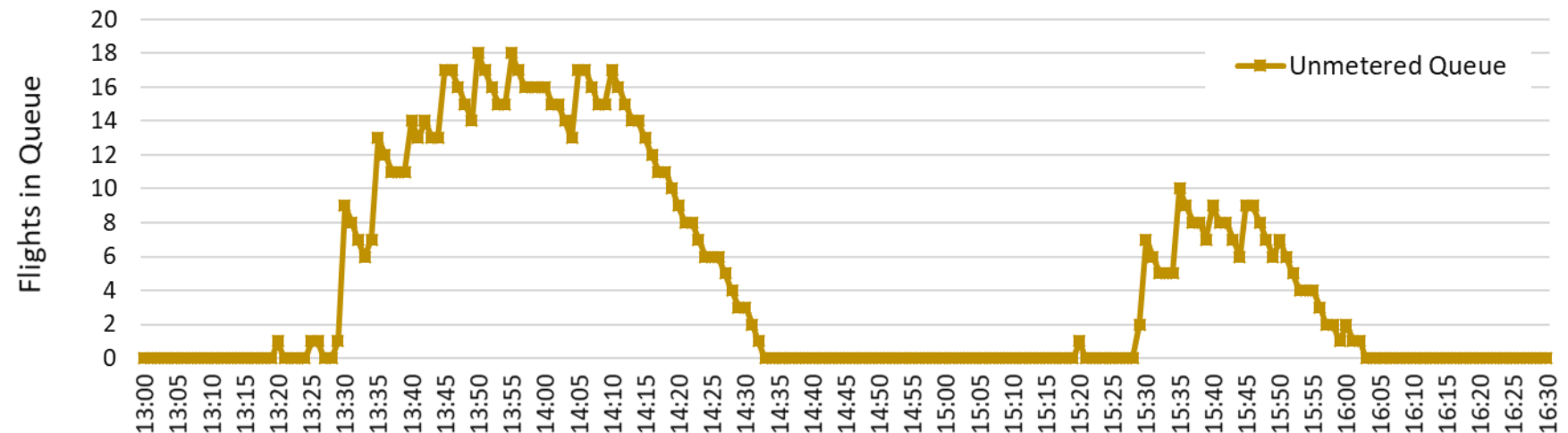
- TFDM generates a surface schedule for each runway and each departing and arriving flight
 - Uses non-FAA stakeholder supplied data (e.g. EOBT, flight data, ramp status), TMI information, airport conditions, and historical data, runway assignment
- Estimated surface event times are calculated for each departure flight and distributed on TTP:
 - Taxi time – NMA (Ramp Transit Time) and AMA (Taxi Time from Spot to Queue)
 - NasMessage/flight/departure/departureTaxiTime/estimatedDepartureRampTransitTime
 - NasMessage/flight/departure/departureTaxiTime/estimatedSpotToQueueTaxiOutTime
 - Estimated queue waiting time
 - NasMessage/flight/departure/departureTaxiTime/estimatedDepartureQueueWaitingTime
 - Estimated Time of Departure (ETD)
 - NasMessage/flight/departure/runwayDepartureTime/estimated
- These times are foundational to predicting departure queues and recommending of SMPs
 - TFDM will calculate queue lengths based on these departure times to identify periods of queue length exceeding the Target Queue Length and Upper Threshold



Predicted Queue Lengths

- TFDM predicts future queue lengths for each runway and any other metering resources by predicting when each flight will enter or exit the queue
 - `airportInformationData/predictedQueueLengthList`
- TFDM also monitors the actual queue length and captures the time history of actual lengths
 - `airportInformationData/actualQueueLengths`

Predicted Queue Graph



SMP Recommendations



SMP Recommendations

- TFDM monitors the predicted queue and will recommend a Surface Metering Program (SMP) based on set SMP Parameters
- Setting SMP Parameters
 - Default SMP Parameters are set in TFDM adaptation
 - The TMC can update most SMP Parameters in the TFDM displays
 - The expectation is that
 - Local airport stakeholders will collaborate on SMP Parameters through the local Surface Working Groups
 - SMP Parameters will be calibrated for a period of time after TFDM is deployed at a site
 - SMP Parameters will not need to be regularly updated after calibration



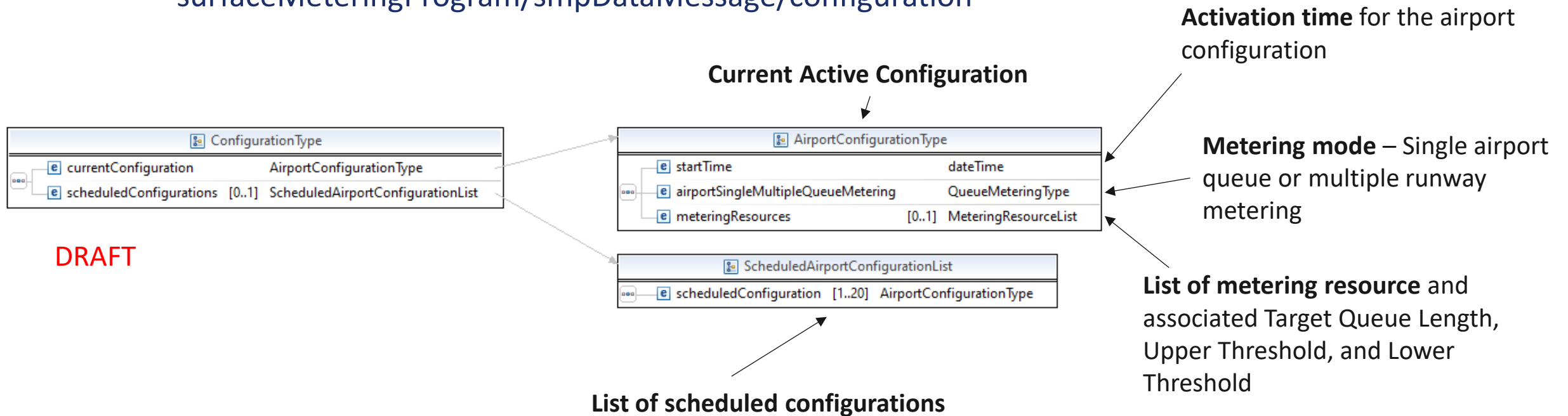
SMP Recommendation – Key SMP Parameters

- **Target Queue Length** – TFDM will assign metering holds to flights during an SMP to maintain the queue at the Target Queue Length
- **Upper Threshold** – TFDM will detect and demand/capacity imbalance if the predicted queue exceeds the Upper Threshold
- **SMP Lead Time** – The maximum amount of time in advance of the start of an imbalance that TFDM will recommend an SMP for that imbalance
- **Planning Horizon** – The maximum SMP duration that TFDM will recommend



SMP Parameters in TTP SMP Service

- Some parameters associated with current and scheduled configurations
 - surfaceMeteringProgram/smpDataMessage/configuration



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SMP Parameters in TTP SMP Service

- Other SMP Parameters are independent of the airport configuration
 - surfaceMeteringProgram/smpDataMessage/parameters

NOTE 1: SMP Lead Time is not currently published in the TTP B2.1 schema

NOTE 2 : There are many different SMP Parameters. These slides cover only a subset of the parameters

ParametersType			DRAFT
e cfrMeteringExempt	[0..1]	boolean	
e averageMeteringHoldThreshold	[0..1]	PercentageType	
e compressionAutomaticAffirmation	[0..1]	boolean	
e reassignmentAutomaticAffirmation	[0..1]	boolean	
e departureFixQueuePercentageList	[0..1]	DepartureFixQueuePercentageListType	
e flightsAffectedThreshold	[0..1]	PercentageType	
e compressionMinimumTMATAdjustmentTime	[0..1]	duration	
e deferralLeadTime	[0..1]	duration	
e extensionEvaluationInterval	[0..1]	duration	
e flightSuspensionTime	[0..1]	duration	
e flightSuspensionWarningTime	[0..1]	duration	
e planningHorizon	[0..1]	duration	
e protectionPeriod	[0..1]	duration	
e minimumTMATAdjustmentTime	[0..1]	duration	
e reclamationWindow	[0..1]	duration	
e staticTimeHorizon	[0..1]	duration	
e unscheduledDemandBuffer		IntegerType	
e unscheduledFlightsLowerThreshold		IntegerType	
e unscheduledFlightsUpperThreshold		IntegerType	
e udbPercentageList		UnscheduledDemandBufferPercentageListType	
e controlledTimeOfDepartureBuffer	[0..1]	IntegerType	
e tmatComplianceWindow	[0..1]	IntegerType	

Minimum TMAT Adjustment Time for compression adjustments

Planning Horizon

Minimum TMAT Adjustment Time for reassignment adjustments

Static Time Horizon

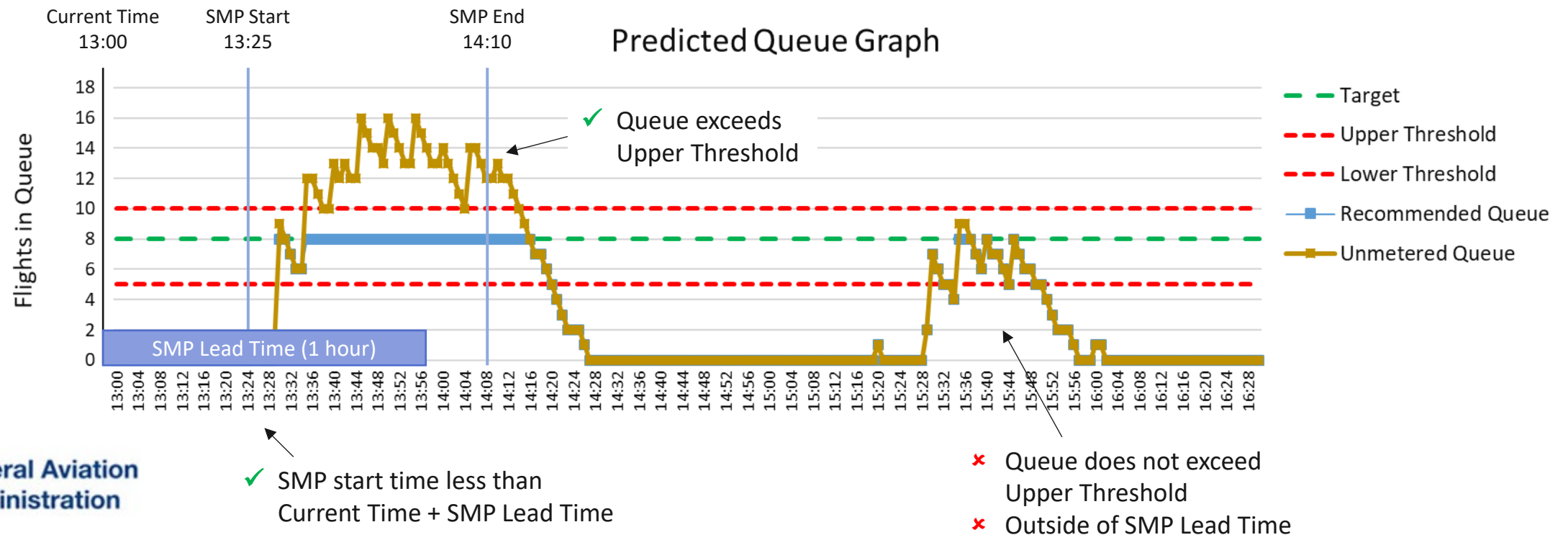
TMAT Compliance Window



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SMP Recommendation – Key SMP Parameters

- TFDM recommends the start and end times of the SMP based on the EOBTs of flights that will enter the queue during the imbalance
 - End time cannot be later than (Start Time + Planning Horizon)
 - In this example, Planning Horizon = 2 hours, so end time is limited by imbalance, not be the Planning Horizon



Types of SMPs

- The type of SMP utilized is driven by conditions such as:
 - Airport layout and operating conditions
 - Pre-SMP execution CDM coordination
 - Other TMIs affecting the airport
 - Forecasted demand
- The airport metering model parameter will drive the type of “surface-driven” SMP (airport or runway SMP)
 - Local adaptation parameter set based on the local surface layout and operating conditions

Surface-Driven SMPs		Local Airspace-Driven SMP
Runway SMP	Airport SMP	In-Trail SMP
Purpose: manage queue imbalances and excessive departure taxi delay	Purpose: manage queue imbalances and excessive departure taxi delay	Purpose: manage departure queues when MIT/MINIT is in effect
Goal: maintain target queue length for a single or multiple runway(s) departure queue	Goal: maintain target queue length for multiple runways at a single airport	Goal: balance the number of flights affected by a MIT/MINIT restriction in a runway queue
Capacity/Demand Imbalance Trigger: queue exceeding target length upper threshold at departure or mixed-use runway(s) for a period of time	Capacity/Demand Imbalance Trigger: queue exceeding target length upper threshold for airport runway(s) for a period of time. The queue is defined as a grouping of all of the queues.	Capacity/Demand Imbalance Trigger: MIT/MINIT restriction
Metering mechanism: Target Movement Area entry Time (TMAT)	Metering mechanism: Target Movement Area entry Time (TMAT)	Metering mechanism: Target Movement Area entry Time (TMAT)
Impact: all flights departing on the runway*	Impact: all airport departures*	Impact: all flights impacted by the MIT/MINIT restriction departing on the runway*

*Except for exemptions



SMP Execution



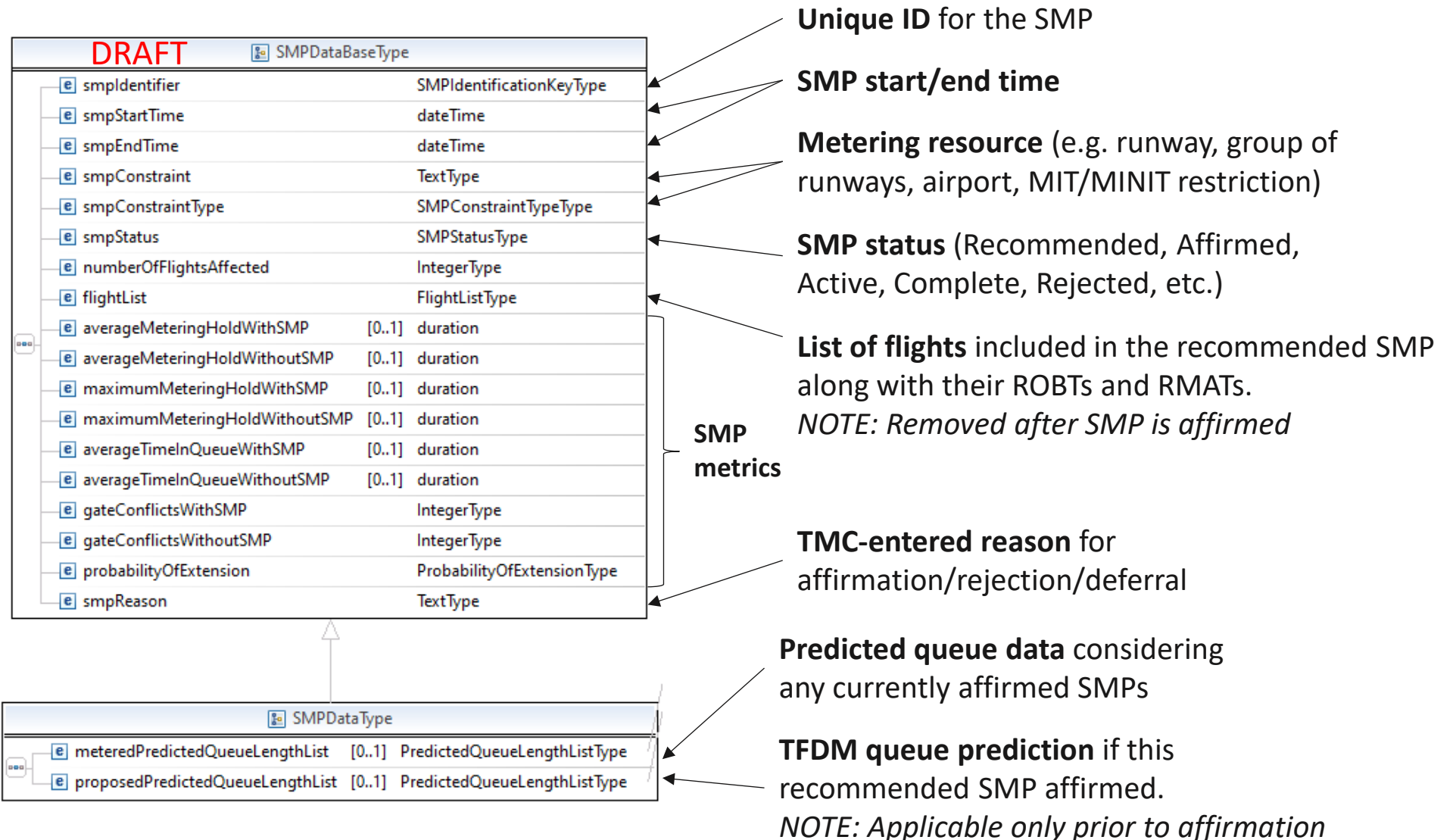
SMP Affirmation – SMP Information

- Upon affirmation of an SMP by the ATCT user, TFDM will publish SMP information via TTP, including:
 - SMP Identifier
 - “YYYYMMDDNNNN” format: YYYY (year), MM (month), DD (day) of the SMP was created; NNNN (sequential number) of SMPs for the day at the specific airport
 - SMP-specific Parameters (including start/end time, probability of extension, reason)
 - SMP Type / SMP Constraint
 - Metering Resource Configuration(s) (current & scheduled)
 - Number of Flights Affected
 - Surface Metering & Scheduling Times (e.g. TOBT, TMA, TTOT, Predicted Departure Queue Waiting Time)
- TFDM will publish unique data for each SMP in place during a given time
- Users should plan to ingest SMP information upon affirmation; affirmed program information may differ from previously recommended SMP data
- *Note: when an SMP is affirmed, the SMP will have an indicated start time at which it will become active*



SMP Data in TTP SMP Service

Schema Location: surfaceMeteringProgram/smpDataMessage/smp/smpData (list of SMPs)



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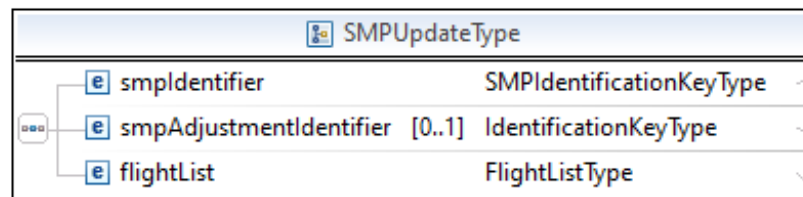
SMP Affirmation – Flights Impacted by SMP

- The flights impacted by an SMP and the associated metering data (e.g. TMA, TOBT) may not match the Recommended SMP publication
 - Factors that can impact the flights and times: change in flight status, route amendments, updated EOB, flight cancellation, surface status change
- Impacted flights are published via TTP
 - Flight list contains flight data for all flights impacted by a single SMP
 - *flightData* includes initial Surface Metering Times (e.g. TOBT, TMA) associated with each flight
 - List is updated periodically upon change in data

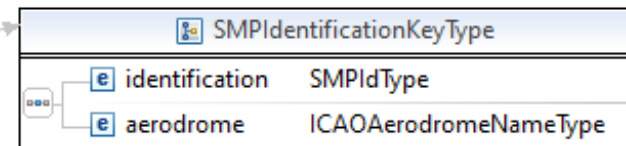


SMP Flight List in TTP SMP Service

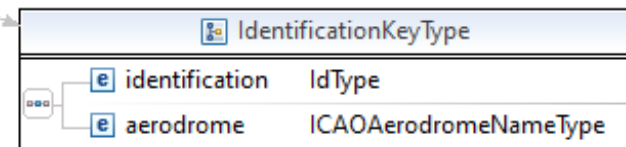
- After an SMP is affirmed, TFDM also published out a list of affected flights for each SMP
 - These flight lists will update as flights are added or removed from the SMP
 - The flight lists include TOBTs and TMATs
 - TOBTs and TMATs will also be published separately in the TTP Flight Data Service
 - TOBT: NasMessage/flight/departure/offBlockTime/target
 - TMAT: NasMessage/flight/departure/movementAreaTargetEntryTime
- Schema Location: surfaceMeteringProgram/smpFlightListUpdate/smpUpdateList (list of SMP updates)



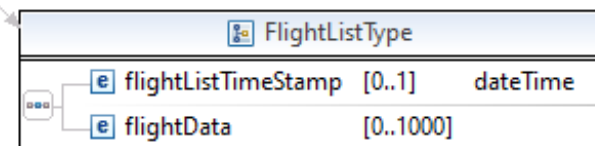
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SMP Unique ID: Identifier for each SMP. Can be used to link back to the SMP data



NOTE: Adjustment ID is not used. When a SMP Adjustment is affirmed, the flight list for the parent SMP is updated and the flights get new TMATs.



List of flights affected by the affirmed SMP. Flight list includes TMATs in FIXM schema



SMP Adjustments

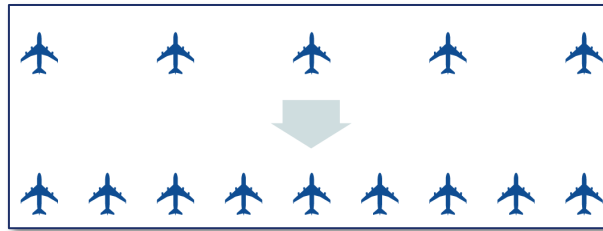
- TFDM may identify the need to adjust the SMP due to a change in departure demand, change in airport configuration and/or conditions, or other situations impacting the departure queue(s) and overall performance of the SMP
- SMP Adjustments & Status are published via TTP SMP Service
 - *SMPAdjustmentStatusType* indicates the status of the adjustment
 - Recommended, Deferred, Rejected, Expired, Obsolete, Affirmed, Superseded, Completed
 - *SMPAdjustmentType* indicates the type of SMP adjustment
 - Compression, TMAP Reassignment, Extension, Termination, Cumulative
- New SMP FlightData and SMP information is re-published via TTP upon the affirmation of the adjustment
 - Includes SMP assigned times (TMAP, TOBT) for flights impacted by the SMP adjustment



SMP Adjustment Types

TMAT Reassignment

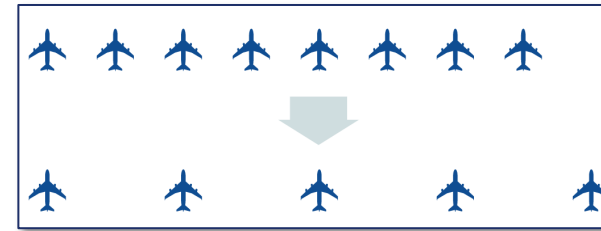
Recommended when the departure queue length is predicted to go above target queue length upper threshold. Prevents congestion on surface (e.g., large number of unscheduled flights)



Reassignment will only recommend a TMAT change if the change exceeds the reassignmentMinimumTMATAdjustmentTime parameter value

Compression

Recommended when the departure queue length is predicted to go below target queue length lower threshold. Prevents queue and/or runway from running dry



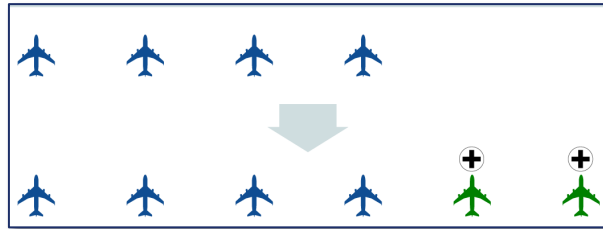
Compression will only recommend a TMAT change if the change exceeds the compressionMinimumTMATAdjustmentTime parameter value



SMP Adjustment Types

Extension

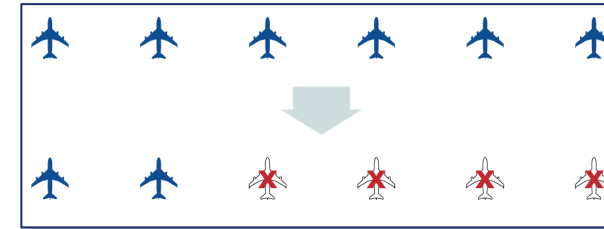
Recommended when the departure queue length is predicted to exceed the target queue length upper threshold past the current SMP end-time.



Extensions will be evaluated on a pre-determined extensionEvaluationInterval and shall not exceed the planning horizon.

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



SMP-related flight data (e.g. TMAP, TOBT) for flights past the SMP termination time will be removed. TTP distribution and indicated of flights impacted by the SMP will be updated to reflect the new end time.



SMP Adjustment Types

Cumulative

Recommended when multiple SMP adjustments of the same or different types exist. When a cumulative adjustment is recommended, individual adjustments recommended by TFDM will become superseded.



An extension shall not exceed the planning horizon. Flight data (e.g. TMA, TOBT) for flights may be updated and published on TTP per normal SMP publication



SMP Adjustments in TTP SMP Service

SMP ID of the parent
SMP that this SMP
adjustment applies to

Similar to the data in an
SMP but applicable to
the SMP adjustment
instead

SMPDataBaseType		
e	smpIdentifier	SMPIdentificationKeyType
e	smpStartTime	dateTime
e	smpEndTime	dateTime
e	smpConstraint	TextType
e	smpConstraintType	SMPConstraintTypeType
e	smpStatus	SMPStatusType
e	numberOfFlightsAffected	IntegerType
e	flightList	FlightListType
...	e	averageMeteringHoldWithSMP [0..1] duration
...	e	averageMeteringHoldWithoutSMP [0..1] duration
...	e	maximumMeteringHoldWithSMP [0..1] duration
...	e	maximumMeteringHoldWithoutSMP [0..1] duration
...	e	averageTimeInQueueWithSMP [0..1] duration
...	e	averageTimeInQueueWithoutSMP [0..1] duration
e	gateConflictsWithSMP	IntegerType
e	gateConflictsWithoutSMP	IntegerType
e	probabilityOfExtension	ProbabilityOfExtensionType
e	smpReason	TextType

IdentificationKeyType		
e	identification	IdType
e	aerodrome	ICAOAerodromeNameType

SMPAdjustmentTypeType

SMPAdjustmentStatusType

SMPAdjustmentDataType		
e	smpAdjustmentIdentifier	IdentificationKeyType
...	e	smpAdjustmentType SMPAdjustmentTypeType
...	e	smpAdjustmentStatus SMPAdjustmentStatusType

Unique ID for the SMP adjustment

Type of SMP adjustment (Compression,
Reassignment, Extension, Termination, or
Cumulative)

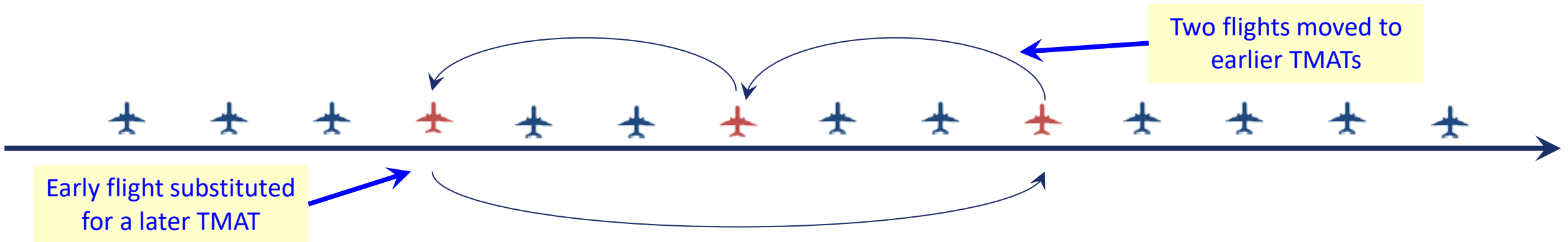
Status of the SMP adjustment (Recommended,
Affirmed, Rejected, Superseded, etc.)



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SMP Substitution

- Stakeholders can submit substitution requests via TFCS to exchange TMA Ts between two or more flights in the same SMP to address:
 - The dynamic nature of departure operations
 - Individual flight operator business priorities
- Substitution requests must follow TFDM substitution rules, as well as meet interface permissions and message format needs



Post-SMP Analysis



Post Event Metrics

- Airport, flight data, and SMP-associated metrics will be available via TTP for use by industry and FAA stakeholders
 - Published on an interval basis
 - Start/end time for the interval is indicated in the TTP Operational Metrics message
 - For Key Performance Indicators (KPIs) that are based on flight data, the flights that are considered are the flights that have matured during the last interval (e.g. strip is archived by ATC)
 - SMP-related metrics will be available only during times in which TFDN recommends SMP(s) and/or SMP(s) are affirmed
 - Individual flight metrics will be available for flights impacted by an SMP program



Post Event Metrics

- Airport Performance:
 - *Airport Throughput KPI* – Counts for departures and arrivals, for the airport and the runways.
 - *Airport Canceled Demand KPI* – Count of flights removed from the airport's departure demand.
 - *RDR Accuracy KPI* – Measurement conveying information about the difference between a runway's observed RDR and the facility's called RDR.
- Flight Data
 - *Flight Data Quality* – System assigned points awarded for the quality of submitted flight data.
 - *Flight Times Actual vs. Predicted* – Measurements indicating the accuracy of predicted times for flights during various times prior to the flight's departure. Includes the "Queue Waiting Time" accuracy, the "Predicted vs. Actual Takeoff Time" accuracy, and the "Planned vs. Actual Taxi Time from the Spot to the Queue" accuracy.



Post Event Metrics – SMP-related

- SMP Performance:
 - *Metering Hold KPI* – Amount of metering hold assigned to a flight; available on a per-flight basis.
 - *Queue Length Accuracy KPI* – Measurements conveying information about the difference between a runway's actual queue length and its target queue length.
 - *SMP Changes KPI* – Running count conveying information about the number of Affirmed SMP Adjustments for each SMP.
 - *Rejected SMPs KPI* – Running count of the number of rejections for each SMP.
 - *Stability of Metering Times KPI* – Information on a per flight basis about TMAT changes.
 - *Missed Departure Opportunities KPI* – Information about missed departure opportunities. Measurement depends on whether the airport is monitoring this metric at the airport level or the runway level.
- Compliance:
 - *Metering Ready Time Compliance KPI* – Measurements, both for the airport and for individual flights, conveying information about a flight's arrival time at its metering control point compared to its TMAT.
 - *Metering Time Compliance KPI* – Measurements, both for the airport and for individual flights, conveying information about the time a flight is cleared to cross its metering control point compared to its TMAT.
- SMP Benefits:
 - *Calculated Fuel Burn KPI* – An estimate of fuel burned by all aircraft operating on the airport surface.
 - *Emissions KPI* – An estimate of the amount of emissions produced by all aircraft operating on the airport surface.



Next Steps



TFDM Testbed

- TFDM has set up a testbed to allow airport stakeholders to test connectivity with a test instance of TFDM B2 software
 - Hosted in a Leidos (TFDM prime contractor) lab with simulated SWIM connections
 - Uses recorded data from CLT
- Open to airports, airlines, and 3rd party vendors to test connections to TFDM prior to TFDM B2 being deployed in the field
- If interested, contact Doug Swol (Christopher.D.Swol@faa.gov) or CSIT (csit@faa.gov)



Questions & Upcoming CSIT Events

- Tech Talk #3: Surface Metering Part 2
 - Wednesday May 26th, 1pm ET
- Open-to-all TFDm orientation
 - Wednesday May 19th, 1pm ET
- Follow up questions: csit@faa.gov

