



Federal Aviation Administration

Airspace Flow Program Best Practices

Modified July 27, 2011

Background

Airspace Flow Programs (AFPs) manage demand-capacity imbalances through the issuance of Estimated Departure Clearance Times (EDCT) to flights traversing a Flow Constrained Area (FCA). An AFP might be used, for example, to reduce the rate of flights through a center when that center has reduced en route capacity due to severe weather, replacing Mile-In-Trail (MIT) restrictions for a required reroute, managing airport arrival fix demand or controlling multiple airports within a terminal area.

The FCA is the basis for the Aggregate Demand List (ADL) and setting flight filters within the FCA allows for specific groups of flights to be included or excluded from the AFP demand. Some examples are: flights flying specific routes destined for select airports or centers, flights traversing a center in an easterly direction or flights traversing a particular sector. The FCA tool is flexible and allows nearly any set of flight filters to be defined. An FCA always has a physical basis, e.g., a line segment between two points, an area of airspace, a center, or a sector. The acceptance rate for an AFP applies to the rate at which flights should intersect the boundary of the FCA.

AFP Process Definition

The essentials of the AFP process are:

- The FAA determines that an AFP is needed, creates an FEA or FCA to determine the desired parameters, edits the FEA or FCA into an FSM-eligible FCA and models the program using FSM driven by TFMS data. FCAs created for use as an AFP should have a minimum duration of 24 hours.
 - *Note: Once the FCA becomes FSM-eligible, avoid changing the FCA parameters as this will alter the ADL. The changes may have undesired consequences if AFP implementation occurs quickly and will also affect post-event analysis.*
- FSM allocates the airspace capacity in 15 minute time periods through the creation of arrival slots (ASLOTs). Flights are assigned into the ASLOTs by the initial AFP entry time (IENTRY). The FSM process is the same as a GDP for an Airport.
 - IENTRY equates to the IGTA in an airport GDP. IENTRY is used for the Ration By Schedule (RBS) logic in ASLOT assignment of the program. IENTRY is computed by TFMS using the historical or filed route and associated ETD/ETA.
 - *Note: The use of Unified Delay Program (UDP) is preferred for AFP, as UDP provides an improved ASLOT and delay assignment to unscheduled demand. Although no historical probabilities are provided, use of the UDP reserve slots will allow Adaptive Compression to manage the unassigned slots, providing benefit to the customers and program performance.*
- The ATCSCC then issues the AFP, sending the customer a list of its controlled flights, the arrival slots to which they have been assigned, and the CTDs required to meet those arrival slots.
- Customers may substitute flights in an AFP the same way they substitute in an airport GDP. Additionally, customers may cancel the flight or reroute it around the AFP.
 - *Note: Cancelled flights continue to “own” slots and appear in the data, making it easy to track and swap the open slots.*

- *Customers often sub flights they plan to route-out of the AFP to the end of the program before filing the new route. This is because the route-out flight slot is discarded by TFMS when the flight is no longer part of the demand.*
- Customers can influence the ASLOT assignment by providing additional data, such as Earliest Runway Time of Arrival (ERTA), or control the compression of a canceled flight by setting the Slot Hold flag. These options provide the customer ways to share data with the automation on when or how the flight will be operating.
- A pop-up is a flight that was not part of the ADL at the time the AFP was issued (i.e., TFMS historical route did not have the flight transiting the FCA), but the filed flight plan or required route traverses the FCA. The manner of assigning delay to pop-up flights depends on the delay assignment mode chosen for the AFP:
 - DAS will assign the average delay for the 15 minute period the flight is projected to enter the FCA, with pop-ups becoming additional demand above the program rate
 - GAAP will fill unassigned slots at the estimated entry time for the FCA, if available, out to the Delay limit if no unassigned slots remain
 - UDP will start looking for a reserve slot based on the DAS delay for the 15 minute period the flight is projected to enter the FCA, out to the delay limit.
- The pop-up or Reserve rate should be decreased if flights are expected to avoid a constrained area and route out of the AFP. Alternately, the pop-up or Reserve rate may be increased if fights are anticipated to route away from a constrained area and into the AFP.
 - Low: 3% of Throughput Rate
 - Medium: 5% of Throughput Rate
 - High: 10% of Throughput Rate.
 - *Note: Certain techniques may be used to apply or modify the pop-up guidelines. For instance, variable pop-up rates should be applied through the AFP's timeline; lower at the beginning because more demand is known and at the end of the AFP where fewer pop-ups typically occur. Similarly, when using an AFP to manage a required reroute, fewer pup-up slots are necessary.*
- The ATCSCC may choose to revise the AFP through Compress Flights, Compress Slots or program Revision. Revision allows for changes to the program times, rates, exemptions, scope. There is no option for blanket adjustments within an AFP.
- TFMS monitors the program for slots that are at risk of going unused and attempts to move those slots to later times where they are more likely to be used through adaptive compression.
- The process continues iteratively until such time that the program is cancelled (purged) or the program expires.

Question and Answer

1. Q: How much lead-time should be provided before implementing an AFP?

A: AFPs (Classic or Dynamic) should be created early enough to allow airlines to protect slots for cancellations or file Early Intent (EI) routes. When operationally feasible, a minimum of three hours' notice should be provided prior to activating an AFP. The initial development of the FSM-eligible FCA is be considered the three-hour notification.

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2. Q: When creating an AFP, should FCA filters or FSM exemptions be used to establish the desired parameters?

A: FCA filters should be used rather than FSM exemptions whenever possible, as the flights will then be omitted from the ADL. Flights filtered out of the ADL are not part of the AFP and will not be processed by FSM, receive an EDCT or be eligible for substitutions.

3. Q: When should an FCA be made FSM-eligible?

A: Make the FCA FSM-eligible once you are satisfied with the settings. Make the FEA a public FCA and select OK. The initial FCA will default to a number, i.e. FCA001. Edit the FCA to rename the FCA following the naming recommendation, at this time make the FCA FSM-eligible.

- *Note: FSM creates an ADL as soon as an FCA, i.e. FCA001, is made FSM-eligible. When the FCAXxx name is changed, i.e. FCAJX1, a new ADL is created for the new name and TFMS stops processing the old, i.e. FCA001, ADL.*

4. Q: How is the Acceptance Rate for tactical AFPs set?

A: Before setting the AFP program rate, the initial FCA AAR needs to be set to preclude stacked demand at the end of the program (*Note: AFP AAR default is 0; using the fill function without the program start/end time will prevent the stack flights from being pushed to the last hour of the AFP*). This is accomplished through the “Modify AAR/ADR” function and completing the following:

Setting initial AAR – The initial throughput rate needs to be set prior to setting the program rate and should be set as soon as an FCA is monitored in FSM. Setting the throughput rate will prevent the possible error of having the stack demand at the end of an AFP being pushed excessively into the future because the throughput is set at zero after the program end time.

Throughput Rate:

- View the FSM bar graph in 30 minute time view
- Take the average of the 4 peak values
- Double this number to determine the initial hourly AAR value
- Modify the AAR in TFMS through the ETMS Tools menu on the TSD or through FSM
- The best practice is to FILL the GDT mode with the High Throughput AAR for the whole time (not program start/end time), then amend hours of the AFP as desired.

Program Rate:

- Discuss with the affected facilities what the expectation is for amount of traffic through the impacted area. There is no set level, the effects of percentage reductions can be seen through the line graph, or as depicted the percentage of traffic being allowed through the AFP
- The classic AFP rates were determined by:
 - Low impact: 10-15% reduction from Throughput Rate
 - Medium impact: 20-25% reduction from Throughput Rate
 - High impact: 30-35% reduction from Throughput Rate.

The use of variable rates is important to AFP performance and allows for known demand to be adjusted at program inception to accommodate anticipated unscheduled demand. The final hours of the AFP should be developed with increasingly higher rates to help manage the stack flights. Significantly reduced rates should not be used for extended periods, as it is more difficult to move flights earlier in a program than to add additional delay. Customers communicate departure times with the crew, ground personnel and passengers based on the delay issued.

5. Q: What is the naming convention for tactical AFPs?

A: The naming convention for tactical AFPs is FCAxxx; the “FCA” text is required, characters four and five will normally be the last two of the primary center for the AFP and character six is a numeric designator. I.e., FCAJX1.

Note: Override of classic AFPs will be up-lettered, i.e., FCAA05 Override will be FCAB05, FCAC05, FCAD05...

6. Q: What happens to a flight that already has an airport EDCT, but is also flying through an AFP?

A: No AFP EDCT will be issued. The flight will still appear as known demand to the AFP, controlled by another element (gold color in FSM bar graph of AFP), the airport GDP.

7. Q: If airport GDPs are expected, how does this affect AFP issuance?

A: When there is a high confidence in airport GDP issuance, those programs should be issued first to maximize AFP effectiveness and limit the number of aircraft being re-controlled out of the AFP.

8. Q: Are the substitution rules for AFP the same as they are for an airport GDP?

A: Yes

9. Q: If a customer routes out of an AFP, do they lose that slot (ASLOT)?

A: Yes, the slot is lost. If the customer has other flights with EDCTs that they want to sub, the customer must swap slots before rerouting the flight.

10. Q: When a flight reroutes out of an AFP and becomes part of another AFP, is the flight eligible for the substitution process?

A: Yes, although this flight loses its slot in the original AFP and is a pop-up in the new AFP, the subbing status will be preserved from the previous program through identification as a re-controlled control type (RCTL). That is, if the flight could be subbed in the previous program, it can still be subbed. If the flight was a pop-up in the previous program, it cannot be subbed. TFMS will send a message indicating the flight has been re-controlled with the new EDCT.

11. Q: Should customers wait to cancel a flight before or after an AFP is issued?

A: If a customer cancels a flight before the FSM-eligible FCA has been created, that slot is lost. It is in the customer’s best interest to wait until the flight is captured in the ADL before canceling it, so they may sub into that slot with another flight.

12. Q: How can AFPs be used in conjunction with required reroutes?

A: AFPs and reroutes have two primary relationships: routing out of the AFP and an AFP issued to meter demand through the AFP.

Note: Whenever issuing reroutes to be used in conjunction with an AFP, the reroutes should be based on FCA, not ETD/ETA. This minimizes the potential movement of flights without the Customer making an explicit choice. The FCA for the reroute can be the same as the AFP or a New FCA with different filters.

- When issuing a reroute **out** of an AFP (i.e., CAN1 East), the reroute should be issued after the AFP to allow customers to substitute flights prior to rerouting.
- When issuing an AFP to regulate demand on a reroute- routing **into** the AFP- (i.e., VUZ), the reroute should be issued before the AFP so the flights are not treated as pop-ups. The following order of actions is suggested:
 - Create the FSM-eligible FCA
 - Issue the Reroute
 - Wait 15 minutes after sending the reroute for TFMS to process the flights
 - Observe the changes to the demand
 - Model and issue the AFP.

13. Q: How can the control element for a flight's EDCT be determined (for ECR purposes)?

A: TFMS keeps a data field called CTL_ELEM (controlled element) that may be viewed for any flight on FSM, in an FCA dynamic list or on Reroute Monitor. The control element may also be determined by viewing the slot name in the list of EDCTs.

14. Q: What happens when an AFP is cancelled or a customer routes out of all AFPs within 45 minutes of P-time?

A: Flights will be assigned a new EDCT based on one of the following three criteria, whichever is latest (*Note: a new EDCT will only be sent to the tower*):

- a) The current time plus 15 minutes. (:15 is configuration parameter)
- b) The filed P-time (not the TFMS ETD derived from the P-time) plus 10 minutes. (:10 is a configuration parameter)
- c) The earliest possible time of departure as computed from user-provided data. This is computed in the same manner used by FSM and TFMS for RBS++ and compression.