ATFM Tools to Balance Demand with Capacity

Federal Aviation Administration

Use of Capacity for ATFM:

Flow Management's core function is to balance demand with capacity

Sustained periods of demand exceeding operational capacity require the implementation of some form of ATFM measure.

- Alternatively, when appropriate local arrangements exist, short demand spikes might be managed tactically by ATC through attentive oversight and flow control.
- Tolerance thresholds may be defined to frame those possible variations to ensure that variations remain within a defined range and that ATC capacity is not exceeded

ATFM Tools to balance demand with capacity

- ATFM Toolbox
- Regional ATFM
- Harmonization of ATFM with FF-ICE

Coarse Air Traffic Flow Tuning:
Flow Rate Management (1/2)

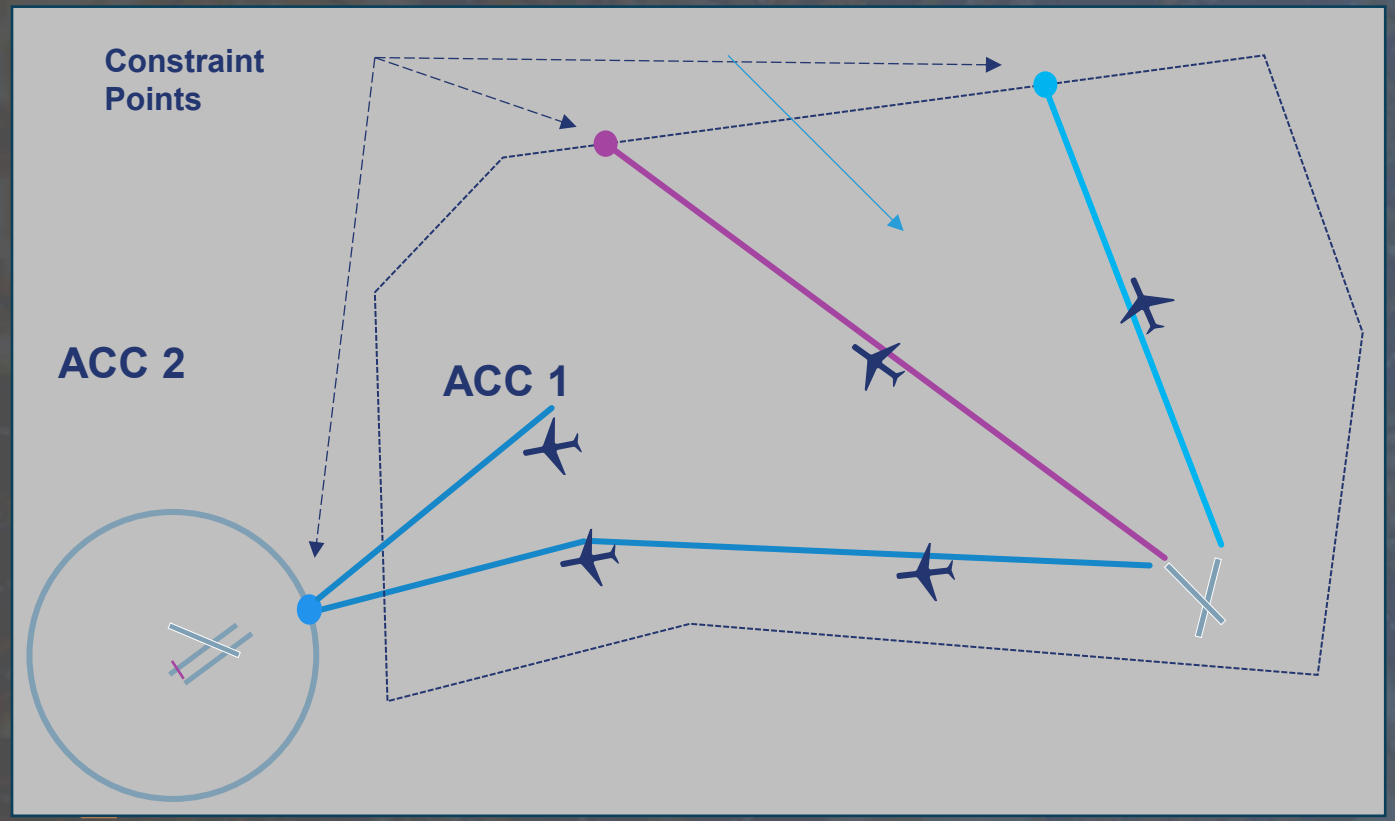
- Altitude
  - Tunneling – descending arrivals under congested airspace
  - Capping – keeping departure aircraft under congested airspace
  - Low Altitude Arrival/Departure Routing (LAADR) – planned low altitude routes that operators fuel and file for
- Miles/Minutes-in-Trail – One ATS facility provides another the specified miles or minutes in trail (longitudinal) to mitigate excess volume or enable weather deviations. Minutes are used in non-surveillance environment and from some towers
- Fix Balancing – rerouting arriving or departing flights to relieve overloaded fixes or gates
- Airborne Holding – short-term measure imposed by one ATS facility on another as a last-minute measure or when weather makes a route impassable and deviating around it is not viable.
- Departure Sequencing Program – Precursor to TFDM, assigns departure times to deliver consistent flows over a fix or gate

Coarse Air Traffic Flow Tuning:
Flow Rate Management (2/2)

- Ground Delay Program (GDP) – Generates CTOTs for arrival airport constraints
- Airspace Flow Program (AFP) – Generates CTOTs for enroute airspace constraints
- Ground Stop (GS) – Temporary stop of departures destined a constrained airport
- Reroutes
  - Required Routes – published via advisory and both ATS units and flight operators comply
    - City Pair based – defined by origin and destination airports
    - Flow Constrained Area based – defined by a line in the air, typically for convective weather
  - Integrated Collaborative Rerouting (ICR) – FMU defines the line and operators avoid the line
    Used in the FAA for mid continent convection, typically early morning before volume steps up
  - Pre-Departure Reroute – ability for TFM units to amend filed proposals to meet constraints
  - Airborne Reroute – ability for TFM units to communicate reroutes to ATC for issuance
  - Trajectory Option Set – Used in PDRR for operators to express their preferences

Fine Air Traffic Flow Tuning: Arrival Manager (AMAN)

Aircraft Sequencing with Departure Scheduling



How it Works

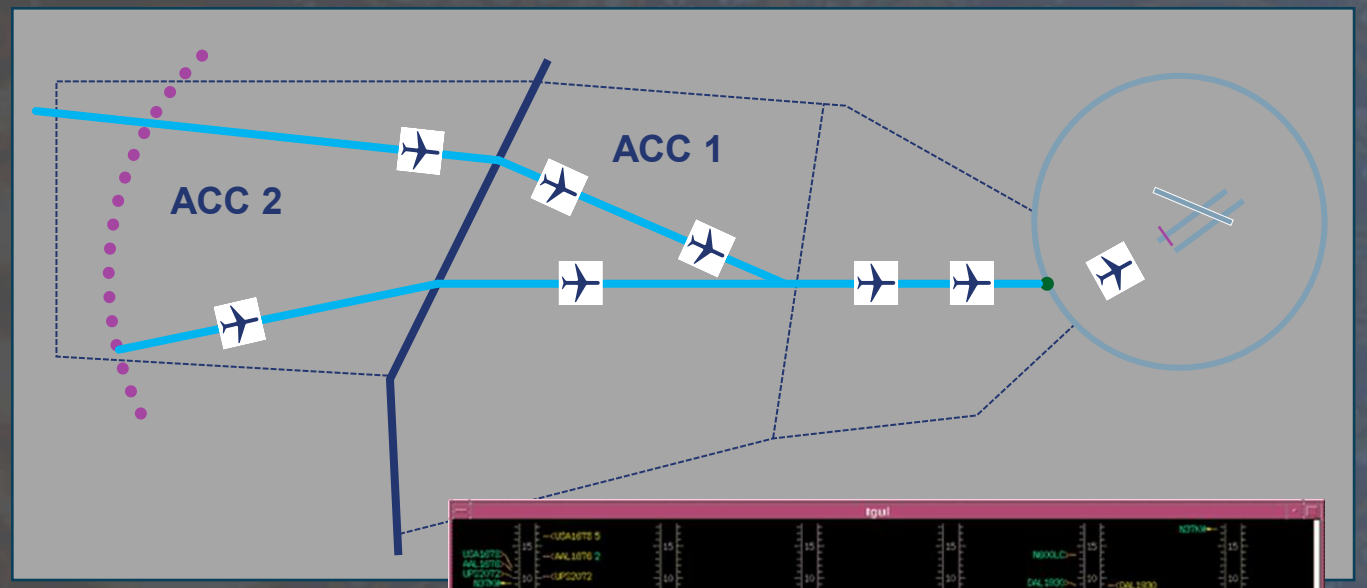
- Schedules departures into an en route or arrival flow
- Calculates departure release time for a time-based schedule
- Can be used with used airborne metering or MIT restrictions
- Can be coordinated between tower and ACC via voice or electronically with a system in the tower called IDAC

Benefit Mechanism

- Improves merging of departures with airborne traffic
- Reduces vectoring and other maneuvers
- Re-distributes delay to the ground

Fine Air Traffic Flow Tuning: AMAN

Aircraft Sequencing with Arrival Metering



How it Works

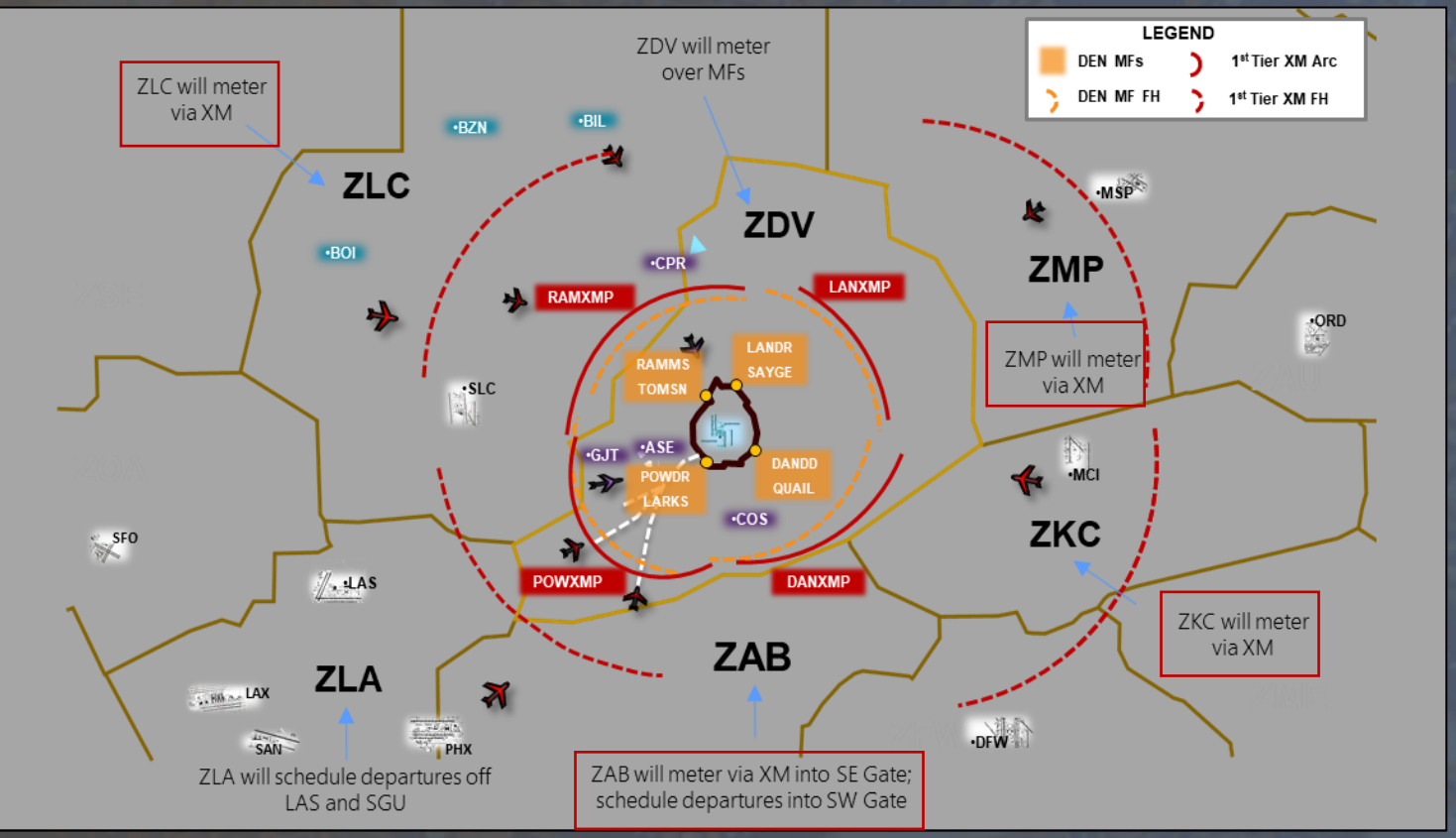
- Provides en route controllers decision support tools to manage time-based schedule for airborne flights destined to a specific arrival airport.
- Schedules the aircraft into metering line by accounting for the applicable spacing based on traffic manager inputs
- When the aircraft crosses the freeze horizon, determines any delays that may need to be absorbed en route to the CTA

Benefit Mechanism

- Improves merging of traffic flows on entry to terminal area
- Re-distributes airborne delay over greater distances at higher altitudes
- Reduces holding at low altitude
- Reduces reliance on static MIT restrictions

Fine Air Traffic Flow Tuning: AMAN

Aircraft Sequencing with Extended Metering (XM)



How it Works

- Adds additional constraint points upstream from the meter fix
- Extends the distance over which TBFM delays can be managed

Benefit Mechanisms

- Improves merging of airborne traffic flows through a congested constraint point
- Improves stability of arrival meter list and predictability of operations
- Improves conformance with scheduled meter times
- Increases adherence to PBN STARs

Different flavors of regional/cross-border ATFM

The Western Hemisphere performs regional ATFM in multiple ways

- Shared ATFM System
- International Data Providers supply data via SWIM and receive demand data via email
- CADENA platform and relationships allows for planned and real-time responses to various types of events
  - Weather
  - Equipment Outages
  - Special Events
  - Space Launches

Cross-border/Regional ATFM Case Study

Shared ATFM System & International Data Providers

ANSPs that share a common ATFM system

Canada

Mexico

USA

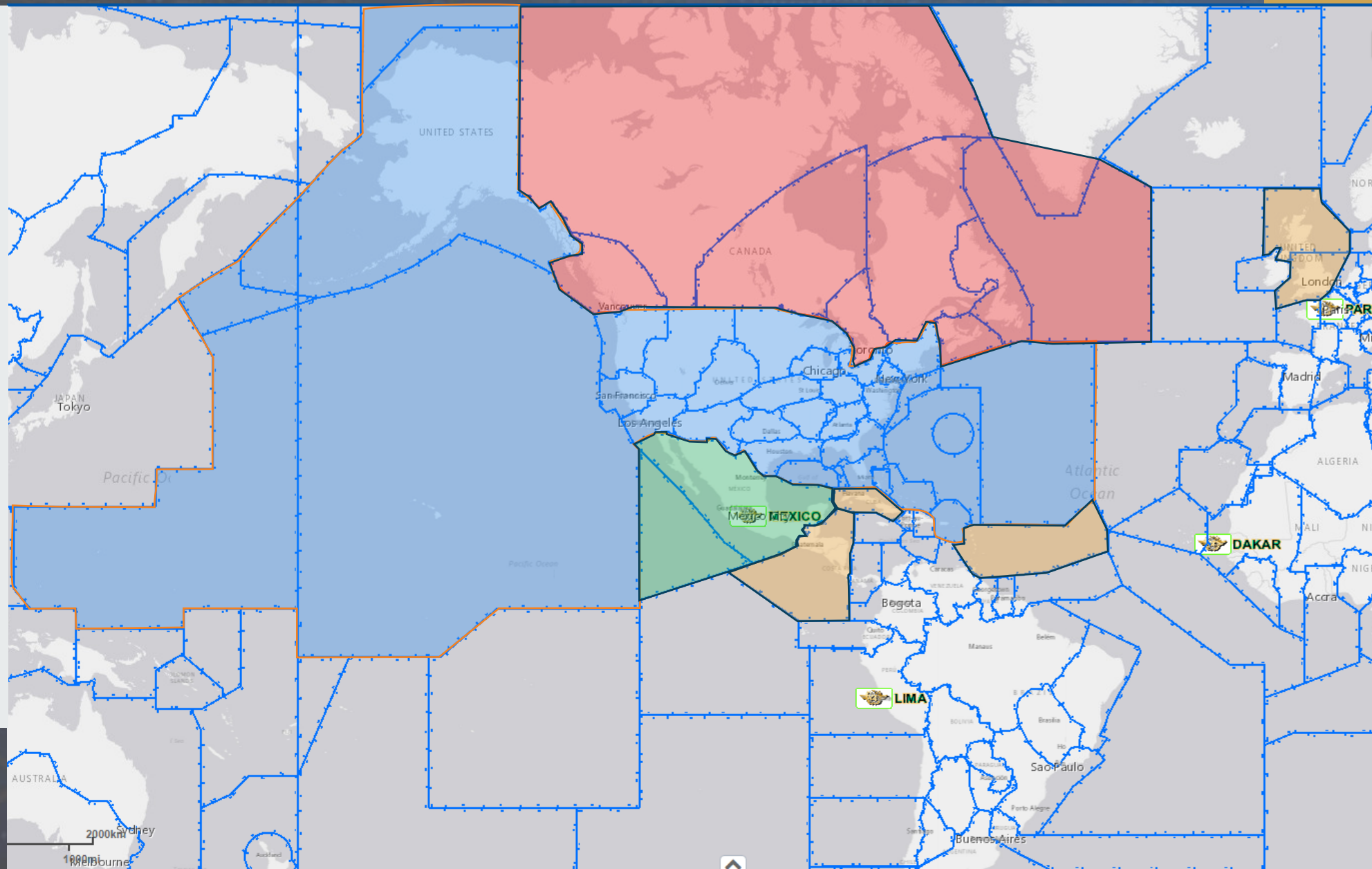
ANSPs that are international data providers

NATS UK

COCESNA

PIARCO

Cuba via AIDC



Shared Demand Data

Three times a day, the FAA emails aggregate demand to the following ANSPs

- Cuba – Airspace & Airports
- Jamaica – Airspace and Airports
- Dominican Republic – Airspace and Airports
- Mexico – Airspace and Airports
- COCESNA – Airspace and Airports
- Bahamas – Airports

Demand lists are in Excel format and some ANSPs import into other systems for staffing and sectorization plans

Piarco and Columbia are exploring joining the demand sharing

CADENA OIS

OIS and twice a week webinars are used to share ATFM Daily Plans, upcoming event and contingency plans CADENA WhatApp group used for real-time coordination during cross border weather events

CADENA WhatsApp

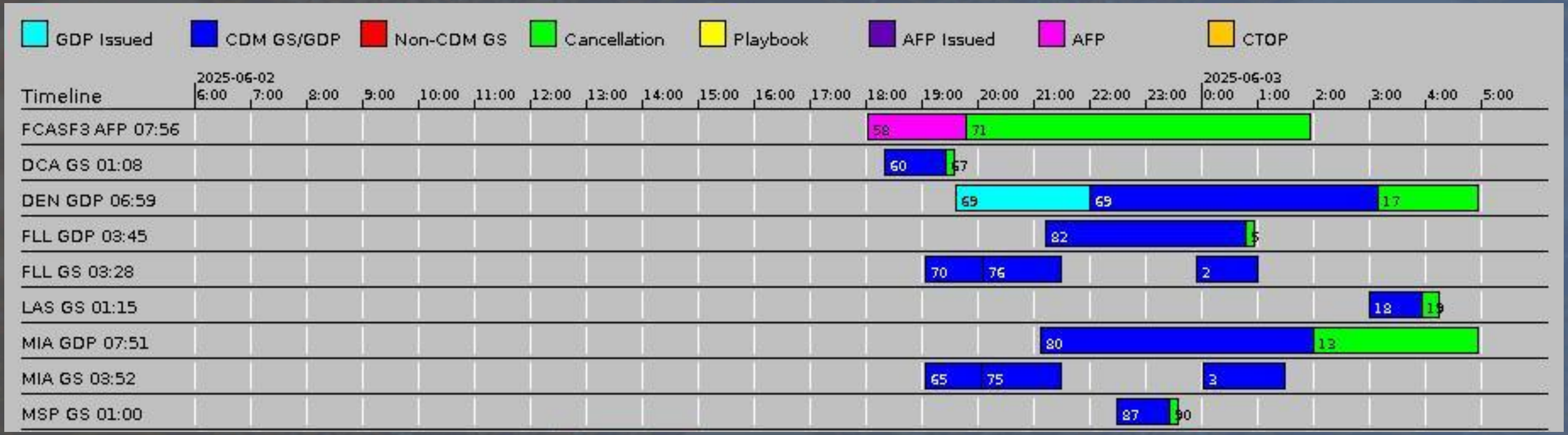
All CADENA members, including Flight Operators and SpaceX have access to the WhatsApp group for real-time, live coordination.

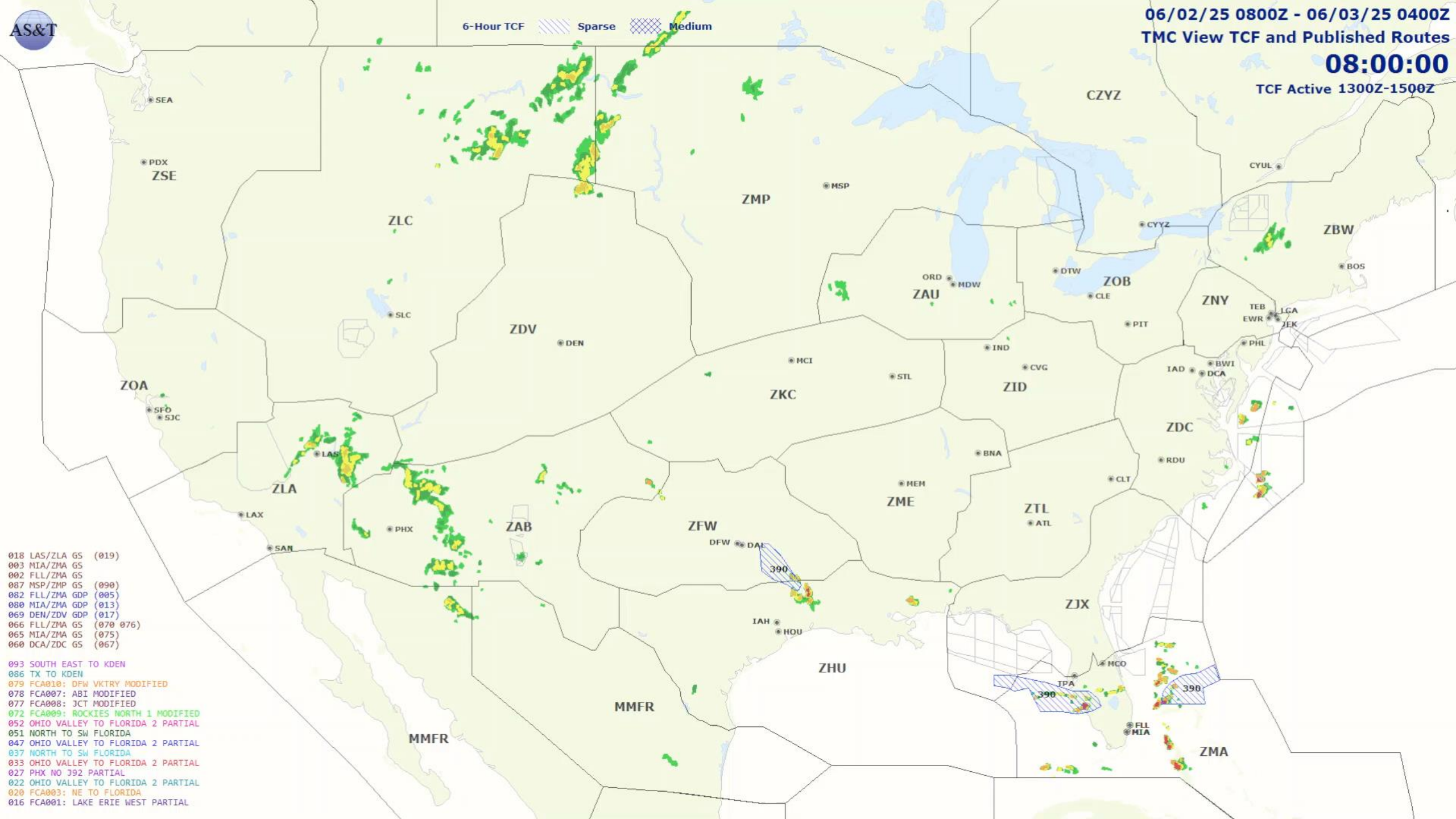
Used extensively during:

- Extreme Weather
- Equipment Outages
- Hurricanes
- Special Events

Example from this week on the next few slides

Monday 2 June 2025




AS&T
6-Hour TCF
Sparse
Medium
06/02/25 0800Z - 06/03/25 0400Z
TMC View TCF and Published Routes
08:00:00
TCF Active 1300Z-1500Z
SEA
PDX
ZSE
ZLC
SLC
ZMP
MSP
CZYZ
CYUL
CYYZ
ZBW
BOS
ZDV
DEN
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MDW
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FLL
MIA
ZMA
ZHU
MMFR
MMFR
018 LAS/ZLA GS (019)
003 MIA/ZMA GS
002 FLL/ZMA GS
087 MSP/ZMP GS (090)
082 FLL/ZMA GDP (005)
080 MIA/ZMA GDP (013)
069 DEN/ZDV GDP (017)
066 FLL/ZMA GS (070 076)
065 MIA/ZMA GS (075)
060 DCA/ZDC GS (067)
093 SOUTH EAST TO KDEN
086 TX TO KDEN
079 FCA010: DFW VKTRY MODIFIED
078 FCA007: ABI MODIFIED
077 FCA008: JCT MODIFIED
072 FCA009: ROCKIES NORTH 1 MODIFIED
052 OHIO VALLEY TO FLORIDA 2 PARTIAL
051 NORTH TO SW FLORIDA
047 OHIO VALLEY TO FLORIDA 2 PARTIAL
037 NORTH TO SW FLORIDA
033 OHIO VALLEY TO FLORIDA 2 PARTIAL
027 PHX NO J92 PARTIAL
022 OHIO VALLEY TO FLORIDA 2 PARTIAL
020 FCA003: NE TO FLORIDA
016 FCA001: LAKE ERIE WEST PARTIAL

CADENA WhatsApp Messaging

MMID ACC INFO: HAV ACC request 5 MINIT for traffic from MMUN & 30MIT for overflights regardless FL, Until 1800UTC.

Airline: Is it due to volume?

HAV ACC: Just talking with SENEAM, the reason is the weather in South Fla

HAV ACC: ZMA closed IKBIX, so the northbound traffic is forced to deviate to ZEUSS. ZMA also requested 30MIT, so we have to slow down the departures from MMUN. MAXIM and IKBIX are closed by ZMA for northbound traffic

Airline: Thanks for the information!

Thank you

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