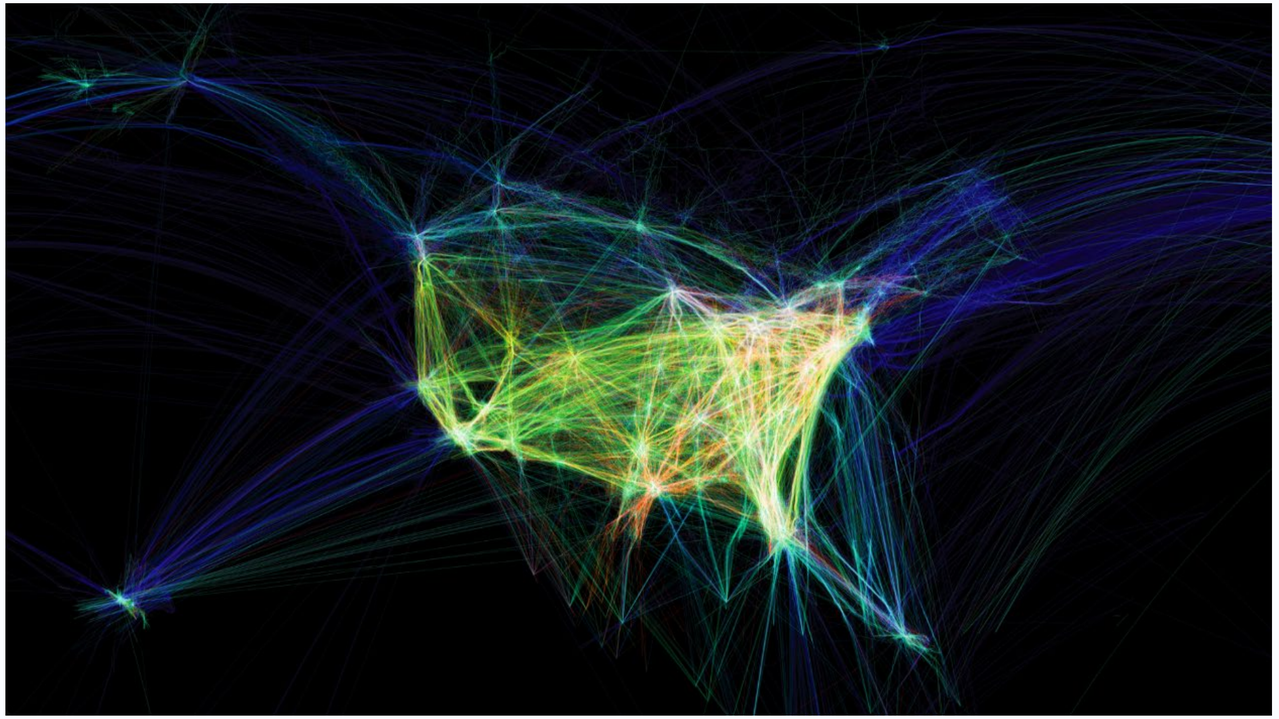
2023 AFP Guidebook



This Guidebook was established for informational purposes. The intent is to give facility personnel and stakeholders information regarding the concepts and thought processes of Airspace Flow Program (AFP) development.

AJR-1100, System Operations Services, ATCSCC

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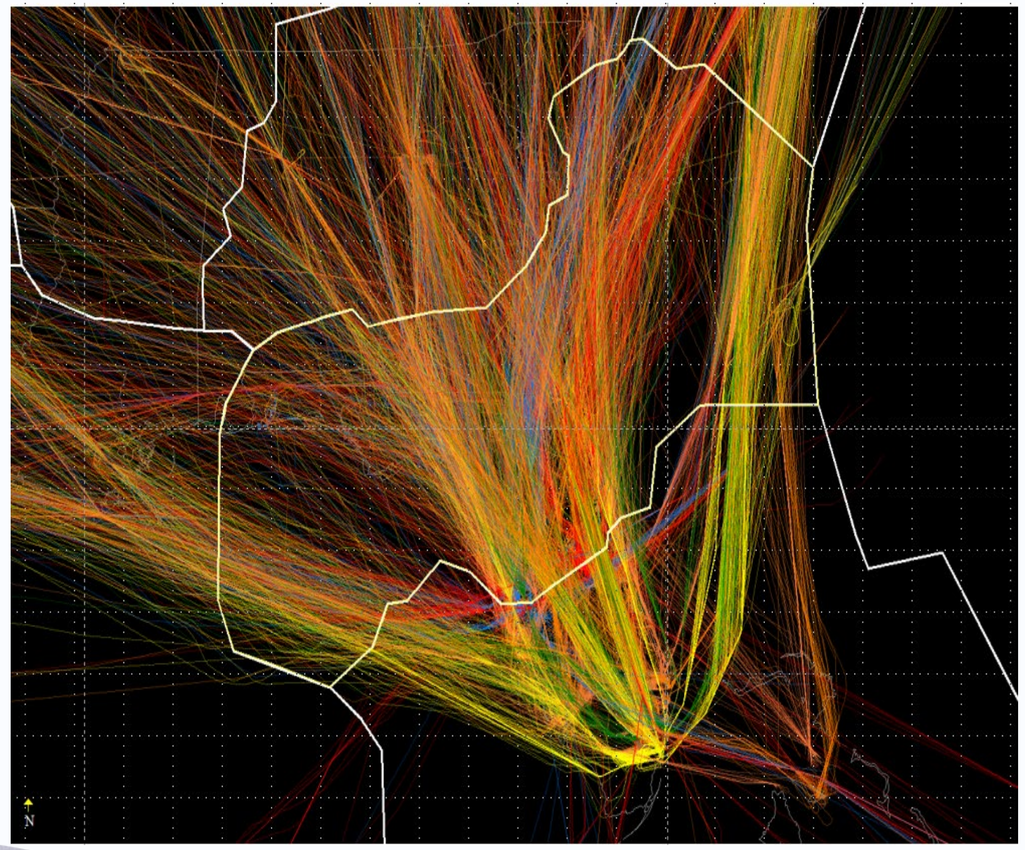
AFP Guidebook

Background

Airspace Flow Programs (AFPs), when used properly, can be a key component to manage volume/throughput/complexity issue events. Because of the unique airspace challenges individual FAA facilities face, AFP implementation and utilization strategies differ throughout the NAS.

Multiple AFP strategy documents exist that address specific regions throughout the NAS. This may cause confusion on when and how an AFP should be utilized.

The intent of this Guidebook is to serve as a resource for the FAA and Industry to refer to on how/when AFP strategies are considered for any flow constrained event.



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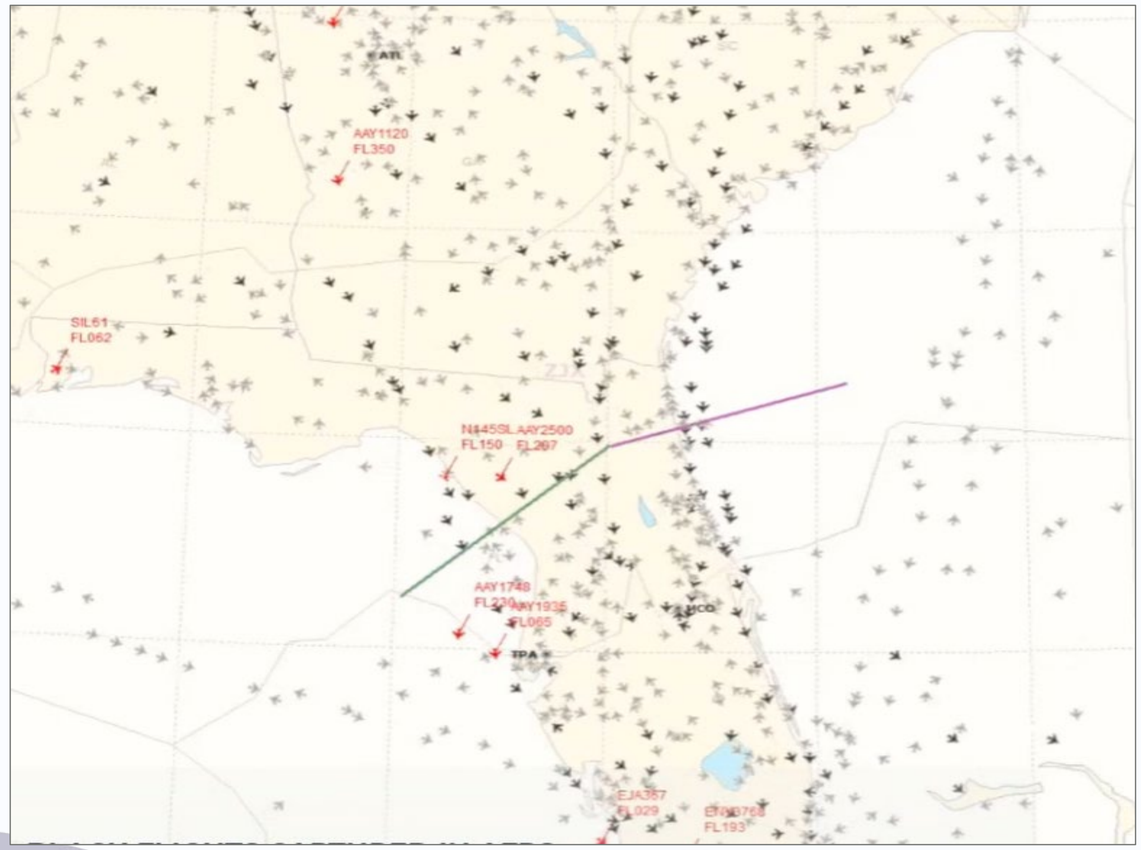
When to consider an AFP

There are four main causal factors for considering and implementing an enroute AFP strategy:

- ✓ Convective activity:
  - ➢ AFPs can be an effective tool for *airmass thunderstorms or stalled/slow moving frontal systems*. The location of the convective activity as well as the type (air mass, line, cluster), speed, growth and the projected life cycle of the event all play into the decision-making process.
- ✓ Staffing/Volume/Terminal/Complexity Constraints:
  - ➢ AFPs can also be used to manage staffing issues, enroute demand to capacity imbalances, and a variety of terminal constraints.



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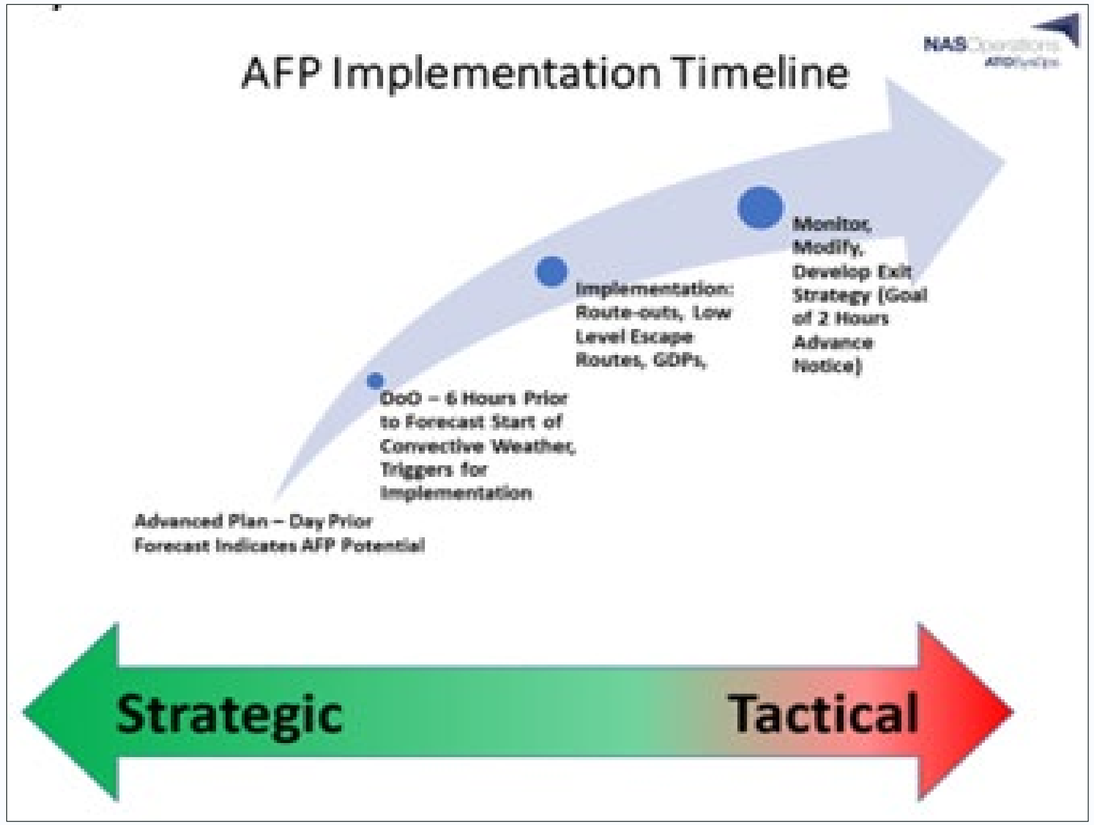
Timing for Implementing an AFP

Implementing AFPs can be subjective due to the uncertainty of weather forecasts and the largescale effects AFPs have on aircraft operators.

The Critical Decision Window (CDW) for implementing an AFP strategy is typically 5-6 hours before the triggering event (see note). This is especially true for Northeast AFPs to capture west coast departures. This also affords flight operators time to plan and adjust their schedules.

Flight dispatchers typically flight plan up to three hours prior to departure. On the Day of Operation (DoO), early/strategic implementation of AFPs reduces disruption to the operators network and provides predictability in the system for the FAA and airlines.

Note: There will be times that 5-6 hour CDW will not be practical/possible. Examples: Inaccurate forecasts leading to tactical event or a collaborative decision to take a “Wait and See approach,” and unscheduled equipment outages.



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Unconstrained FCA Throughput (UFT) values

In order to manage a convective weather or volume event, it is imperative to have awareness of the ***Unconstrained*** volume that transitions through the airspace of interest (i.e. OB6, ID1, JX1, JG5 etc.). Unconstrained FCA Throughput (UFT) values serve as a reference point for determining AFP rate reductions on established AFP FCAs associated with convective/volume/complexity events. UFTs are determined by:

- ✓ ***Actual traffic that transitioned*** through an FCA.
- ✓ Many of the established AFP FCAs have been evaluated over several months or years.
- ✓ The 14 busiest days are selected from the time period analyzed.
- ✓ The three busiest hours from each day (not necessarily in succession) are averaged to determine a Maximum Hourly Throughput.
- ✓ The Maximum Hourly Throughput should be used to determine the UFT.

Note: UFTs are ***not*** AFP rates; they are a reference point for evaluating and determining an AFP rate.

- ✓ NE FCA UFTs were determined and collaborated with NATCA by using pre-COVID time periods (2017-2019).
- ✓ SE FCA UFTs were determined and collaborated with NATCA by using October 1st 2021 – March 31st 2022 minus HARP days.

A08 - HOURLY

Week	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Average across week
2/25/2019					132	114	136	134
3/4/2019	145	142	135	129	133	141	146	139
3/11/2019	142	131	140	139	133	121	151	137
3/18/2019	143	138	142	137	125	122	159	138
3/25/2019	134	141	137	138	132	137	155	139
4/1/2019	138	134	137	129	131	119	144	136
4/8/2019	115	139	132	140	125	118	129	133
4/15/2019	131	138	148	131	92	132	154	139
4/22/2019	158	148	148	137	109	127	156	146
4/29/2019	146	140	139	119	125	108	134	137
5/6/2019	136	136	135	140	125	110	126	133
5/13/2019	131	136	140	134	133	119	140	136
5/20/2019	132	137	142	131	135	124	113	134

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UFT Parameters

UFTs are pre-calculated for routine constraints used in AFPs (i.e. OB1, JX5 etc.) and are based on saved parameters for each individual FCA. Currently, it takes the Office of System Analysis (AJR-G) approximately 4 hours to perform historical analysis on a FCA to calculate an ad hoc UFT. Changing any FCA parameter on the DoO will alter the number of aircraft captured which will change the UFT. If FCA parameters need to be changed to be effective, utilize the Ad Hoc AFP Maximum Throughput Rate calculation (discussed later in this document) to derive the initial throughput rate.
The following has been briefed to ATCSCC personnel:

"When evaluating a "Classic or Dynamic" FCA; if the FCA parameters for the base or ceiling altitudes are changed, the rationale for amending the altitudes should be documented in the NTML. Amendments to these parameters will alter the Unconstrained FCA Throughput (UFT) value of the FCA being evaluated. These changes may have unforeseen impacts to the day of operations plan and should be thoroughly vetted in conversation and documentation."

Example of how changing altitude parameters changes UFT

FCA Name and Parameters	Unconstrained FCA Throughput (UFT)
SNMSR (090-600, All Headings)	329
SNMSR (100-600, All Headings)	326
SNMSR (110-600, All Headings)	323
SNMSR (120-600, All Headings)	320
SNMSR (130-600, All Headings)	319
SNMSR (140-600, All Headings)	318
SNMSR (150-600, All Headings)	316
SNMSR (160-600, All Headings)	313
SNMSR (170-600, All Headings)	311
SNMSR (180-600, All Headings)	308
SNMSR (190-600, All Headings)	305
SNMSR (200-600, All Headings)	301

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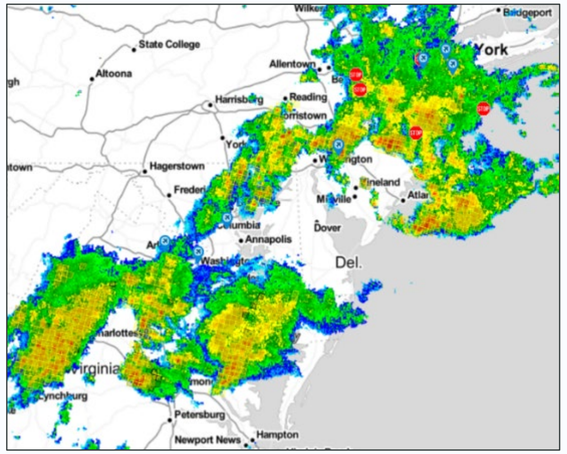
Factors to Consider when Determining AFP Rates

An AFP can be an effective strategy to provide a safe and efficient amount of aircraft through constrained airspace. Determining the available capacity and throughput can be a difficult task. There are many factors to consider when determining AFP rates. Some basic considerations are:

- ✓ Permeability of thunderstorms?
- ✓ Location, type and speed of thunderstorms activity? (air mass, line, clusters)
- ✓ Thunderstorm impacts on high density route structure(s)? Are there foundational routes that can be used throughout the event?
- ✓ Other constraints in the region? (staffing, turbulence, airport impacts etc.)
- ✓ Airspace usage (complexity)? (managing flights that are primarily enroute vs. arrivals/departures)
- ✓ Favoring arrivals or departures? Arrivals can only be favored briefly if there are extended periods of limited departure route availability. If favoring departures, AFP rates should be reduced.
- ✓ Primary FCA (manage event) vs. Secondary FCA (manage volume due to reroutes/route-outs/prevent pop-up delays)
- ✓ Other TMIs used in conjunction with AFPs?

Note: AFP rates should be determined based on the constraint and not set to generate delay.



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TMIs Commonly used in Conjunction with AFPs

Route-out options, Capping and Tunneling:

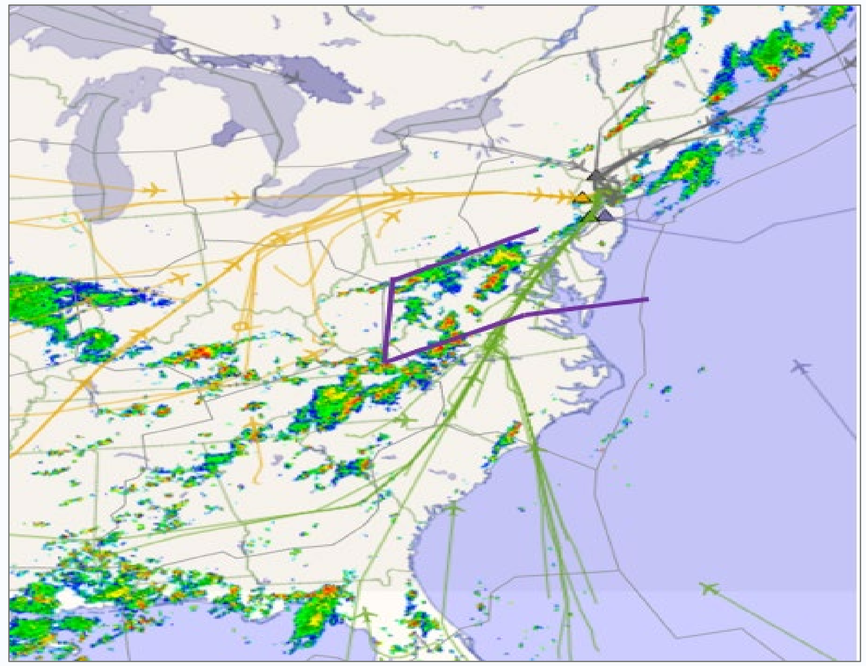
Increases efficiency and maximizes throughput.

- ✓ Reduces volume, complexity and overall delay.
- ✓ Provides aircraft operators options to avoid assigned delays by flying extended trajectories or at lower altitudes than preferred.

Ground Delay Programs (GDPs) and Ground Stops (GS):

- ✓ When GDPs are used in conjunction with AFPs, the delay associated with the GDP takes priority over the AFP delay assignment. Delay equitability is **not** a consideration when utilizing a AFP/GDP strategy. Supports airport throughput.
- ✓ Ground Stops are implemented to mitigate a sudden loss in capacity, or demand exceeding capacity that may degrade sector/airport safety and efficiency.

A wise man once said, "I can route-out of an AFP delay but I cannot route-out of a GDP delay!"



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Impacts TMIs can Have on AFPs

Mile-in-Trail (MIT) passbacks:

- ✓ AFPs are designed to reduce volume through the configured FCAs.
- ✓ Since the AFP reduces total volume, significant MIT should not be needed.
  - ➢ Significant MIT through the AFP will typically result in underdelivery.

Ground Delay Programs:

- ✓ GDPs become the controlling element when AFPs are used.
  - ➢ When the GDP is issued prior to the AFP, FSM will build the AFP around the GDP issued times resulting in a smooth program.
  - ➢ When the GDP is issued after the AFP, the AFP delivery will be impacted (normally reduced).

Ground Stops:

- ✓ If a full GS is needed for the AFP, the AFP GS procedure on page 42 of this guide can be followed. The AFP GS is basically a revision utilizing the airborne rate during the impacted time period.
- ✓ If a GS is needed for an individual airport within the AFP, only revise the AFP if there is a significant impact to the AFP delivery.

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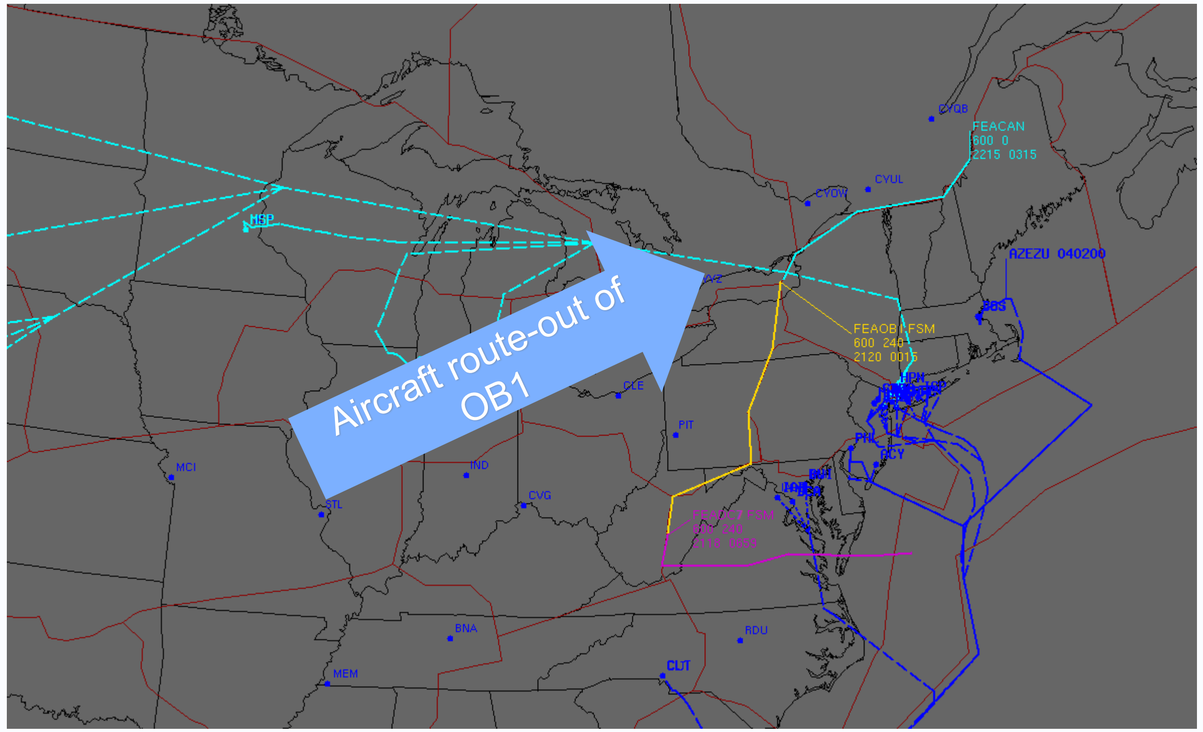
Route-Outs

Giving an option to “Route-out” of AFPs to avoid a delay through constrained airspace is beneficial to both the FAA and aircraft operators.

- ✓ Aircraft routing out of constrained airspace benefits air traffic operations by reducing airspace complexity and increases efficiency.
- ✓ By filing out or around the constrained airspace, operators are able to reduce/eliminate delays.

Example of a Route-Out



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General

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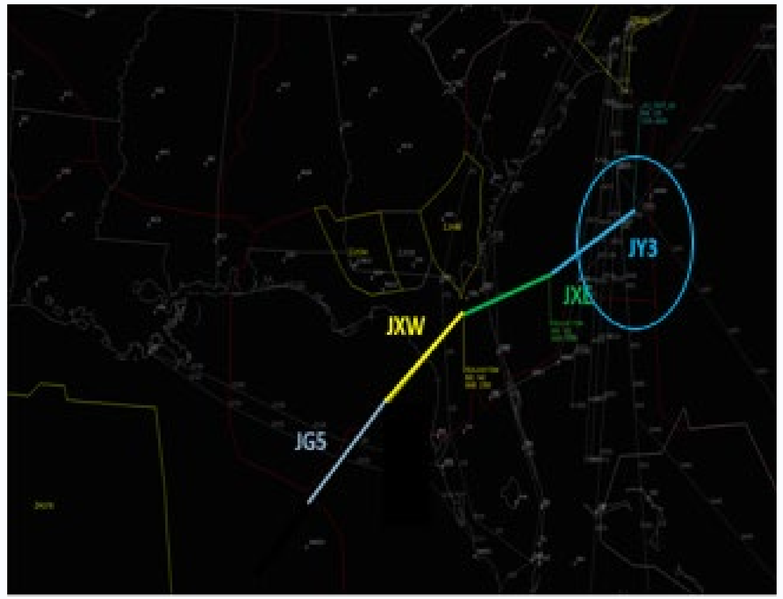
Re-controls: Moving From One AFP to Another

Re-controls and Pop-up delays need to be considered when deciding the proper AFP configuration and placement to address a constraint. In some instances, adjacent AFPs may be needed to control excess volume that file late or route-out of the primary AFPs.

- ✓ In the example on the right, even though there were no weather constraints expected on the ARs, an adjacent AFP on the ARs should be considered to avoid excess volume including pop-up delays and re-control issues from a later issued AFP which is often needed to protect the JY3 airspace.
- ✓ Also using this notional example, segmented AFPs are issued due to convective activity that will result in reduced capacity for the JG5, JXW and JXE FCAs.
- ✓ The JY3 is currently not needed because the AR's are wide open with no weather constraints. However, a rocket launch later in the day will close the AR's and force traffic inland. If the JY3 is not implemented, flights will receive Pop-up delays with no substitution rights when they file inland, due to the AR closures.
- ✓ The solution: Implement the JY3 with the other AFPs using a variable rate to account for the launch. When a flight reroutes from one AFP to another, it will receive a re-control delay (not a pop-up delay) for the new AFP and maintain substitution rights. This is a significant benefit for aircraft operators and the ATCSCC TCA position (Reduction in EDCT change requests).

Note: These examples are not uncommon occurrences in this airspace.



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FSM Time Parameter Settings

When the ATCSCC models and implements an AFP, the FSM's default parameter setting exempts flights within 45 minutes of departure from receiving an EDCT (T+45). This reduces the effect on operators/facilities by allowing aircraft boarding/taxiing/in the line up to depart without receiving an EDCT delay. This is an adjustable parameter.

- ✓ There will be times, however, when an AFP is implemented tactically, on short notice. This may result in program over-delivery in the first part of the AFP, if the T+45 parameter is not adjusted. To address this issue, reducing the time parameter (example T+30, T+20 etc.) may capture more flights and address program over-delivery issues sooner.

- ✓ If a situation is imminent, implementing via "Status" should be considered. "Status" captures and assigns delay to all aircraft that have not departed. "Status" implementation is an immediate TMI. Implementation and revisions to AFPs via "Status" should be used as a last resort. In most cases, proper planning will help avoid issuing an AFP via "Status".

- ✓ If demand is over the program rate to start, a rate lower than the program rate may be used in the first hour to absorb airborne demand.

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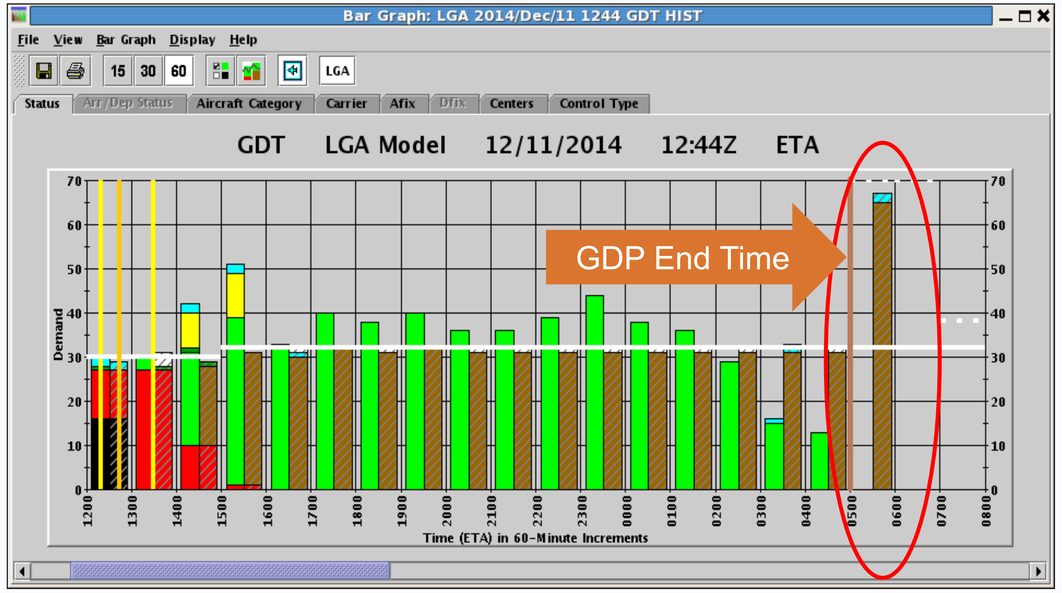
Exit Strategy

AFPs, when compared to all other TMIs, typically affect the greatest number of flights and generate the highest number of delay minutes. Building in an exit strategy at the time the AFP is issued, is practiced to reduce the number of aircraft affected, average delay and total delay minutes issued.

AFP exit strategies differ from GDP exit strategies with respect to residual demand, or “stack value” at the end of a program. AFPs typically have a low number of cancelations due to an operator’s ability to route-out of the AFP in lieu of canceling flights. For this reason, **“Stack” exit strategies do not work well with AFPs.**



Example of a GDP Stack Strategy: Note that the stack ran outside of the program end time, utilizing a high rate in anticipation of cancelations throughout the day

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Exit Strategy

From January 2018 through July 2022 there were 601 AFPs implemented by ATCSCC.

- ✓ 28 instances (5%) were extended beyond their original end times.
- ✓ 25 instances (4%) the AFPs ran to completion.
- ✓ 132 instances (22%) the AFPs were canceled within 60 minutes of the AFP end times.
- ✓ 416 instances (69%) the AFPs were canceled more than one hour prior to the AFPs end time.

AFPs implemented with a reduced throughput rate beyond the constraint's forecast end time can result in unrecoverable effects on operators, such as unnecessary delay, additional fuel burn to route-out of AFPs, canceled flights etc.

- ✓ AFPs that are run below UFT values should be ramped up to the UFT value, if known, at the constraints anticipated or forecast end time.

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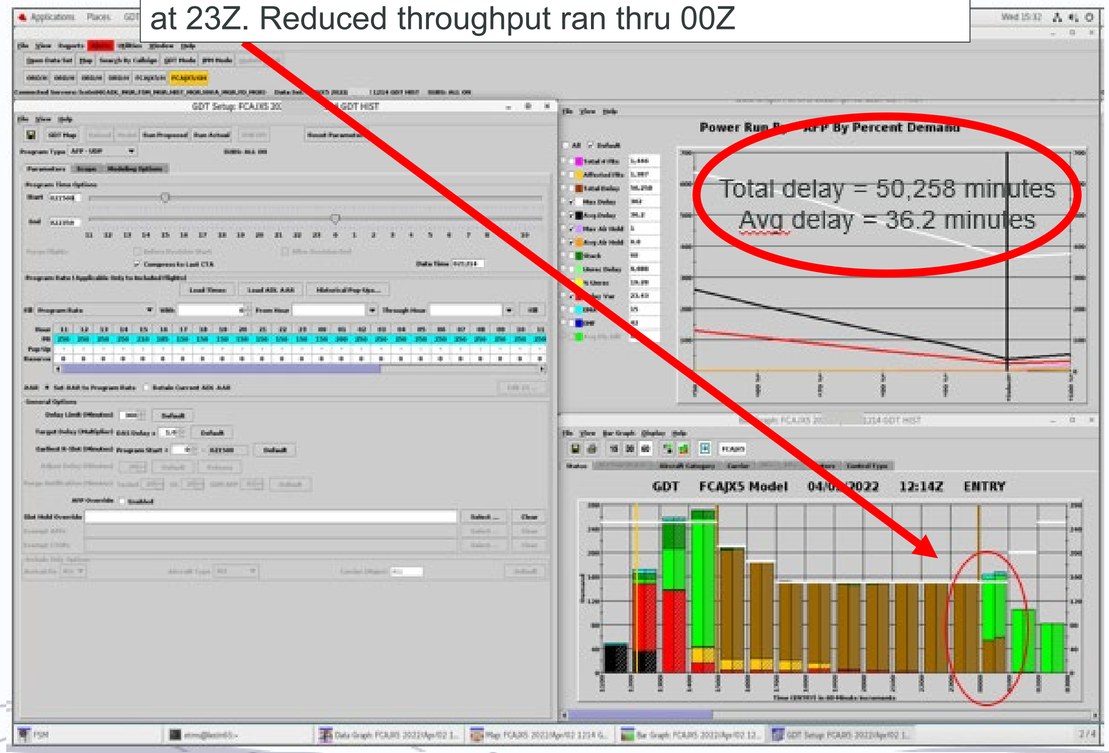
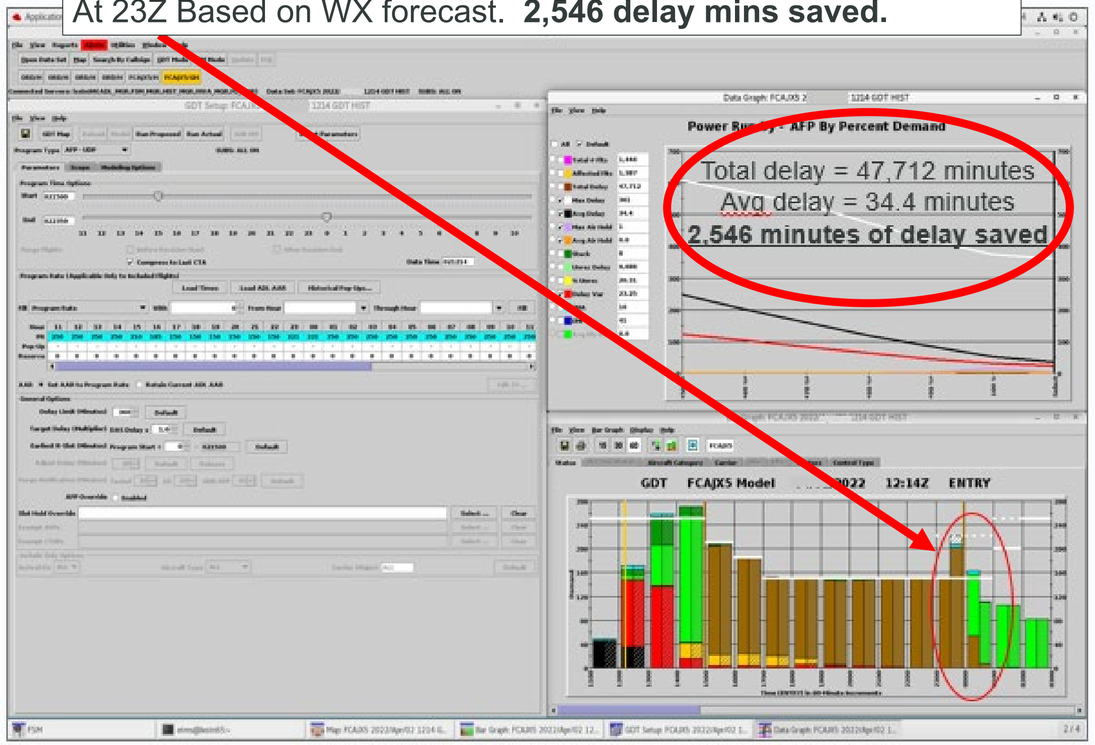
Example - AFP Ramp up exit strategy built in at AFP Implementation

AFP parameters - WX forecast indicated diminishment at 23Z. Reduced throughput ran thru 00Z



AFP modeled parameters – JX5 UFT Value, 221 ran
At 23Z Based on WX forecast. **2,546 delay mins saved.**



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AFP Guidebook
AFP Checklist – TSTMs

Checklist for AFP Coordination due to Convective Activity

What type of convective activity is the constraint (Air mass, frontal, sea breeze) and Special use airspace availability?

- ✓ What areas will be affected?
  - ➢ For NE and SE events, determine which AFP combination would be appropriate to manage the event.
- ✓ What is the life cycle (Start to End Time) of the event (i.e., forecast start/end time that high altitudes or transitional airspace will be affected).
- ✓ Utilize step down rates and step up rates to the maximum extent possible targeting the most impactful time period for the lowest rate.
- ✓ Are we able to obtain Special Use Airspace (SUA) for deviations or structured access?
  - ➢ What confidence do we have to keep the SUA?
  - ➢ Is there a recall on the airspace?

Note: AFP rates should be determined based on the constraint and not set to simply generate delays.

AFP Guidebook
AFP Checklist - TSTMs

Checklist for AFP Coordination due to Convective Activity – cont'd

- ✓ Will there be any airport GDPs required due to volume/extended TSTM activity affecting the terminal? If the GDP is imminent, a good practice is to implement the GDP prior to implementing the AFP(s). This strategy will help keep the AFP as efficient as possible. **Note:** FSM functionality can accommodate/accept GDP(s) after the issuance of AFP(s), but if it is known a GDP is going to be implemented in conjunction AFP(s), it is a preferred practice to implement GDP first, then the AFP.
- ✓ If structured routes that transition through the AFP FCAs are going to be utilized, **implement reroutes prior issuing AFP to avoid pop-up and re-control delays.**
- ✓ Will route-outs be available? If so, issue the reroute/s before implementing the AFP.
- ✓ Evaluate potential AFP start/end time as it relates to the life cycle of the event. (i.e. demand exceeding capacity for extended periods. Examine FCA in 15-minute buckets).
- ✓ Will the AFP be implemented in a timely fashion to allow for T+45? If no, is T+30 or T+20 sufficient? etc. *Note: "From status" should only be used in extreme circumstances and as a last resort.*
- ✓ Consider implementing off-load routes such as WATRS_RMD or CAN Playbooks to route out/reduce traffic on inland routes/ARs. ***The WATRS_RMD route is the normal route-out for the East Coast.***

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AFP Checklist - Volume

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Checklist for AFP Coordination due to Volume and complexity

- ✓ What areas will be affected by the high volume (i.e. extended AR closure for launch pushing traffic inland, Snowbird event etc.)?
- ✓ What is the projected life cycle (Start to End Time) of the event (i.e. is demand exceeding FCA capacity for an extended period)? Would alternative, less restrictive TMIs be more appropriate? Could the AFP be filtered to be more effective and precise without including all traffic transitioning the FCAs?
- ✓ Will there be any airports that require GDPs due to volume/extended TSTM activity affecting the terminals? If so, it is recommended to implement GDPs prior to implementing AFP(s).
- ✓ Will structured routes be issued that will transition through the AFP? If so, **implement reroutes prior to AFP modeling/implementation to avoid pop-up or re-control delays.**
- ✓ Will the AFP be implemented in a timely fashion to allow for T+45? If no, is T+30 or T+20 sufficient? etc. *Note: "From status" should only be used as a last resort.*
- ✓ *Will the strategies complexity require the need to lower the anticipated program rate future?*

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AFP Guidebook
AFP Checklist - Volume

Checklist for AFP Coordination due to Volume and complexity– cont'd

- ✓ For Southeast U.S. AFPs, will the ARs be available for both north and southbound traffic?
  - ➢ If ARs are unrestricted, select AFP rate as close to UFT to encourage operators to route into. Same for Gulf Routes.
  - ➢ Consider implementing WATRS RMD to route out/reduce traffic on inland routes/ARs.
- ✓ Depending on location of constraint, will route-out options be offered to encourage operators to reroute to avoid delay? Examples – CAN routes, WATRS, AR's, Gulf routes ad-hoc, etc.
- ✓ If this is a pure volume event, model the AFP rate close to the FCA UFT. This will cap the volume at a level at which the facility can handle and minimize the impacts on the users. The events complexity will typically lower the rate.
- ✓ Will there be a significant number of late filers (i.e. GA/Snowbirds/non-scheduled flight operations)?
  - ➢ If yes, be aware of the impact of these late filers especially if utilizing the DAS mode (more AFP revisions should be expected). If issuing the AFP in UDP mode, adding additional time on the Delay Limit could be considered.

AFP Guidebook
FSM: DAS vs UDP

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Pop-Ups

Flight plans filed after an AFP has been issued are often referred to as pop-ups. It is important to understand the difference between running an AFP in Delay Assignment (DAS) mode vs Unified Delay Program (UDP) mode as the delay assignment and slot allocation for pop-up flights differ.

- ✓ In DAS mode: pop-up flights receive the average delay calculated in the Fuel Advisory Delay Table (FADT).
- ✓ In UDP mode: The Reserve Rate, creates and reserves slots to address pop-up flights typically associated with late filing aircraft. pop-up flights receive the first open slot available after the DAS delay has been assigned up to the delay limit set in FSM (Default setting is 180 minutes).
  - ➢ If an open slot is available and received, the flight will have full substitution rights.
  - ➢ If there is no open slot available, the flight will have limited substitution rights.

Note: In most cases, because of the high volume of unscheduled GA/business jet flights that transition through ZJX, running AFPs in UDP mode may be a better option to meet the needs of ZJX/ZMA. Northeast U.S. AFPS are typically run in DAS mode.

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AFP Guidebook
FSM: DAS vs UDP

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DAS Mode AFPs

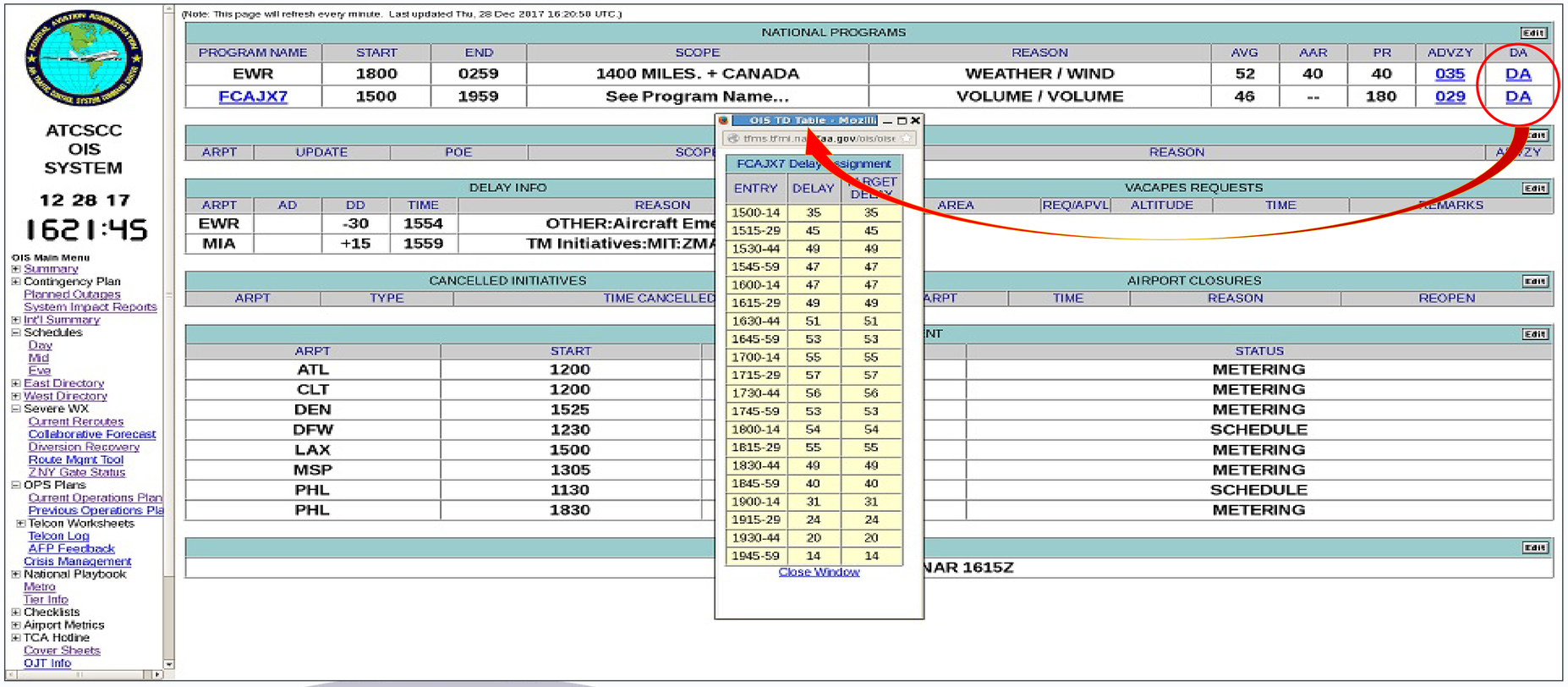
The DAS delay table is accessed from the OIS page. It can also be viewed on the FADT tab in FSM prior to issuing the AFP-Actual or AFP-Proposed.

Clicking on the "DA" link brings up the delay table

DAS Mode provides predictability to operators

- ✓ Customers can view the DAS delay table to determine the amount of delay that their flight will receive.
- ✓ Based on the expected delay, operators can file an alternate routing(s) around the AFP based on their business model.

If multiple AFPs are in place, they can compare expected delay times and file accordingly



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FSM: DAS vs UDP

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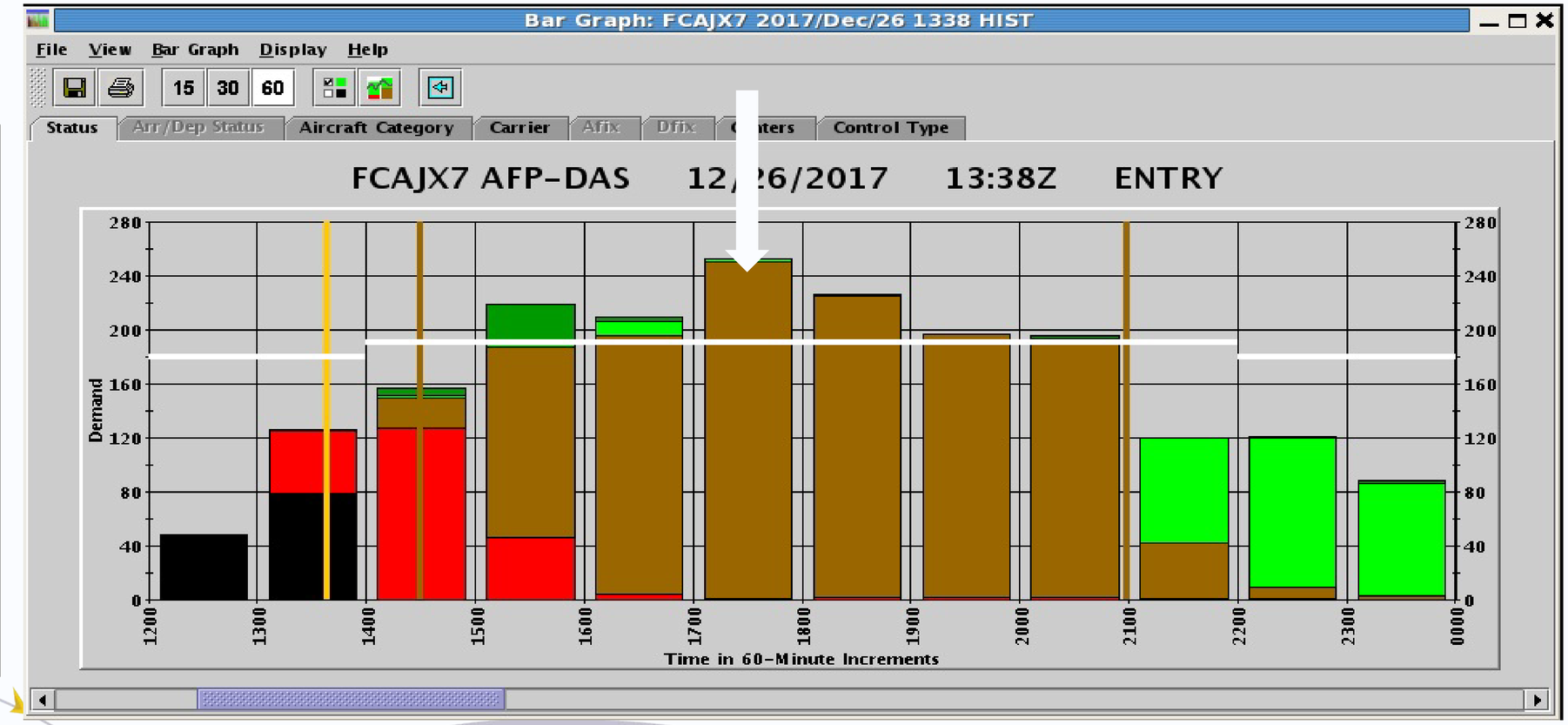
DAS Mode AFPs

DAS Mode shortfall:

Regardless of the number of pop-up flights that file into a specified 15-minute timeframe, they all receive the same amount of delay. This may result in an over-delivery and potentially a revision to the program.



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AFP Guidebook
FSM: DAS vs UDP

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UDP AFPs

UDP mode functions differently than DAS mode. In UDP mode, FSM will apply the DAS delay, then search for an open slot and assign the next open slot. FSM continues looking later and later for an open slot, however, if no slot is found when the maximum delay assignment time value is reached, the flight is assigned the maximum delay regardless of slot availability. The maximum delay assignment limit is set as a parameter prior to program implementation. The default parameter is 180 minutes but can be adjusted higher or lower.

Running in UDP mode will maintain the integrity of program delivery for a longer period of time. The downside to using UDP mode is the uncertainty aircraft operators have and the lack of visibility into the delay they will receive when filing into the AFP. Typically, UDP mode will generate more delay assignment than DAS mode for pop-ups or flights moving from one AFP to another. UDP can cause frequent revisions with volume farther ahead in the time-line.

Example: Operator routes out of one AFP into another AFP that was issued in UDP mode and receives a higher delay than the AFP that was just routed out of.

AFP Guidebook
IPM

Integrated Program Manager (IPM)

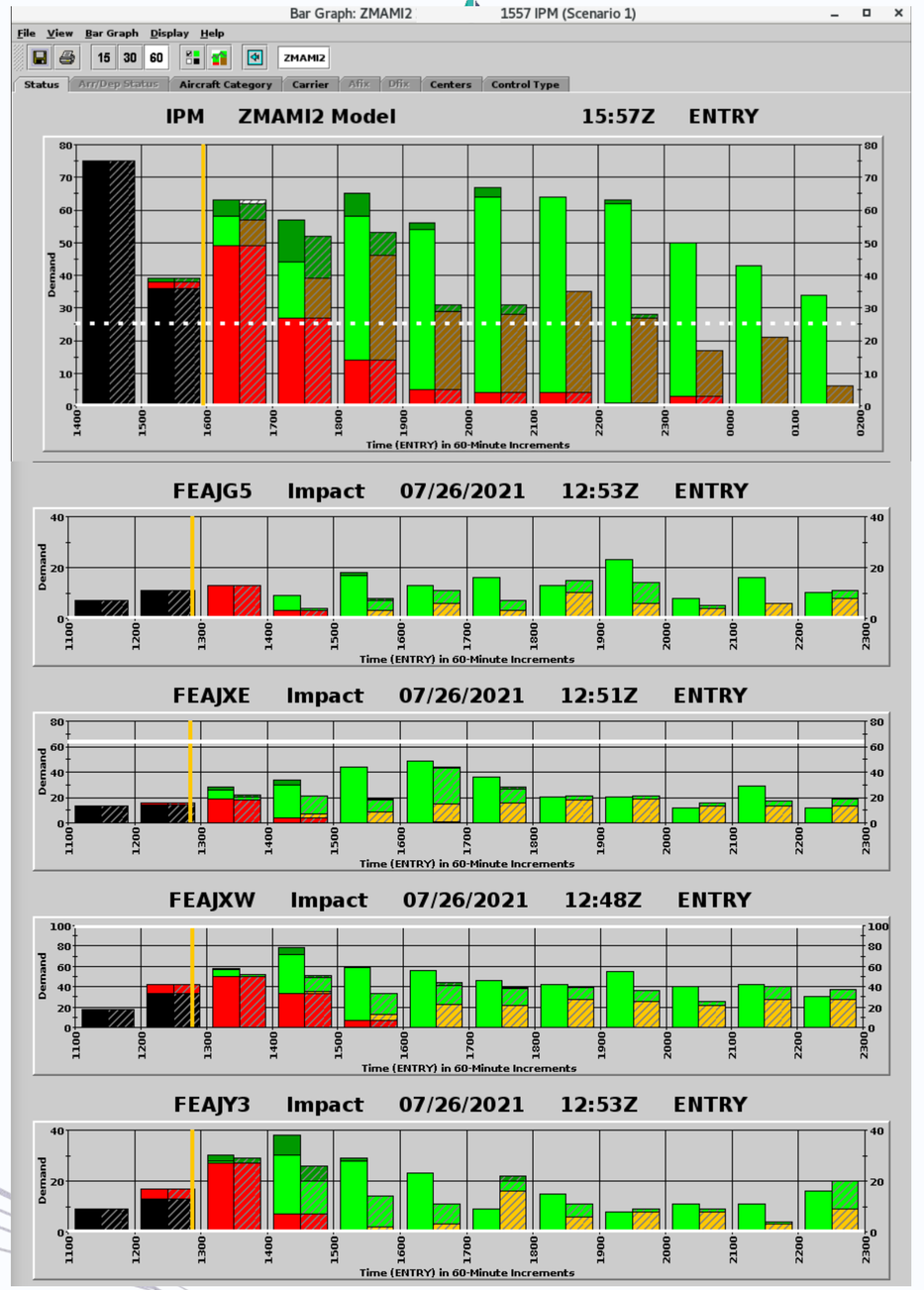
IPM functionality models, compares and previews how one TMI may “impact” the demand on other TMIs under consideration.

In the notional example to the right, the ATCSCC performs a strategic analysis of a MIA TRACON AFP, and the effects it will have on the JG5, JXE, JXW, and JY3 throughput.

- ✓ A NAS element AFP is modeled in IPM for MIA TRACON due to runway construction. Separately, ZJX is considering an AFP strategy due to volume issues. ATCSCC uses IPM to model the effect a MIA TRACON AFP will have on the ZJX FEAs to determine if they are necessary.

This type of comparative analysis is often required for NE events. IPM is utilized for “Advanced Planning” (Day before) strategic planning as well as DoO.

Note: IPM cannot model Ground Stops or the effects route-outs would have on control elements



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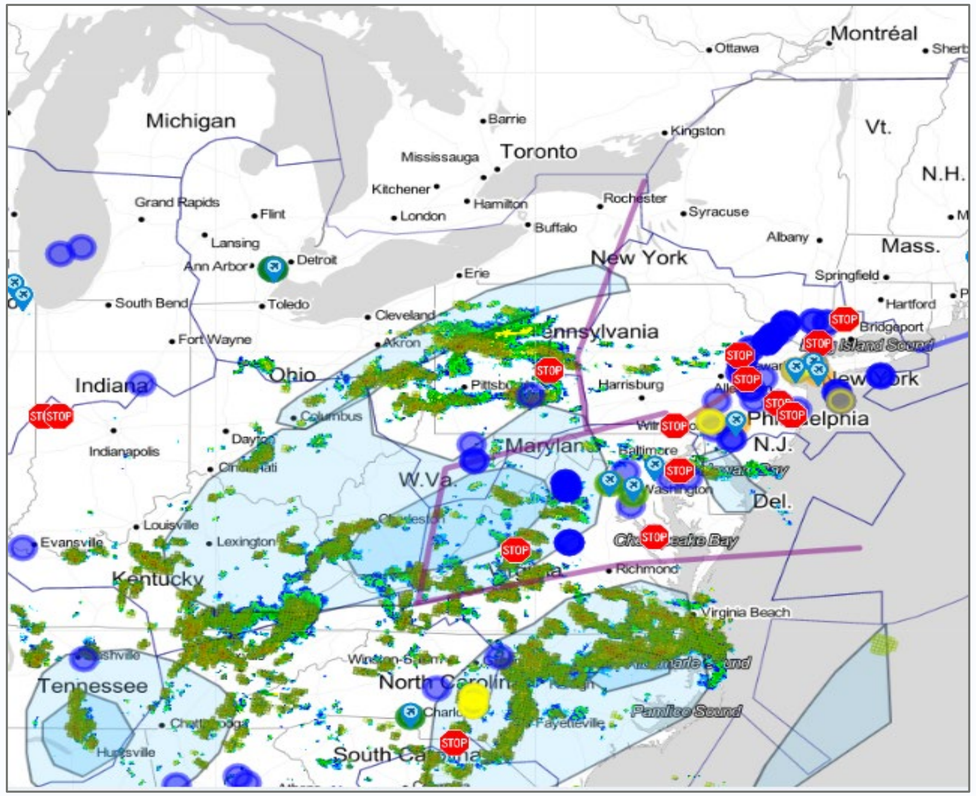
Complexity of Airspace – Northeast

The Northeast portion of the United States is extremely complex due to the sheer density and volume of air traffic arriving/departing multiple busy hubs. Convective weather events severely restrict the amount of airspace available to provide ATC services.

AFPs can be an effective tool to manage demand, capacity imbalances and throughput issues during SWAP events. They can be used to maintain efficiency through constrained airspace affording aircraft operators the option to flight plan through the constraint or route-out of it.



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AFP Guidebook
Northeast AFP Strategy

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Route-Outs – Canadian Airspace

Due to the volume of aircraft that may route-out of U.S. airspace to escape AFP delay, prior coordination with CZY/CNOC is expected to ensure appropriate staffing levels are available. Knowing Canada's ability to work additional traffic is critical when developing an AFP strategy.

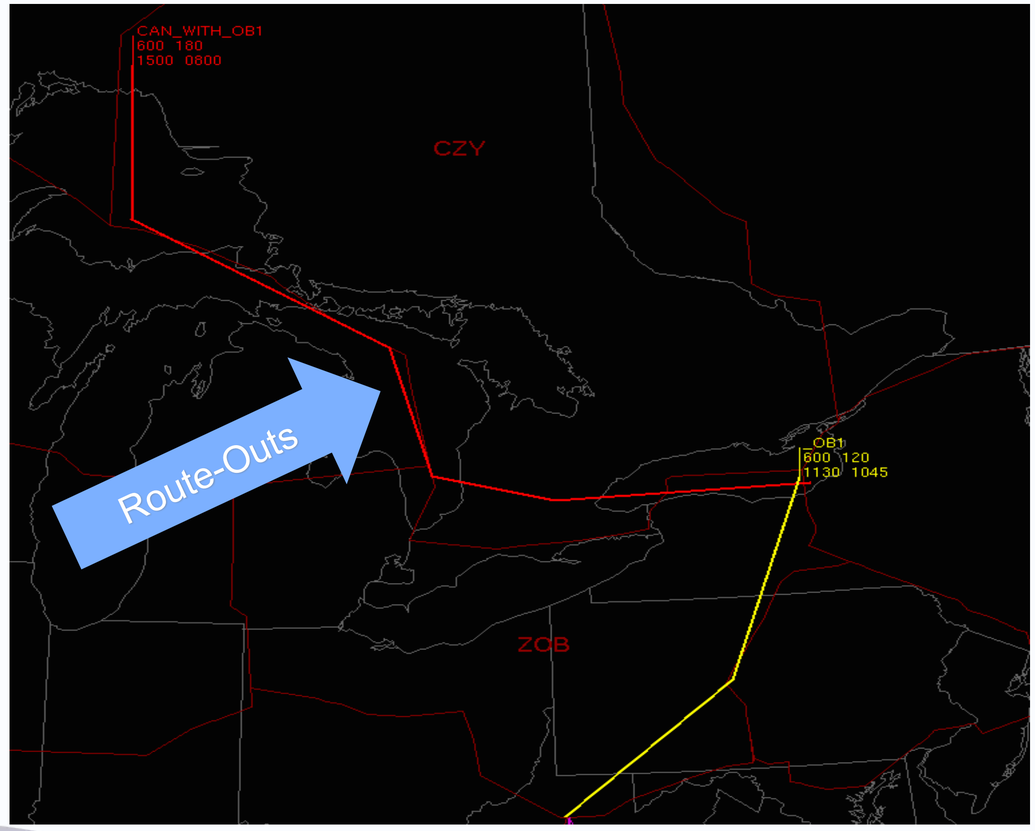
CZY/CNOC will typically require:

- ✓ FCA based Structured routes with expanded MIT.

CZY/CNOC may request:

- ✓ A Canadian (CAN) AFP that corresponds with OB1 or OB6.
- ✓ A Combination of Structured Routes and CAN AFP.

Note: The CAN AFP request is not typical.



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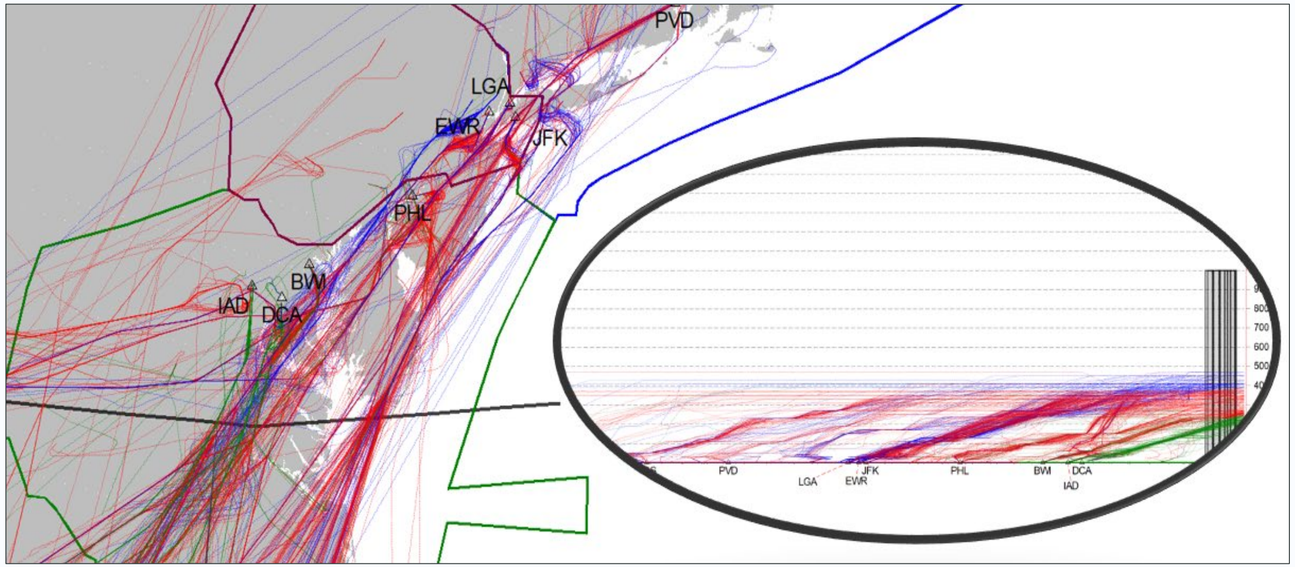
AFP Floors and Ceilings – Northeast

All Northeast FCA floors and ceilings are set at 120 and FL600:

- ✓ Due to the close proximity of the NE regional airports, these altitudes will not normally be adjusted.
  - ➢ Floor: The airspace AOB FL230 is generally used for escape routes and capping/tunneling which precludes the floor from being raised.
  - ➢ Ceiling: Sequencing and spacing requirements into the NE regional airports preclude aircraft from flying over the top of an AFP/constraint and descending in.
  - ➢ **NE U.S. FCA parameters are based on eastbound traffic landing ZBW/ZNY/ZDC destinations.**



Federal Aviation Administration

AFP Guidebook
Northeast AFP Strategy

ATOSysOps

UFTs – Northeast

The Northeast UFTs are based on the set/saved parameters for each FCA. All Northeast FCAs are destination based and not heading based.

Again, UFTs are not AFP rates but rather a reference point established to understand what traffic volume is during normal conditions. AFP rates are determined based on the many variables and constraints on the DoO.

Northeast FCA UFTs were determined and collaborated with NATCA by using pre-COVID time periods (2017-2019).

DESTINATION BASED PARAMETERS

Destination Based: ZBW/ZNY/ZDC LTFC FCA Name and Parameters	Unimpeded FCA Throughput (UFT)	
A08 (120-600)	A08	153
BW1 (120-600)	BW1	49
DC7 (120-600)	DC7	131
ID1 (120-600)	ID1	72
OB1 (120-600)	OB1	149
OB6 (120-600)	OB6	117

ALTITUDE PARAMETERS

NORTHEAST FCA UFTs

Federal Aviation Administration

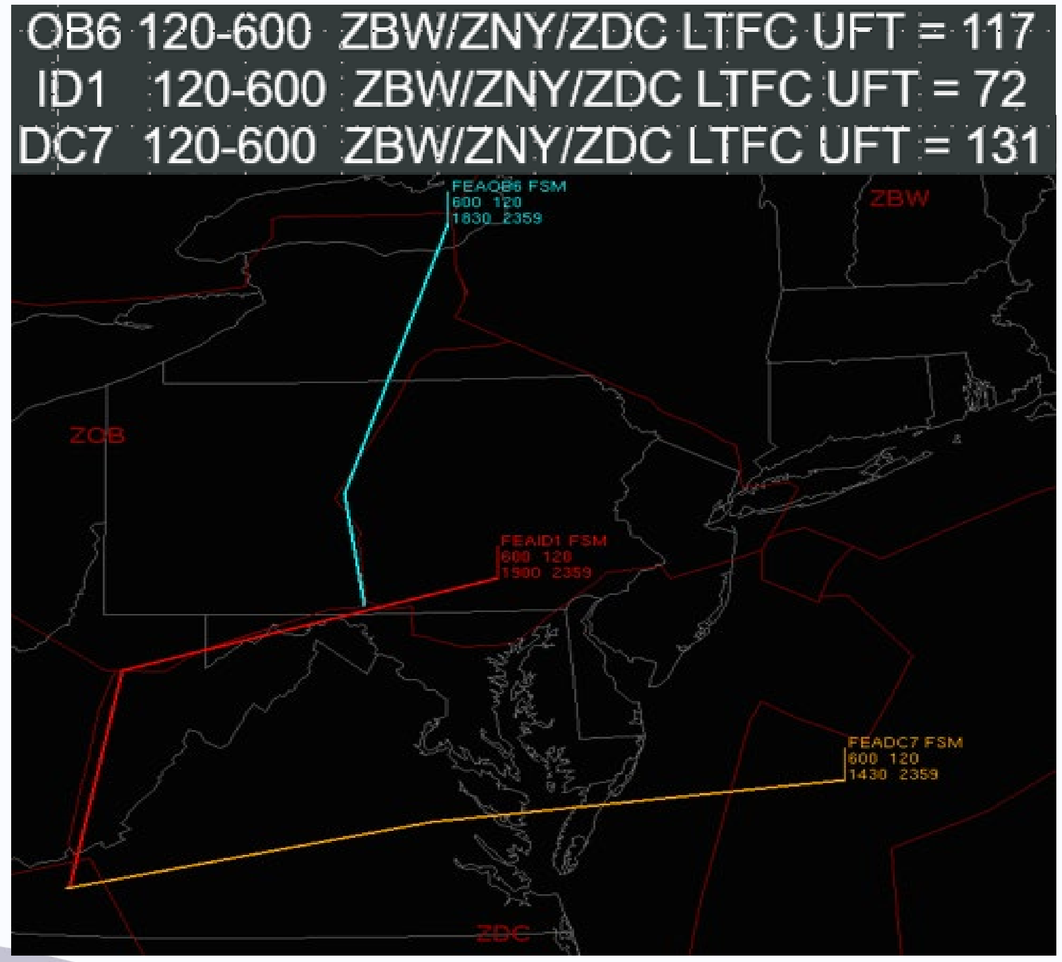
AFP Guidebook
Northeast AFP Strategy

NE AFP Selection Strategies

Although there are many usable NE AFP utilization strategies and combinations, the following two strategies have been most used for managing SWAP events since 2018.

- ✓ OB6/ID1/DC7: consider using this combination when TSTM activity is affecting multiple areas in ZDC/ZOB/Eastern ZID airspace.
- ✓ Not all of these AFPs have to be issued at the same time. Some can be monitored with a trigger for implementation.
- ✓ This combination allows for the most flexibility and control in handling NE events, particularly when using variable throughput rates that align with lifecycle and movement of TSTM activity.

Note: This is currently the preferred, most often used AFP combination for NE events.



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AFP Guidebook
Northeast AFP Strategy

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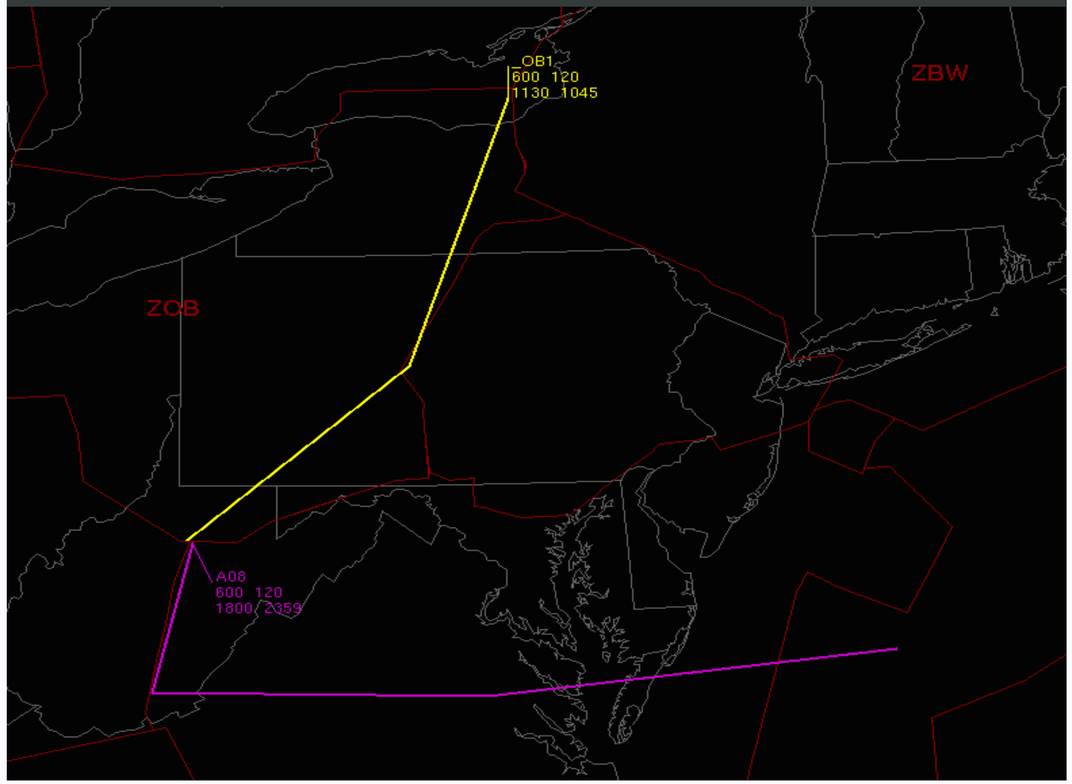
NE AFP Selection Strategies – Cont.

OB1/A08: Consider using this combination when TSTM activity is predominately in either ZDC airspace or ZOB airspace.

- ✓ Example use case: TSTMs predominately in ZDC results in variable throughput rates that align with the lifecycle and movement of the TSTM activity. OB1 ran at the UFT to encourage route-outs through ZOB airspace.
- ✓ AFPs like this are also to support access to airspace in the enroute airspace for departure or any combination.

Note: This is the second most used AFP combination used to address NE events.

OB1 120-600 ZBW/ZNY/ZDC LTFC UFT = 165
A08 120-600 ZBW/ZNY/ZDC LTFC UFT = 47



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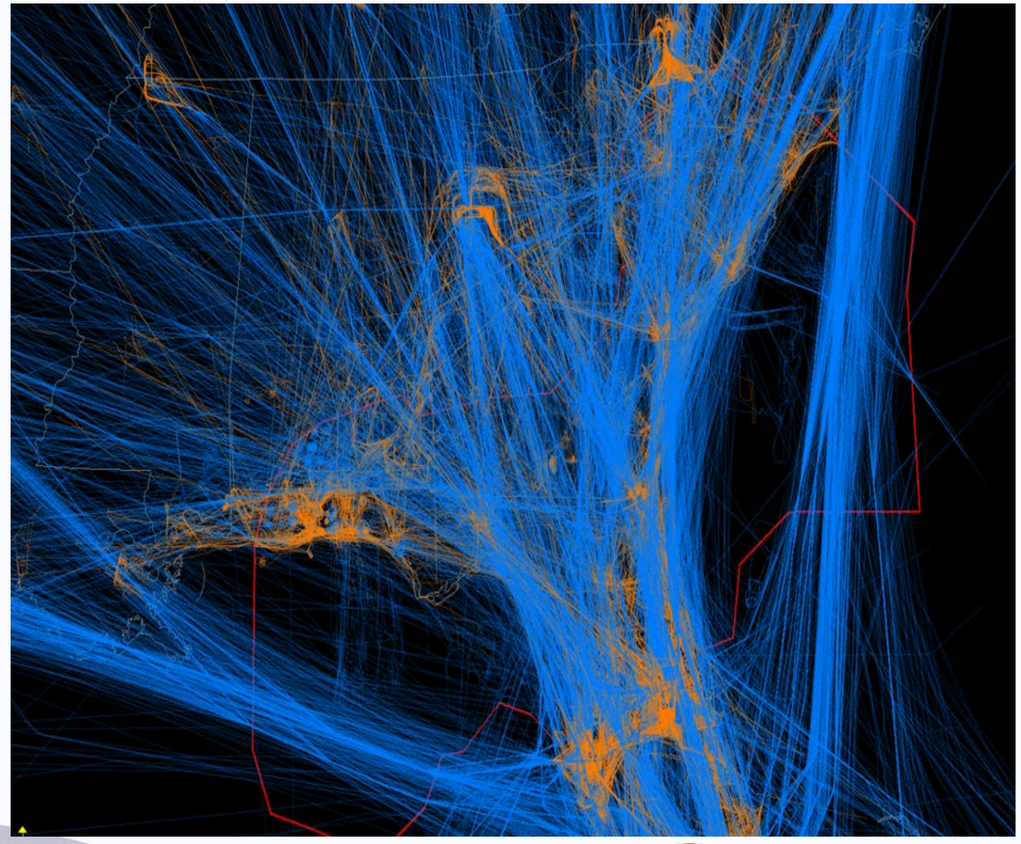
AFP Guidebook
Southeast AFP Strategy

SE AFP Selection Strategies

ZJX and ZMA ARTCCs have the distinct honor of leading the NAS in growth of air traffic volume in 2022. ZJX and ZMA have unique challenges that few other centers face due to:

- ✓ Their location, which creates a funneling effect as air traffic transitions through ZJX/ZMA airspace.
- ✓ Significant and unique convective weather activity.
- ✓ Airspace closures/reroutes associated with Space Launch / Reentry operations.
- ✓ Airspace constraints due to military activity.



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AFP Guidebook
Southeast AFP Strategy

ATOSysOps

UFTs – Southeast

UFTs are based on the default parameters set for each FCA. All Southeast FCAs are heading based and not destination based. A perpendicular heading to the FCA line, plus or minus 80 degrees, is used as the heading parameter (i.e. JG5 is a 130 heading +/-80).

Again, UFTs are not AFP rates but rather a reference point established to understand the traffic volume during normal conditions. AFP rates are determined, based on many variables and constraints on the DoO.

When calculating Southbound AFP rates, established Northbound FCA volume should also be considered to avoid overloading ARTCC sectors. The evaluation includes throughput for access to enroute airspace. Some hours may be lowered based on larger demand northbound.

Southeast FCA UFTs were determined and collaborated with NATCA by using data from October 1st, 2021 – March 31st, 2022 minus HARP days.

Note: Southbound FCAs are odd numbered.

Southbound FCAs	TOP 14 2021-2022 NO HARP
FCA Name and Parameters	UFT
JG5 (0-470, 130+/-80)	30
JXW (140-600, 140+/-80)	109
JXE (160-600, 160+/-80)	66
JY3 (220-450, 150+/-80)	47
JX7 (200-500, 170+/-80)	204
JX1 (220-470, 160+/-80)	165
JX3 (220-450, 190+/-80)	47
JX5 (200-440, 170+/-80)	221
MA1 (200-450, 180+/-65)	117
MA5 (0-600, 150+/-60)	48
MA7 (200-450, 170+/-80)	213

Federal Aviation Administration

AFP Guidebook
Southeast AFP Strategy

ATOSysOps

UFTs – Southeast US

ZJX Northbound AFPs are not normally used for AFPs due to:

- ✓ The inability to effectively capture demand (internationals exempted northbound traffic).
- ✓ Inconsistent GA schedules.
- ✓ Significant amount or origins to enforce EDCT compliance.

However, they are used routinely to monitor demand for situational awareness.

Note: Northbound FCAs are even numbered.

Northbound FCAs	TOP 14 2021-2022 NO HARP
FCA Name and Parameters	UFT
JG6 (0-470, 310+/-80)	36
JNW (140-600, 320+/-80)	88
JNE (160-600, 340+/-80)	85
JY4 (220-450, 330+/-80)	39

Federal Aviation Administration

AFP Guidebook
Southeast AFP Strategy

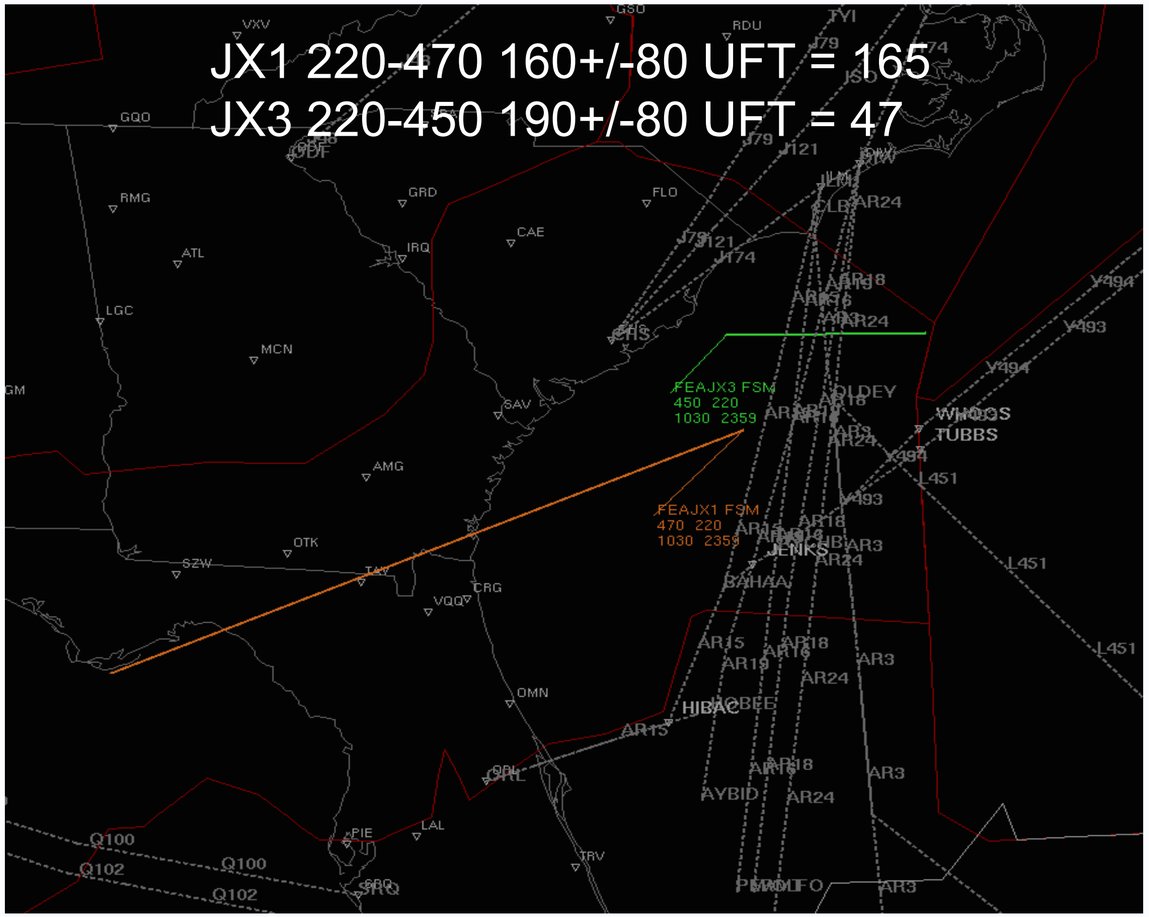
ATOSysOps

SE AFP Selection Strategies

JX1: Consider to manage volume and complexity in the inland portion of ZJX between east and west coast SUAs. Allows/encourages route-outs via ARs and Q-Routes. Consider running in UDP mode.

JX3: Consider to manage volume and complexity in the ARs traffic. Can be used in conjunction with JX1 when heavy AR usage is expected (Run UFT rate), or if ARs are affected by weather but are still usable. Consider running in UDP mode.

ZJX can manage the JX1 flow tactically east and west coast as weather moves through the inland. Keep a constant rate which will allow ZJX to manage the opening as it moves across.



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AFP Guidebook
Southeast AFP Strategy

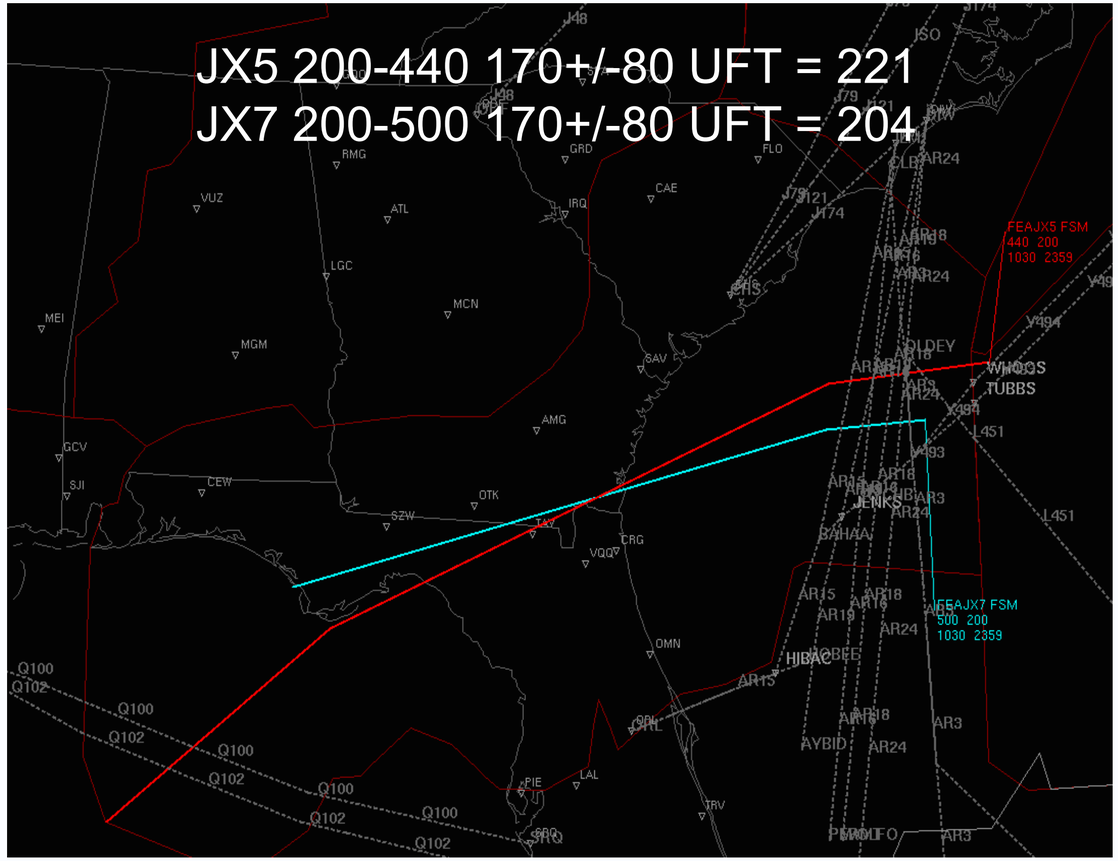
ATOSysOps

SE AFP Selection Strategies

JX5: Consider using when TSTMs will affect/shutdown Q-routes and ARs creating volume issues inland in addition to deviations. Consider running in UDP mode.

JX7: Consider using for TSTMs with frontal line movement moving east through ZJX (covers ARs).
Allows/encourages route-outs via Q-routes. Consider running in UDP mode.

Note: Multiple areas of convective activity could require the use of JX5/JX7 in lieu of JX1/JX3.



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AFP Guidebook
Southeast AFP Strategy

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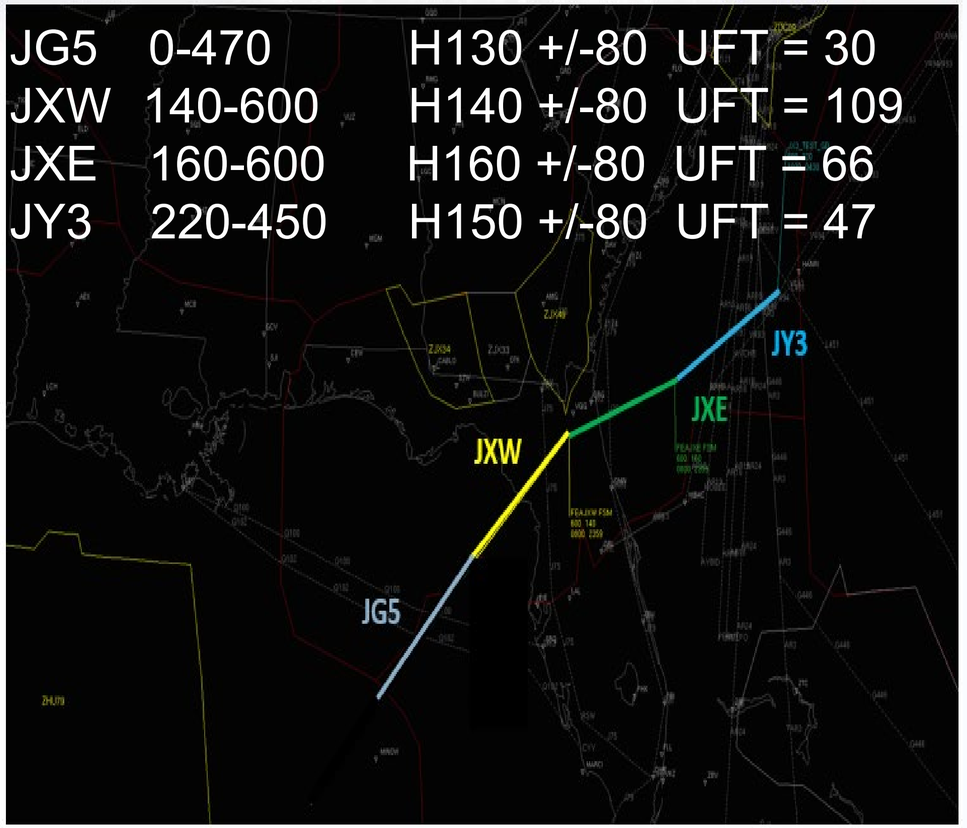
SE AFP Selection Strategies

JG5, JXW, JXE, JY3: The most recent AFP additions:

- ✓ Used primarily for VFR, heavy volume events. These AFPs, used individually, grouped, or together, allow ZJX the flexibility to adjust throughput rates to manage the event more efficiently. These have been used during TSTM events with mixed results.
- ✓ Consider running in DAS mode so that operators can evaluate which AFP they want to fly through by comparing the delay vs route requirement.
- ✓ JXW/JXE east work well with high volume and no convection. Each can manage its limit. If convection is involved with a load on both sides, either side can't take the wait of the other in a missed forecast event since it is running at max value.



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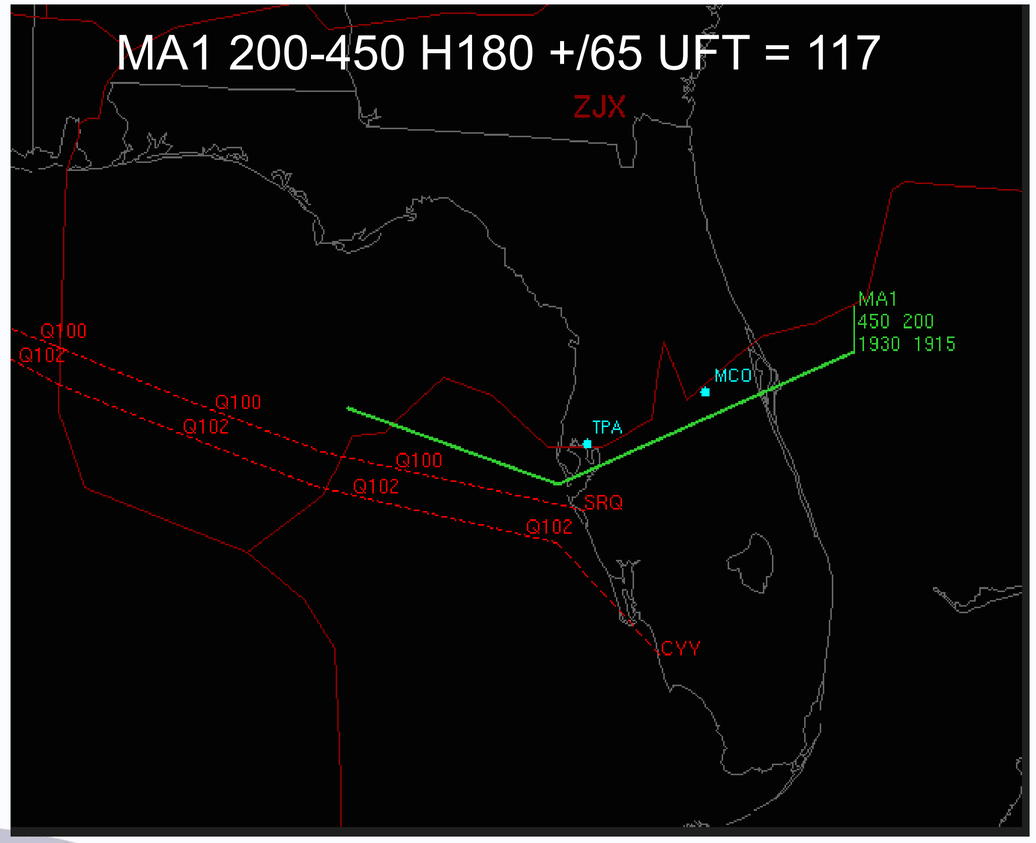
AFP Guidebook/Best Practices
Southeast AFP Strategy

ATOSysOps

SE AFP Selection Strategies

MA1:

- ✓ Can be used with frontal line moving down the peninsula while managing TPA /MCO with GSs until clear.
- ✓ Used for convection affecting ZMA airports needing room for arrivals and departures in limited access to enroute airspace.
- ✓ Restricted access to SUAs and/or ARs will increase its chance for usage
- ✓ Consider running in UDP mode.



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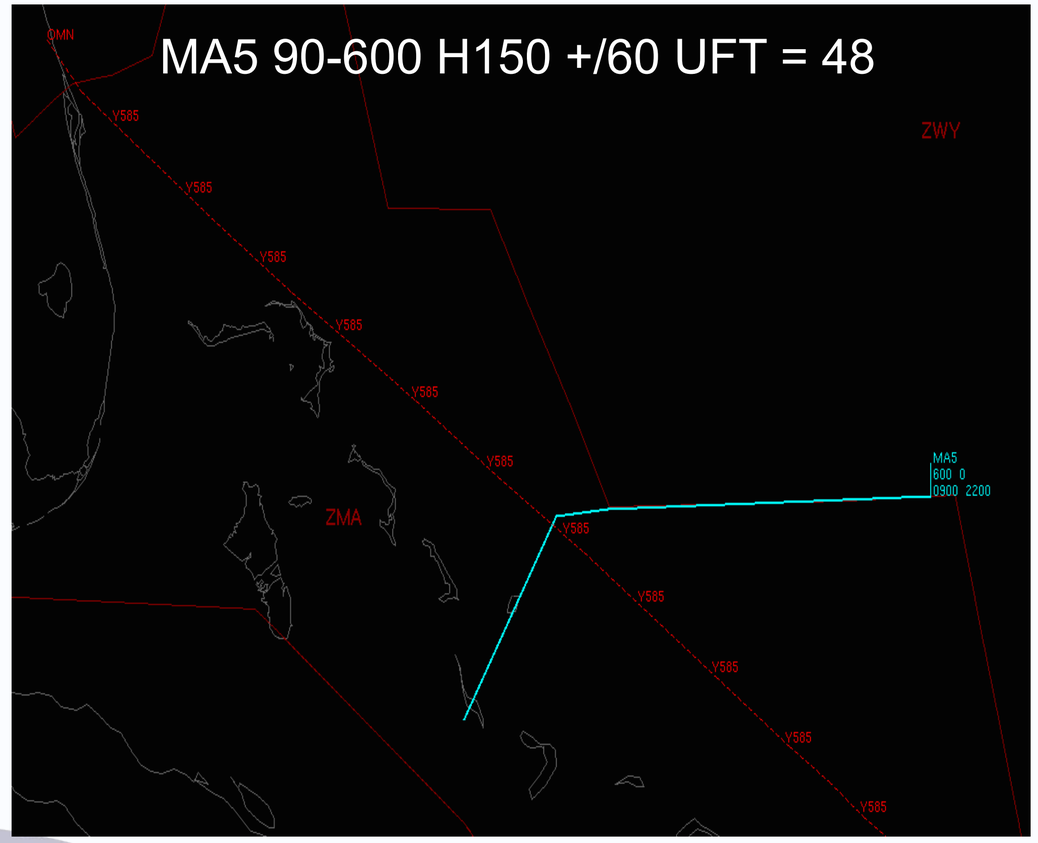
AFP Guidebook/Best Practices
Southeast AFP Strategy

ATOSysOps

SE AFP Selection Strategies

MA5:

- ✓ Used primarily to manage volume issues through ZMA58 associated with Caribbean Traffic during the Snowbird/Holiday season.
- ✓ The northbound volume identified in MA6 is a consideration when determining MA5 throughput rates.
- ✓ Caution on too much delay or extended end time, volume will push into the northbound demand MA6.
- ✓ Sometimes used to manage WX events/TSTMs.
- ✓ Consider running in UDP mode.



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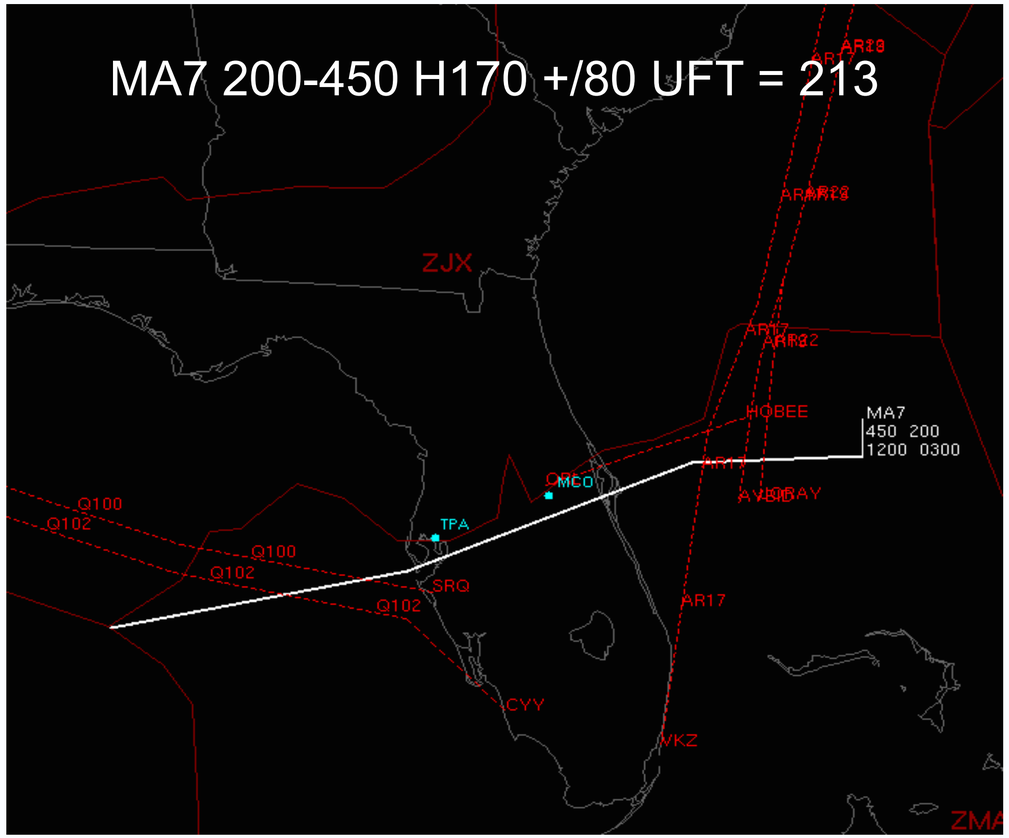
AFP Guidebook/Best Practices
Southeast AFP Strategy

SE AFP Selection Strategies

MA7:

- ✓ Used when convection covers all access into southern FL.
- ✓ Weather can be stationary, stalled front, sea breeze or any combination
- ✓ Consider running in UDP mode.



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AFP Guidebook/Best Practices
Terminal AFPs

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Terminal Dual AFPs

Seasonal volume increases or other variables such as runway construction can create challenges for managing delay distribution. This is especially true at airports that have significant variations in unscheduled traffic.

Dual AFP strategies have been successfully deployed for Providenciales International Airport (MBPV) due to seasonal volume and at DAL due to runway construction. Dual AFPs may be expanded to other airports with scheduled/unscheduled variations.

Historical data analysis on the percentage of user class usage is used to determine AFP rate distribution for Dual AFPs.

Example: Data calculation used to determine dual AFPS for DAL
This calculation applies to any airport considered for dual AFPs

Month	Mar '22
Sched	5,514
UnSched	4,354
Total	9,868
Sched %	56%
UnSched %	44%

Scheduled vs. Unscheduled percentages x modeled AAR = Scheduled vs Unscheduled Rates

The baseline capacity allocation for the entire month is, AAR: 24, Scheduled – 13, Unscheduled – 11.

Further analyzing by day of week, the split is slightly different on Mondays and Tuesdays that the other days of the week.

Weekday	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Sched	184	169	187	184	187	181	149
Unsched	145	119	135	154	153	146	127
Total	329	287	322	338	339	327	276
% Sched	56%	59%	58%	54%	55%	55%	54%
% Unsched	44%	41%	42%	46%	45%	45%	46%
AAR	24	24	24	24	24	24	24
Sched Rate	13	14	14	13	13	13	13
Unsched Rate	11	10	10	11	11	11	11

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AFP Guidebook/Best Practices
Ground Stop AFPs

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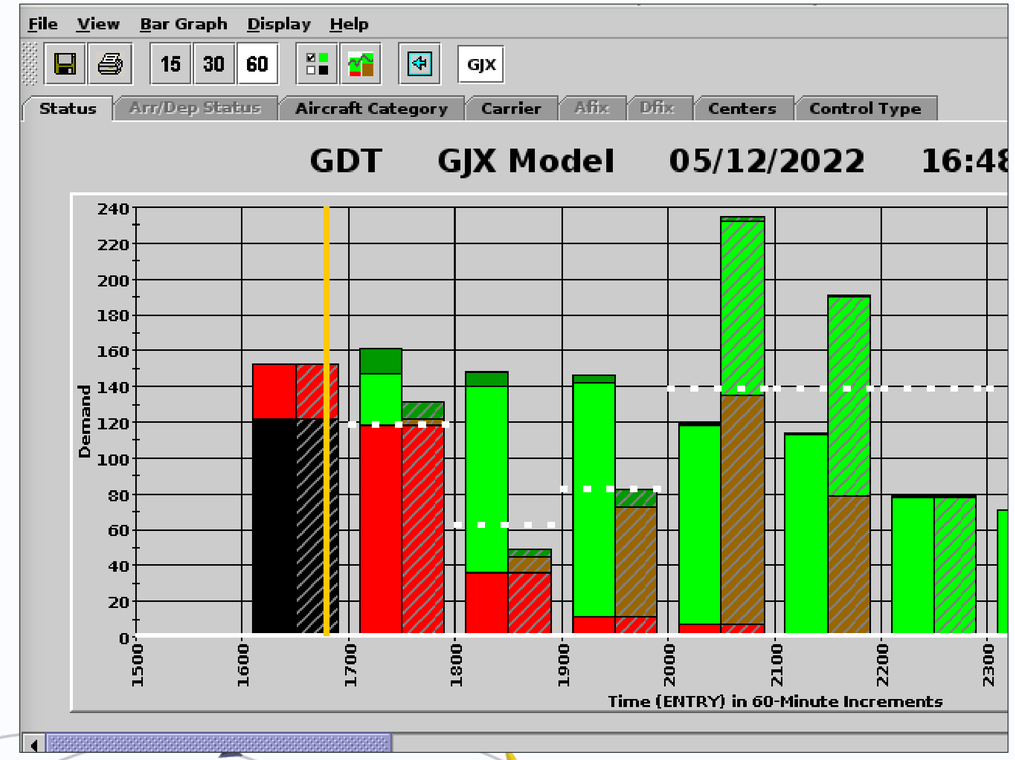
Ground Stop AFP



A Ground Stop AFP is used when an unexpected loss of capacity occurs and there is too much demand already airborne to maintain the integrity of the airspace. This technique is normally preferred when an AFP is already in place; however, it can be employed from scratch.

When this occurs, the current airborne demand is used as the AFP rate in the first hour, with a step down to the new capacity rate. When the unforeseen event is forecasted to improve, a step up rate will be used and the program will be issued/revised from “Status”. This essentially “ground stops” all non-airborne traffic.

The benefit to this strategy is that EDCTs are issued informing Aircraft Operators when to expect to depart in lieu of the uncertainty of a Ground Stop where aircraft operators have no visibility into when they will be released.

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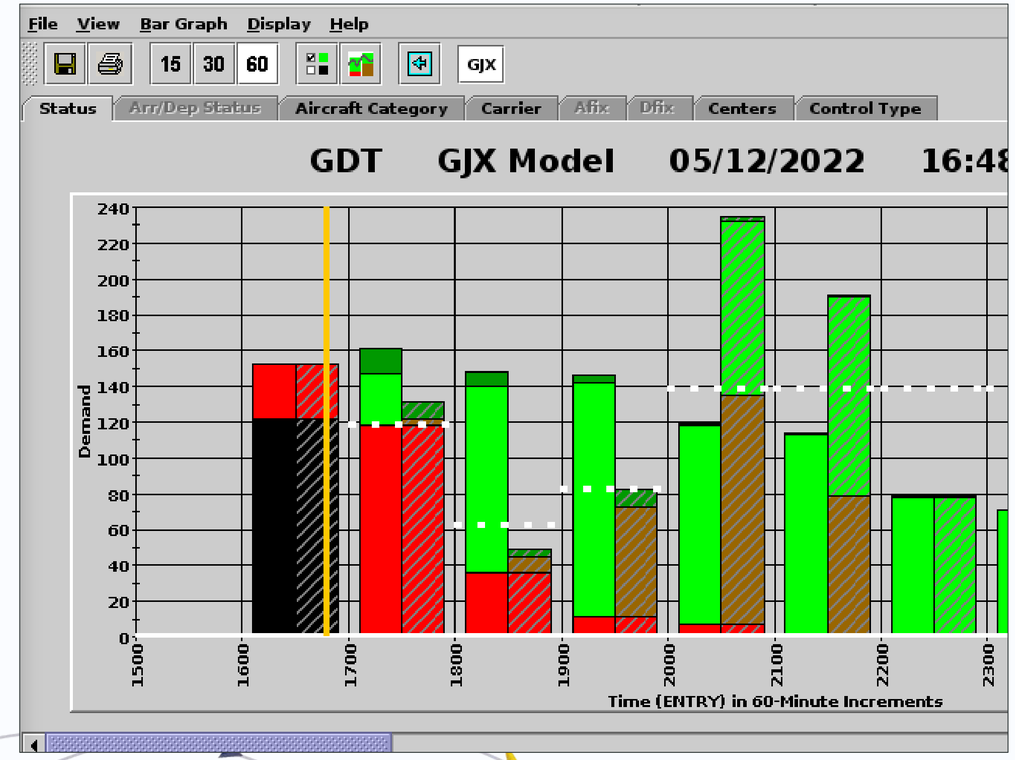
Ground Stop AFPs – Cont'd



Exit Strategy

1. Allow the Ground Stop AFP to end or cancel early based on the life cycle of the event.

2. Extend the Ground Stop AFP for short term issues.

Naming Convention

The first letter of the FCA should always be **G** for Ground stop.

The second two letters will represent the center that is impacted and requiring the Ground Stop.

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AFP Guidebook/Best Practices
Ad Hoc AFPs

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Ad Hoc AFPs

Ad Hoc AFPs have been used successfully to manage unforeseen or short term events where there are no existing AFP configurations that would be appropriate such as:

- ✓ Staffing issues result in reduced throughput.
  - ➢ Example: A80 AFP due to staffing.
- ✓ Weather or volume constraints in unique locations.
  - ➢ Example: ZAB requests an AFP due to a line of convective weather from the ZAB/ZDV boundary north.
- ✓ Create an FSM eligible FCA for the airspace being evaluated for an AFP. Apply all necessary parameters/filters.
- ✓ If time permits, use AJR-G to provide a UFT reference point to determine FCA throughput rate.

A critical component in determining how to manage an ad hoc flow constrained event is knowing the UFT for the airspace volume. As previously discussed, it takes approximately 4 hours for AJR_G to determine a UFT for a section of airspace.

Note: The difficult part of an Ad Hoc AFP is determining the Maximum Throughput Rate. Typically, when an Ad Hoc AFP is needed there isn't time for AJR-G to determine the historical throughput of the FCA.

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Ad Hoc AFPs Methodology

Since the objective is to reduce traffic currently scheduled through the FCA, there is a formula that has been proven to be successful to achieve the Maximum Throughput Rate and develop the AFP rate.

- ✓ View the FCA FSM Bar Graph in 30 minute buckets.
- ✓ Add the highest 4 30 minute buckets then divide by 2. This is the current Maximum Hourly Throughput rate.
- ✓ Evaluate the constraint to determine the reduction percentage in capacity or maximum capacity, if a volume event.
  - ➢ Is the FCA being evaluated already compromised with airborne holding, ground stops, departure delays etc.?
- ✓ Reduce the Maximum Hourly Throughput rate by the percentage that will address the constraint.
- ✓ That will be the AFP rate.
- ✓ Model, collaborate and if needed issue AFP.

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Special Event AFPs

Special Event AFPs have been used successfully to manage short term seasonal and/or tactical events such as:

- ✓Sector complexity issues in TRACON airspace.
  - ➢ Example: N92/N93 AFPs – Used when EWR is on a 4/11 configuration and the overflow runway arrivals conflict with N90 satellite traffic.
- ✓Sporting or seasonal events.
  - ➢ Example: Ski Country Season, Super bowl, F1 races etc.

Note: N92/N93 and Ski Country AFPs have established, pre-coordinated FCAs and AFP rates derived from historical evaluation and uses. Pre-coordinated Special Events like the Super Bowls or F1 races normally have detailed FCA and rate information that has been collaboratively designed and coordinated.

AFP Guidebook
ICRs

Integrated Collaborative Reroutes (ICRs)

ICRs are useful tools to manage a constraint by providing suggested routings without issuing required reroutes and/or requiring an AFP.

- ✓ ICRs are an effective alternative and option to RQD reroutes/AFPs and are generally used in the Midwest portion of the US where AFPs are not typically used.
- ✓ ICRs identify a constraint but allow operators to avoid the constraint by filing User Preferred Trajectories (UPTs) around the constraint.
- ✓ If operators do not file out of the ICR, the FCA is amended to required (RQD) to ensure the area is avoided.

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AFP Guidebook
ICRs

ATOSysOps

Integrated Collaborative Reroutes (ICRs) – Cont'd

ICRs are popular with Aircraft Operators due to the flexibility they offer.

- ✓ Customers can choose to file around FCA according to their own business model.

ICRs require continuous monitoring of the FCA to ensure enough traffic is routing out of the constrained airspace.

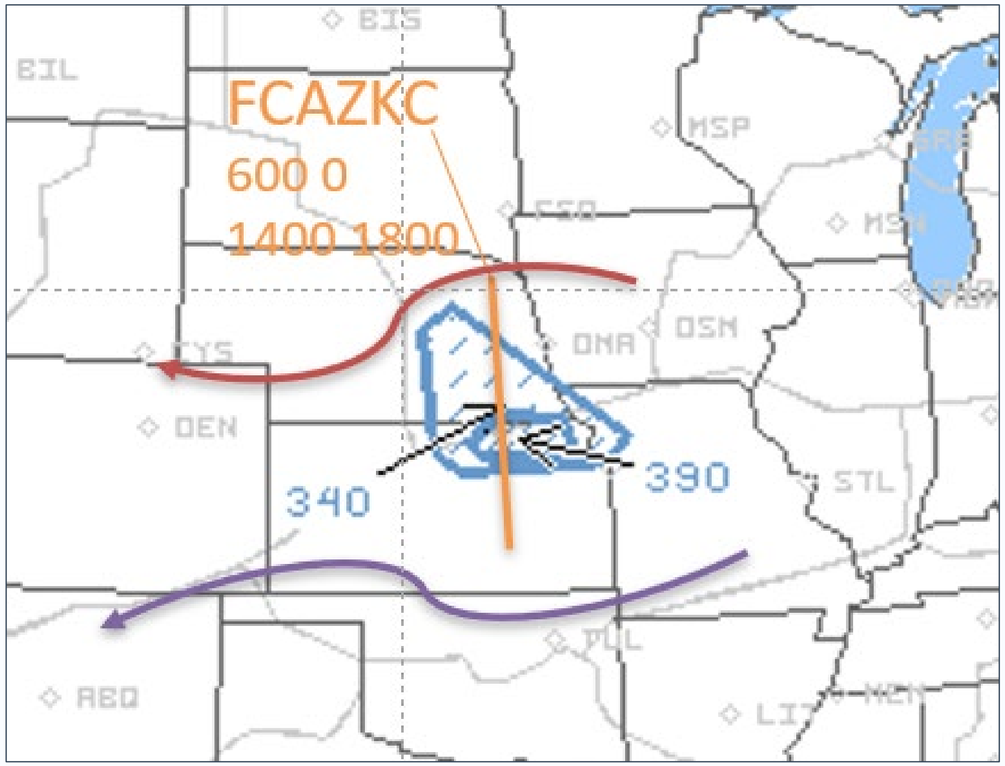
The areas/sectors adjacent to the ICR need to be closely monitored for potential volume issues created by the ICR.

When other convective weather is present in the NAS, ICRs may not be the best option.

ICRs work best for East to West traffic when overnight convection persists into morning but dissipates by 1800z.

Bi-directional ICRs have not been successful in the past.

ICR Example



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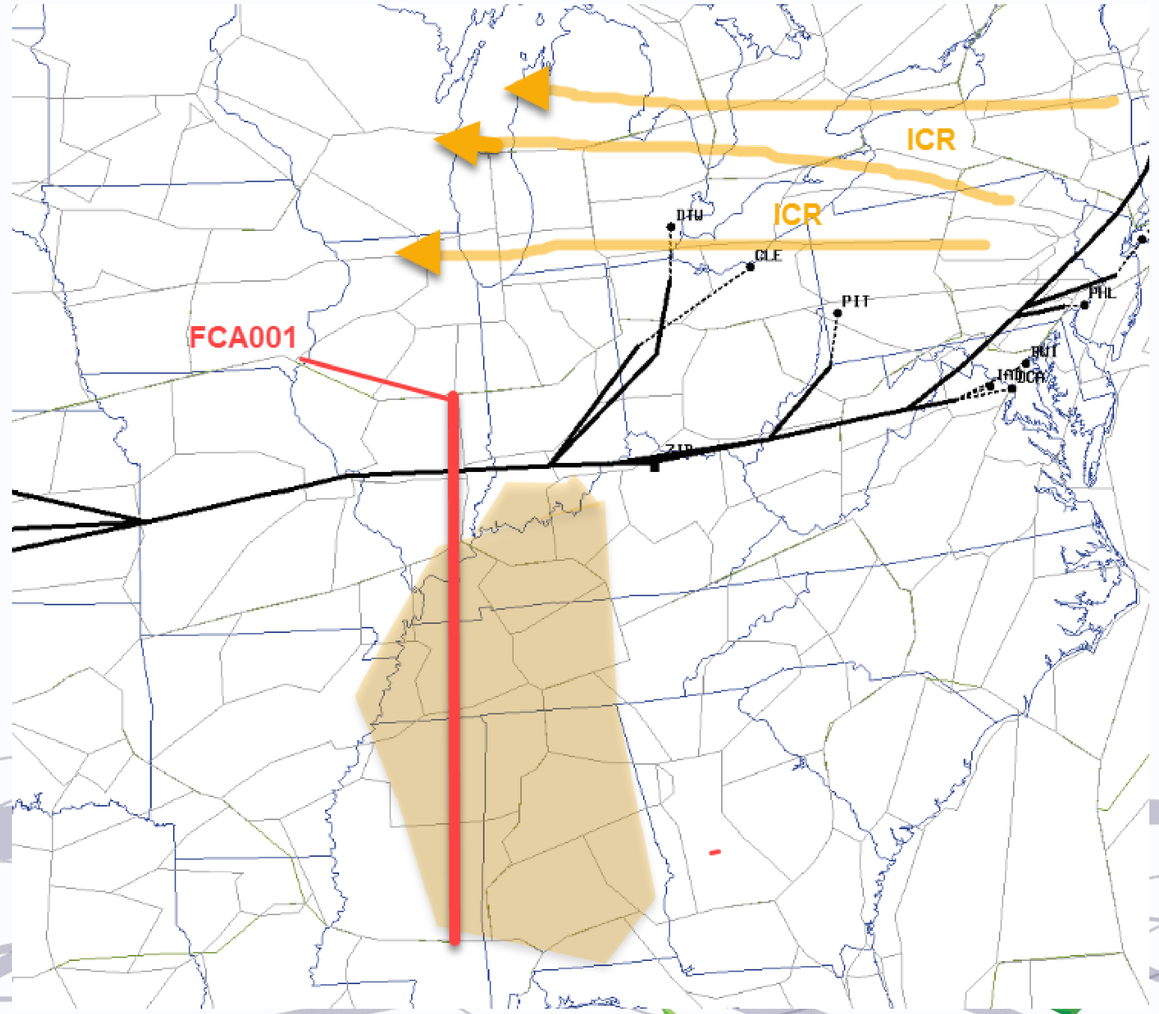
Integrated Collaborative Reroutes (ICRs) Strategies



HYBRID ICR using FCA route:

- ✓ If filed through the FCA or the customer did not take action on a currently filed flight plan, the red line (FCA) will identify the flight and required an amendment to the black route.
- ✓ However, if customer filed UPT (ICR) north or south around the FCA without restriction then no action would be taken against the flight and it would fly it's filed route.

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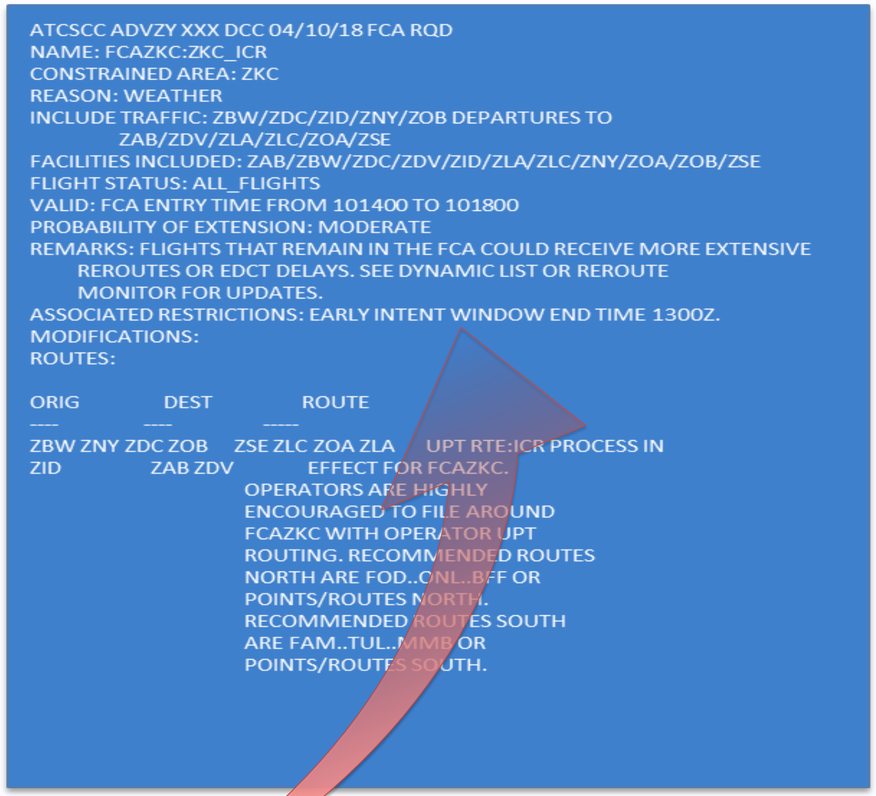
Integrated Collaborative Reroutes (ICRs) – Cont'd

ICRs can be issued as an FEA-based (FYI) route or FCA-based (RQD) route.

- ✓ When an FCA-Based UPT Route is created offering route guidance to avoid the FCA, the remarks section RQD route stresses that these route options are recommended for weather avoidance.
- ✓ When this type of ICR is used, the use of an Early Intent (EI) Window is important to allow alternative TMIs to be issued if there is not enough FCA route out participation. Flights that remain in the FCA can expect possible required route structure.



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AFP Guidebook
ICRs

Integrated Collaborative Reroutes (ICRs) Strategies

When drawing the FCA, conclude each end of the FCA at ARTCC Sector boundaries outside of the constraint if possible.

Publish route recommendations in the adjacent Sectors.

- ✓ This reroutes the traffic outside of the Sectors that are encountering the deviations.
- ✓ The Sectors working traffic at the edges of the WX have the additional complexity of WX deviations.
- ✓ This will also keep flights that don't follow the recommended reroute but file just around the outside edge of the FCA clear of the impacted Sector.

Past experience has shown J60 is a key when considering an ICR for NE departures due to the typical overnight WX in the ZKC area.

- ✓ If J60 is North of the FCA, ZNY departures to the SW will typically file J60 or North remaining North of the ICR.
- ✓ ZBW departures to the SW will typically stay just North of the NY departures.

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Integrated Collaborative Reroutes (ICRs) Strategies

- ✓ If J60 is included in the FCA, most departures from ZNY and ZDC to the SW will file South of the FCA.
  - ➢ This often leads to significant volume/complexity issues in Southern ZKC.
  - ➢ A mitigation solution could be a low impact structured route further South through southern ZKC or Northern ZFW for ZDC departures in combination with the ICR. This strategy has proven to be successful in the past.

Due to the time constraints often experienced when considering an ICR, don't wait for a planning telcon to relay the information about the initiative being considered.

Contact the major carriers transitioning the impacted airspace to explain the ICR being considered.

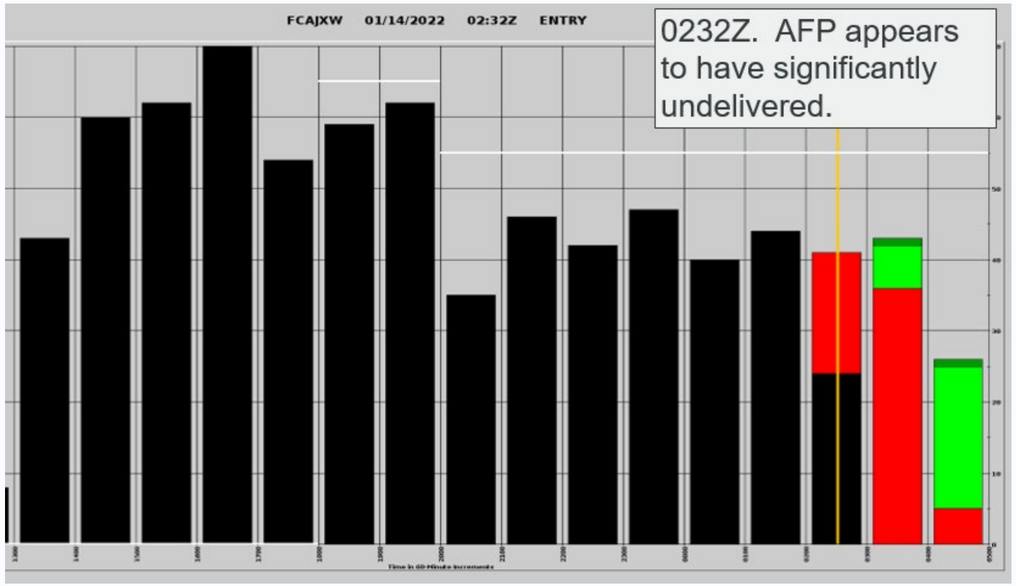
- ✓ Brief the airlines on the details of the initiative.
- ✓ Stress to them the importance of moving enough flights during the EI window to avoid the structured routes that will follow if there isn't enough compliance.

Federal Aviation Administration

AFP Guidebook
AFP drop out issue

An issue has been identified for AFPs that have a base/floor altitude. **If an Enroute Controller inputs an assigned, "hard", altitude into the aircrafts data block that is below the base/floor of an AFP, the flight delay will drop out of the AFP.** The TFMS algorithm associated with flight trajectory modeling for flights transitioning across FCA's do not account for an aircraft's descent profile, but instead treats it like an elevator, going from the assigned altitude straight down to the assigned lower assigned altitude.

The AFP dropout issue may give the appearance that an AFP is under delivering. Communication with affected facilities and stakeholders are recommended to create common situational awareness of sector capacity issues prior to revising an AFP. **Note***:* A workaround exists to determine accurate AFP throughput: Copy the FCA coordinates and parameters, then create an FEA to monitor AFP performance. FEAs do not have the drop out issue.



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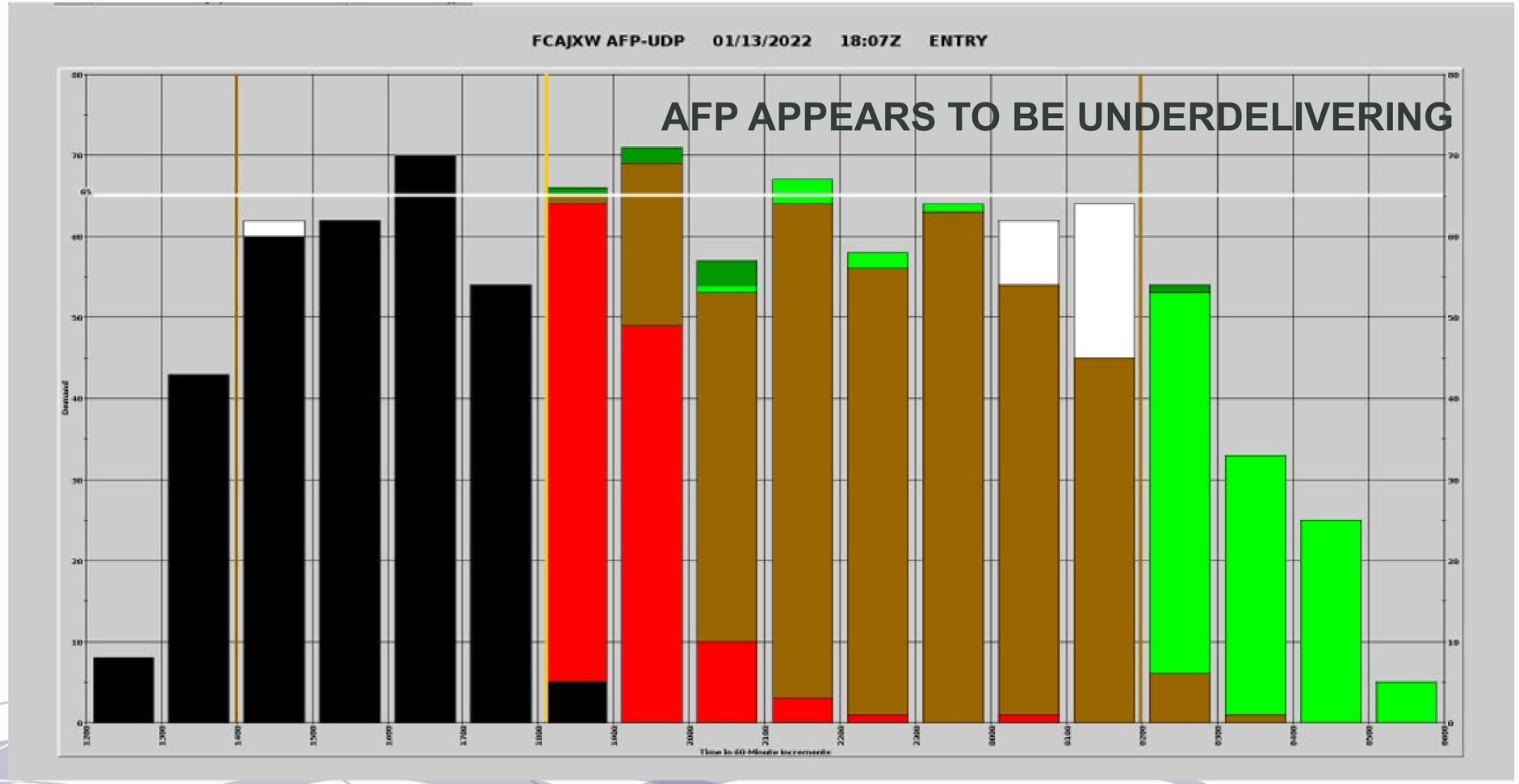
AFP Guidebook
AFP drop out issue

On 01/13/22 JXW AFP
was implemented.
The 1247Z ADL shows delivery at the AFP modeled throughput rate.

AFP Guidebook
AFP drop out issue



1807Z ADL indicates program under delivery. If only the chart were used for evaluation, one would be inclined to revise the AFP to fill in the gaps and shorten the AFP duration.

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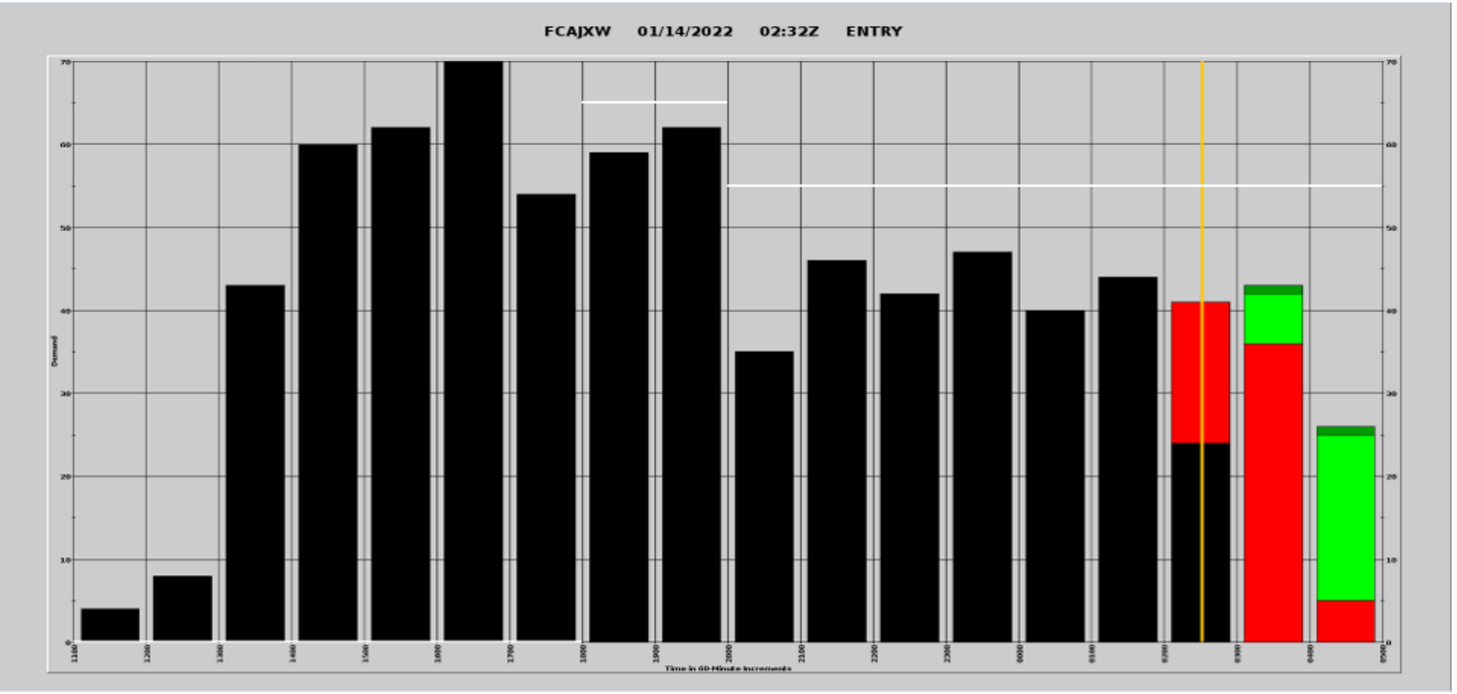
AFP Guidebook
AFP drop out issue



HOUR UTC	ACTUAL DEMAND THAT TRANSITIONED THRU JXW	FSM
14	73	60
15	73	62
16	92	70
17	85	54
18	82	50
19	86	62
20	61	35
21	69	46
22	68	42
23	73	47
0	60	40
1	53	44
2	54	41
TOTALS	929	653

0232Z. Although the AFP appears to have significantly undelivered, 929 aircraft actually crossed the FCA. However, the FSM only recorded 653

Federal Aviation Administration

AFP Guidebook Conclusion

AFPs have been a cornerstone of the Focus Five Initiative for 2022. This Guidebook was developed in an effort to improve collaboration, coordination and expectations when an AFP is being considered and implemented.

AFP utilization, implementation strategies are constantly evolving, while more experience and insight is gained by utilizing or incorporating the PERTI process. Additional strategies have been conceptualized and are currently under development.

This Guidebook is a living document that will be updated annually to correspond with National SVRWX refresher training leading into SVRWX season.