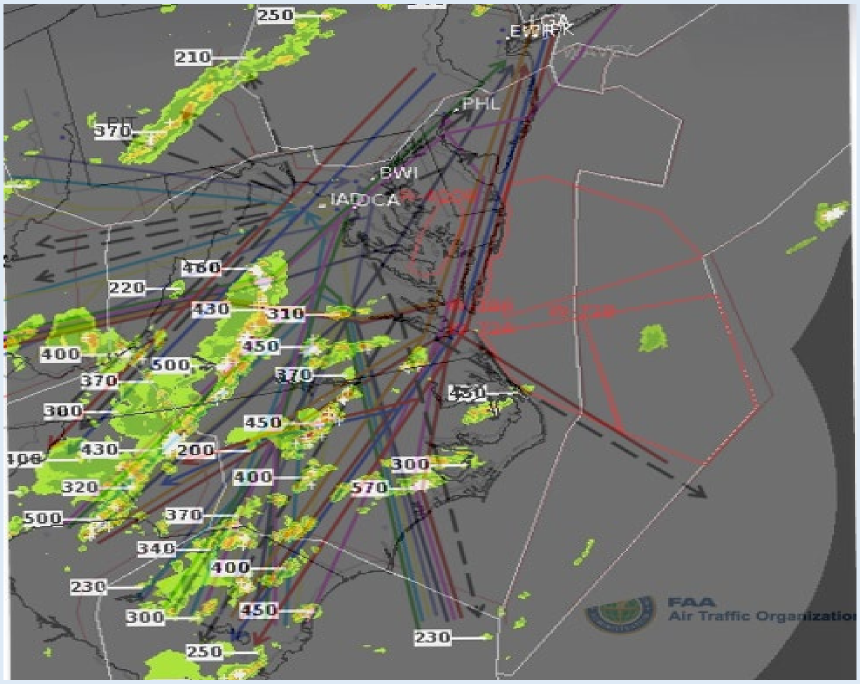
NE AFP Strategy of Use Plan

Background:

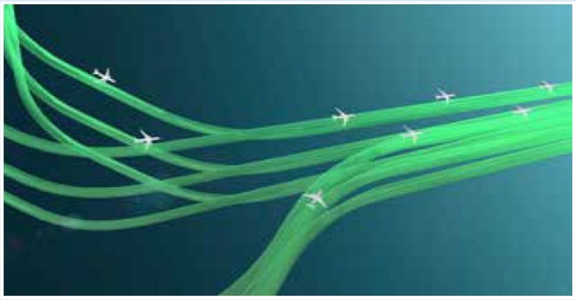
Significant convective weather events in the National Airspace System (NAS) create challenges for the movement of aircraft through enroute airspace and in/out of major airports. There is valuable information available from analyzing similar historical weather events and recognizing that there will be variations in the execution of a chosen strategy. Each day of operation (DoO) will benefit from historical knowledge from past NAS management strategies, similar forecast information, and NAS performance outcomes to collaboratively develop a strategy and mix of Traffic Management Initiatives (TMIs) and address expected NAS impacts.



Objective:

The intent of this document is to improve transparency for all NAS users and FAA Facilities by documenting common weather scenarios, historical strategies, and supporting TMIs when Airspace Flow Programs (AFPs) are used to manage NAS convective weather constraints in the Northeast region.

AFP Strategy of Use:



The goal of the Air Traffic Control System Command Center (ATCSCC) during Northeast SWAP events is to proactively manage the NAS without over control. AFPs should be considered in conjunction with multiple TMIs when developing a Day of Operations (DoO) plan to maximize throughput, balance capacity with demand and ensure a safe enroute environment. AFPs are one of the most impactful TMIs and are rarely used in isolation in the northeast. When other less impactful TMIs, i.e. structured routes, MIT, escape routes, capping/tunneling, variable rate GDPs, Ground Stops etc. are not enough to manage the convective event, the AFP can be an effective way to further reduce peak demand.

The following TMIs are often used in conjunction with AFPs:

- **GDP**
  - Ground Delay Programs (GDPs) are used when weather is forecasted to impact the airport or a significant portion of routes getting to/from the airport. When used in conjunction with AFPs, GDPs take priority in assigning delay to flights. Therefore, when a flight is captured by both a GDP and AFP, the GDP will assign delay to the flight. GDPs and AFPs are used in conjunction with each other due to the limitation of the automation that does not allow the AFP to discriminate between flights based on destination. This means that the automation does not recognize airport arrival rates. In this respect, it is more advantageous to run GDPs to the major airports whose arrival demand is affected by the AFP to allow for the most efficient arrival flow to those airports. In many instances, GDPs have spread out the demand on the constrained airspace enough that AFPs are not needed.

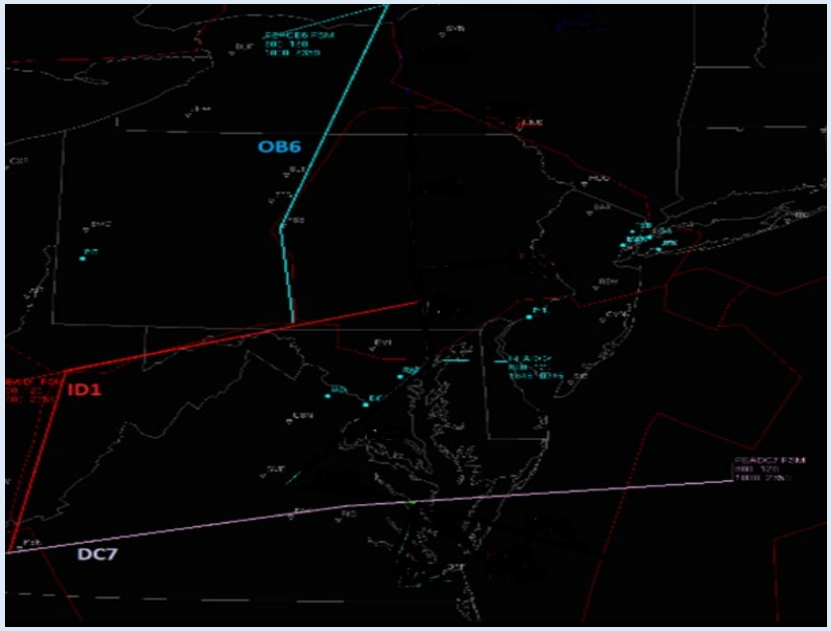
    Note: When GDP and AFP are applied concurrently, with common flights, for constraint management, the flights controlled by the GDP are also uncontrolled demand in the AFP. The GDP will be considered demand in the SLOT allocation of the AFP reducing the number of assignable SLOTs in the AFP. Typically the AFP average delay will increase due to the reduced number of assignable program SLOTs. Equalizing delay between GDP and AFP measuring the average delay is not advisable, as it will introduce unnecessary extra delay. Each program (GDP and AFP) should be managed based on the constraint capacity, not on equalized delay between programs.
- **Ground Stops**
  - Ground Stops (GS) are used when an airport is no longer able to accept arrival traffic due to a constraint at the airport or when the airborne arrival demand for the airport greatly exceeds the airport arrival rate. Ground stops are issued at the time of the constraint and are rarely, if ever, issued for a start time in the future. When a ground stop is issued for an airport that is not controlled by an AFP, those flights are now controlled by the ground stop and not the AFP. If AFPs are implemented in DAS mode, the termination of the GS will cause all GS captured flights to become 're-controlled' flights as they are placed back into the AFPs and they will receive delay according to their new departure time.

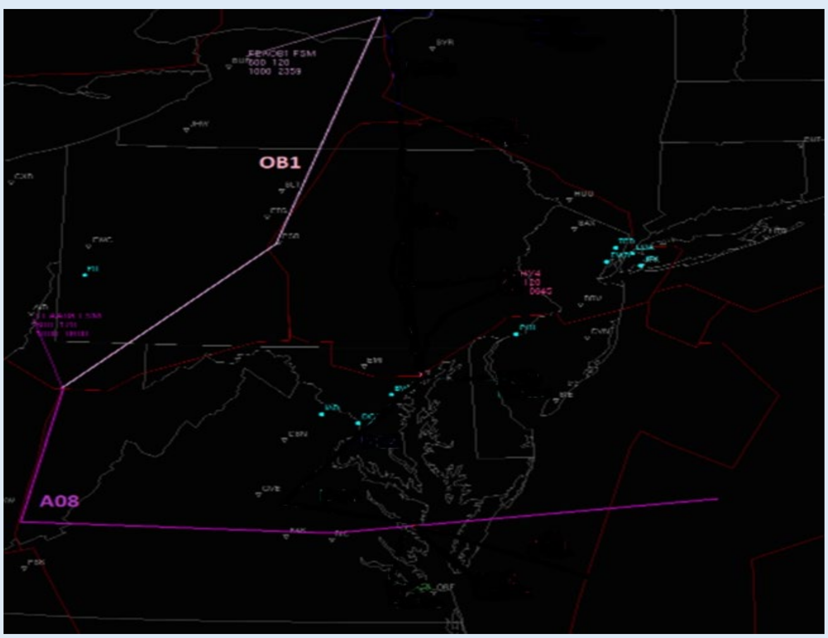
- **Reroutes**
    - Route-outs
        - Route-outs are routes used by the ATCSCC to allow for flights that wish to route around an FCA (AFP), to be able to do so. These routes are typically longer routes to fly, however, allow operators to escape the delay associated with the AFP. Given the longer distance to fly, ATCSCC assigns these routes to be either 'recommended' or FCA-based to allow individual operators to make a business model-based decision on whether they would like to take the longer route to their destination and escape the delay getting airborne or whether they would prefer to take the AFP delay at their origin airport in order to be able to fly a more direct route. A common route-out option on the east coast is the AZEZU route via New York Oceanic airspace.
    - Low level escape routes
        - Low level escape routes are routes that are used to depart an airport and remain at a low altitude, typically in approach control airspace. Using these routes can create bandwidth in the higher altitudes for other flights to be able to deviate around weather or to reduce volume constraints.
    - CAN routes
        - Eastbound CAN routes are a common route-out option for flights coming into the northeast (N90 and ZBW arrivals) from points west and northwest which may be captured by an AFP. These routes utilize Canadian airspace; after receiving NavCanada's approval, ATCSCC publishes these routes to maintain arrival capacity and improve departure throughput by reducing the volume of traffic through ZOB. These routes must be published early enough (5-6 hours prior to forecast impact) to capture departures from the west coast airports that will be impacted by the constraint in the northeast.
        - Westbound CAN routes relieve surface congestion and add departure capacity out of the northeast similar to the low level escape routes. The west CAN routes reduce sector volume and capacity and increase flexibility for flights to deviate within ZNY and ZOB. These routes add extra miles and can tax the ability for smaller airframes to carry enough fuel to fly them.
- **Capping**
    - Capping departures is another method to remove volume from the high altitude sectors, reduce complexity, and utilize airspace within the low altitude sectors that normally may be under-utilized. This creates more space in the high altitude sectors to be used for flights captured by AFPs. Capping can increase total airspace throughput because both overflights and departures may flow simultaneously in lieu of stopping departures to favor the overflight traffic.
- **Tunneling**
    - Tunneling arrivals destined for closer-in airports reduces sector complexity and removes the arrivals from the volume and weather constrained high altitude sectors. For instance, ZDC will often put a restriction on ZJX to have the flights landing IAD, DCA, and BWI enter ZDC airspace at or below FL230. This puts these flights into the low altitude sectors, taking advantage of under-utilized airspace. Tunneling increases high altitude sector capacity that can reduce enroute delay and sometimes preclude the need for an AFP altogether.

Standard AFPs for NE Operations:

Several standardized AFPs were designed for the most often encountered NE Severe Weather events. The standardized NE AFPs include:

- **FEAOB6**
- **FEAID1**
- **FEADC7**





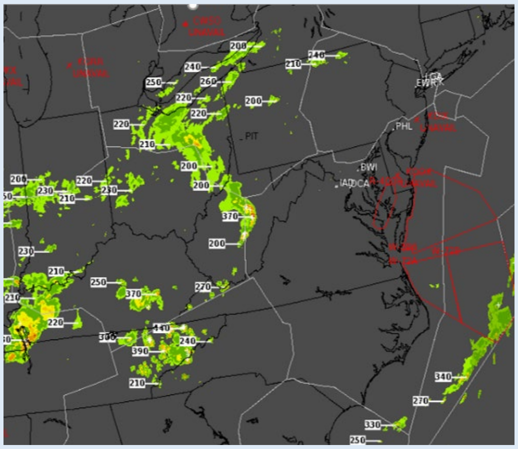
- **FEAOB1**
- **FEAA08**

When to Consider an AFP Strategy:

When extremely severe weather systems threaten the northeast, AFPs are an effective tool for maximizing some level of throughput in airspace that otherwise might be closed. AFPs by their very design are among the most impactful Traffic Management Initiatives (TMIs) that the ATCSCC has to mitigate the effects of the severe storms when lesser TMIs will not suffice. Location of actual or forecasted thunderstorm activity, type of activity (air mass, line or clusters), speed of growth, timing of event and whether to favor arrivals or departures all play into the decision making process when considering an AFP strategy.

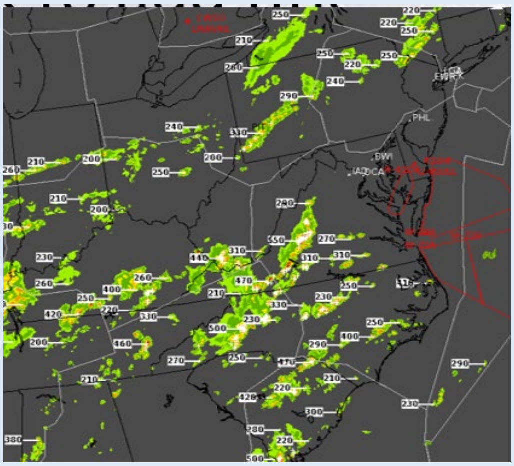
- **Generally, AFPs will be considered for three types of NE Severe Weather Events:**

  1. *Significant Severe Weather is forecast or present mostly in Cleveland Center (ZOB) and Washington Center (ZDC) must absorb rerouted ZOB demand*
     a. Expect a strategy to maximize use of the remaining ZOB capacity as possible with the overflow being routed through ZDC. If the weather is rapidly changing, such as with an air mass storm system, the AFP rate may be lower as structured routes are of little help. If structured routes are deemed appropriate, the AFP rates will generally be higher. If ZDC is relatively open, structured routes including CAN routes will likely be used to reduce sector complexity and increase throughput. FAA facilities and flight operators should be prepared to discuss these options early with implementation usually occurring 5 hours before the first weather impact.



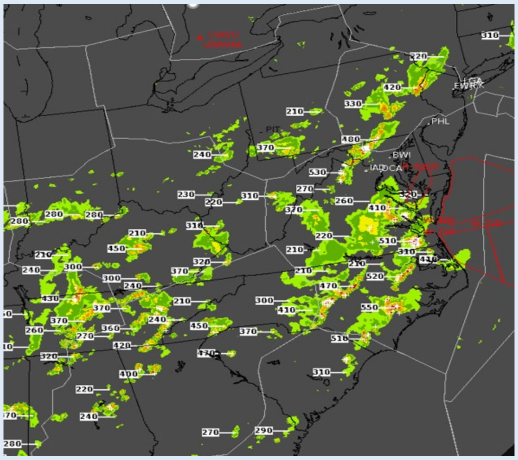
        i. When the majority of weather is in ZOB and it will not reach the eastern PA/New York Terminal areas by early evening, commonly used strategies include the following AFPS:
           1. FCAOB1/FCAA08
           2. FCAOB6/FCAID1/FCADC7
           3. FCABW1
        ii. When the majority of the weather is in ZOB and it will reach eastern PA or the New York terminals by late morning/early afternoon, commonly used strategies include:
           1. Ground Stops/GDPs for EWR/JFK/LGA/PHL
           2. Strategically timed reroutes, including CAN routes

2. *Significant Severe Weather is forecast or present mostly in Washington Center (ZDC) and Cleveland Center (ZOB) must absorb rerouted ZOB demand.*



    a. Expect a strategy to maximize use of the remaining ZDC capacity as possible with the overflow being routed through ZOB. If the weather is rapidly changing, such as with an air mass storm system, the AFP rate may be lower as structured routes are of little help. If structured routes are deemed appropriate, the AFP rates will generally be higher. If ZOB is relatively open, structured routes including CAN routes will likely be used to reduce sector complexity and increase throughput. FAA facilities and flight operators should be prepared to discuss these options early with implementation usually occurring 5 hours before the first weather impact.
        i. When the majority of weather is in ZDC and it will not reach the ZDC/ZID or northern VA areas by early evening, commonly used strategies include the following AFPS:
            1. FCAOB1/FCAA08
            2. FCAOB6/FCAID1/FCADC7
        ii. When the majority of the weather is in ZOB and it will reach the ZDC/ZID or northern VA areas by late morning/early afternoon, commonly used strategies include:
            1. Ground Stops/GDPs for EWR/JFK/LGA/PHL
            2. Strategically timed reroutes, may include CAN routes

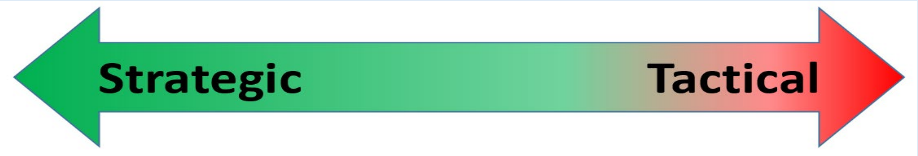
3. *Significant Severe Weather is forecast or present in Cleveland Center (ZOB), Washington Center (ZDC) and New York Center (ZNY) and capacity in all affected Centers is greatly reduced.*



    a. Expect a strategy to significantly reduce all flows of traffic through ZOB, ZDC, and ZNY utilizing GDPs, Ground Stops, AFPs and limited reroutes.
        i. When the majority of weather will not reach the eastern PA and ZDC/ZID or northern VA areas by early evening, commonly used strategies include the following AFPS:
            1. FCAOB1/FCAA08
            2. FCAOB6/FCAID1/FCADC7
        ii. When the majority of the weather will reach the eastern PA and ZDC/ZID or northern VA areas by late morning/early afternoon, commonly used strategies include:
            1. Ground Stops/GDPs for EWR/JFK/LGA/PHL
            2. Strategically timed reroutes, may include CAN routes
            3. AFPs to reduce traffic flow into the northeast corridor

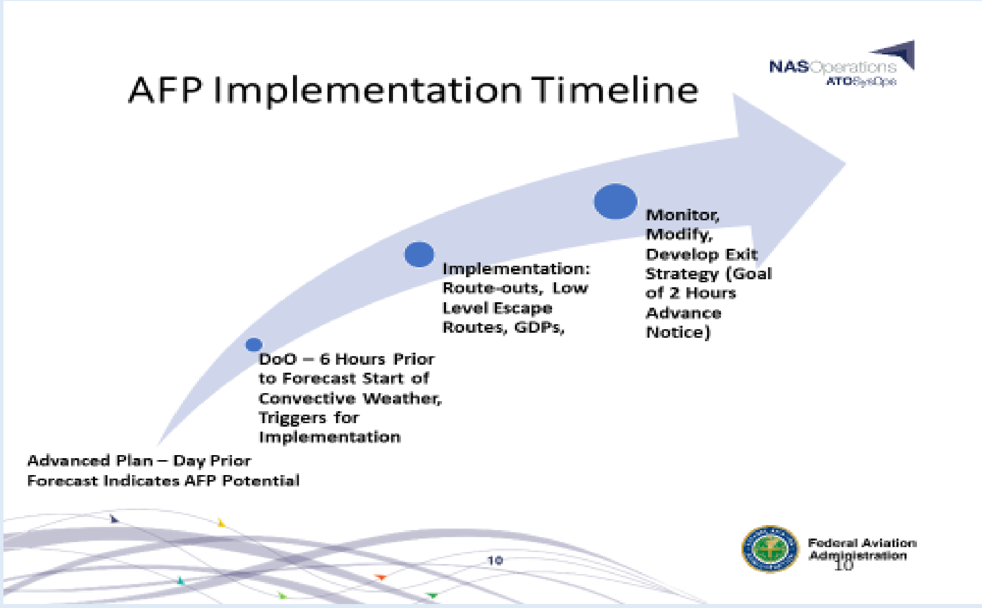
Timing of Northeast AFPs:

Because most severe weather events in the northeast begin in the early to late afternoon, the arrival traffic departing the west coast in the morning (west coast time) must be addressed before 15z or it will be airborne. The Critical Decision Window (CDW) for implementation is five to six hours prior to the forecasted convective weather activity.



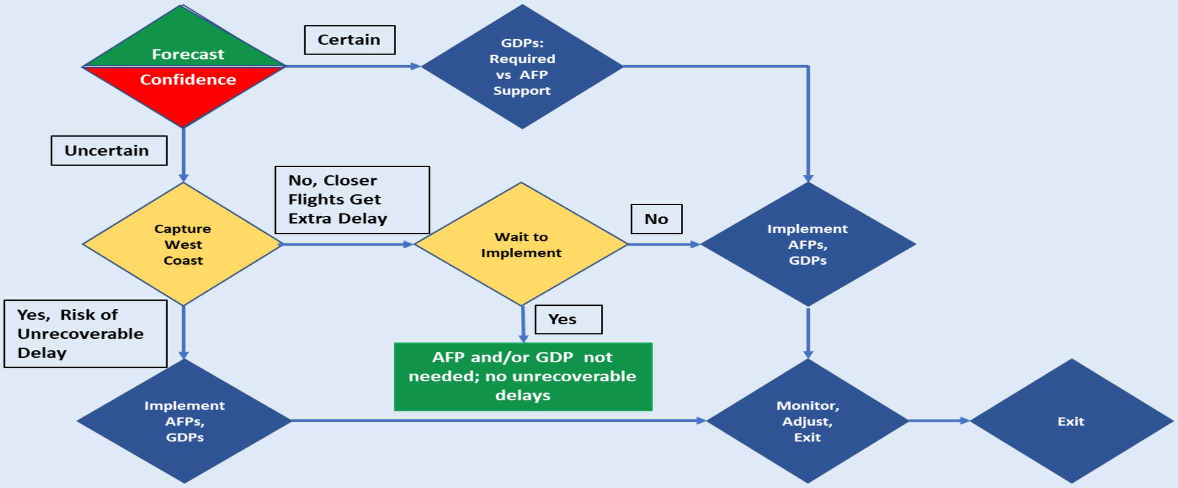
11-12z: Advanced planning from the day before has likely indicated AFPs may be required. The first operations planning webinar will be used to confirm or modify what the advanced plan forecast. Flight operators and FAA facilities should be prepared for an early collaboration that will result in a decision to use/not use AFPs or in the event of a late day convective event, determine triggers and timing for the AFP decision.
13-15z: Unless the AFP decision has been deferred, expect implementation of GDPs (if needed) and AFPs to occur during this time frame.

Note: Timing of the AFPs takes into account the confidence in the forecast for both the start of the convective event and for the time it is forecast to diminish. The AFP and associated GDPs if needed will usually reflect rate decreases and increases based on forecast and forecast confidence in the start, the end, and the geographic location, i.e. near the airports or rolling over the airports of the convective weather. The AFPs and/or GDPs will be monitored and collaborated on during the DoO.



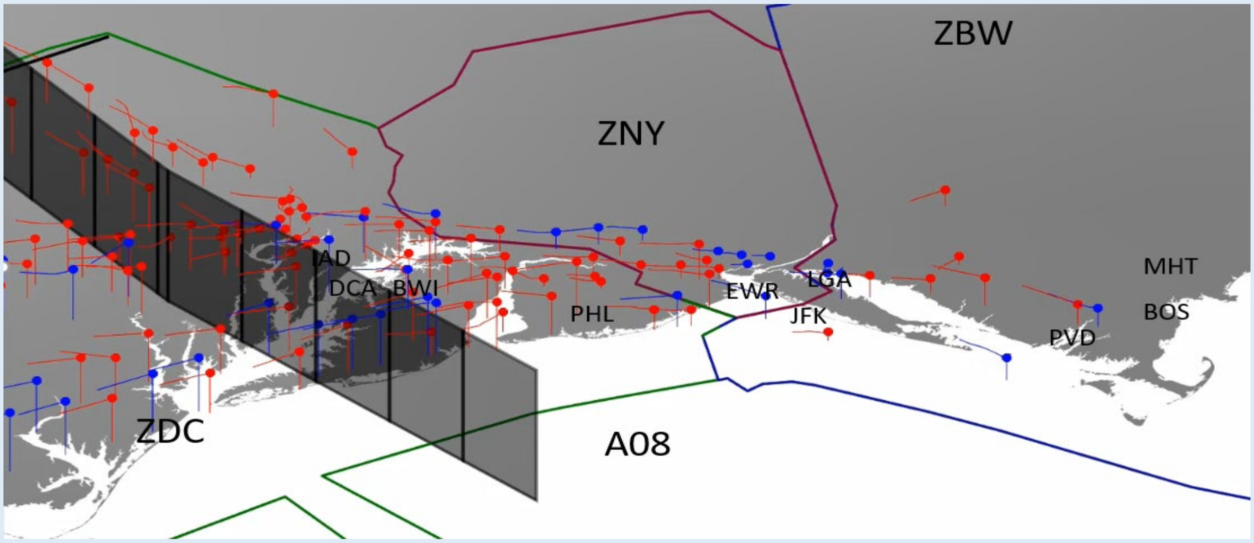
Decision Making Process:

The decision-making process is the same for all three AFP scenarios that follow. From the Advanced Planning webinar through the actual DoO implementation, the following diagram describes the collaborations and actions that follow. Flight operators and FAA facilities are encouraged to participate as much as possible in each stage of planning and operational decision-making.



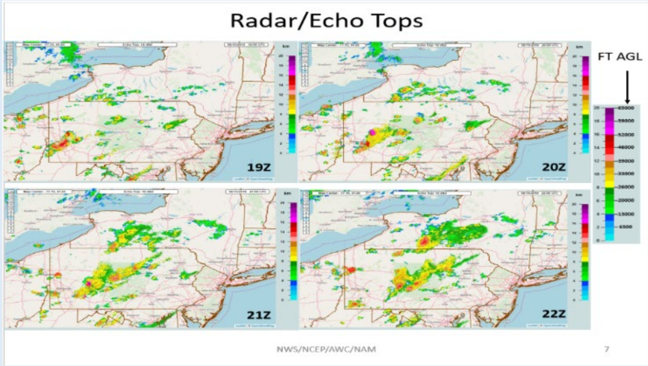
Ceiling and Floor Information:

All AFP ceilings and floors are set at FL600 and 120. Ceilings and floors shall not normally be lowered and/or raised due to the close proximity of the AFPs to the NE regional airports. Sequencing and spacing requirements preclude aircraft from flying over the top of an AFP/constraint and descend into the regional airports. This would impede an efficient operation, magnify complexity and increase holdings and diversions. The airspace AOB230 is generally used for escape routes and capping/tunneling which precludes the floor from being raised. However, Day of operational requests may be made and exemptions given on case by case basis.



General Factors to Consider in Determining Rate Reductions

An Airspace Flow Program is effective in providing safe and efficient structure and control when an area of airspace is constrained by volume or convective weather. Determining the correct capacity and throughput is not an exact science and requires intuitive knowledge of the airspace and the flows of traffic. Determining what the actual (or available) capacity will be based on weather forecasts can be very subjective.



General factors and Considerations when deciding a rate reduction are:

Note: This list is not all inclusive. It is a guide for ATCSCC and facility personnel to consider

- Permeability of thunderstorms
- Location, type and speed of thunderstorms activity (air mass, line, clusters)
- Other WX impacts in the region (turbulence, airport impacts etc.)
- Are thunderstorms going to impact high density airways?
- Airspace usage (managing flights that are primarily in enroute vs. arrival/departure airspace)
- Favoring arrivals or departures?
  - If favoring departures than reduce AFP rate
- Primary FCA (to manage weather impact) vs. secondary FCA (to manage volume due to reroutes)
- Other TMIs used in conjunction to AFPs

FEA/FCA Data and AFP Rates:

The Unconstrained FCA Throughput (UFT) values were developed from an analysis of peak traffic levels actually worked by the northeast facilities that measured peak quarter hours and peak three hour periods. These peak traffic statistics were shared in support of a collaboration between the ATCSCC and the facilities to identify the highest sustainable level of traffic. They are captured in an ATCSCC Severe Weather operational directive. The UFT is the starting point for every day of operations with few exceptions. From the Advanced Plan issued the day prior to the first Operations Plan and bi-hourly on the Planning Webinars, the constraints listed above will be the collaborated basis for determining the rate reduction from the UFT, the step-downs, step-ups and the variations caused by the constraints throughout the day. It should be clearly understood that AFPs in the northeast are a TMI to keep traffic organized and maximized during the worst of convective weather days. As the severe weather develops and reaches its peak impact, it is not unusual to implement step-downs to 25-50% during those critical hours. The trade-off for reduced flexibility for flight operators is higher predictability and reduced complexity for air traffic controllers that results in maximized throughput during northeast severe weather events.

Appendix A
FEA/FCA Data and Analysis:

Collaboration with the Northeast DDSO office and the field facilities, management and NATCA led to an agreement to use the existing filters and hourly data counts as those parameters most closely represent the actual traffic worked by the facilities during sustained peak periods.

The AJR-G analysis used Pre-COVID PDARs data (01/2017 – 01/2020) to measure and analyze actual traffic transiting through each FCA to determine actual throughput during clear weather days. Calculations included:

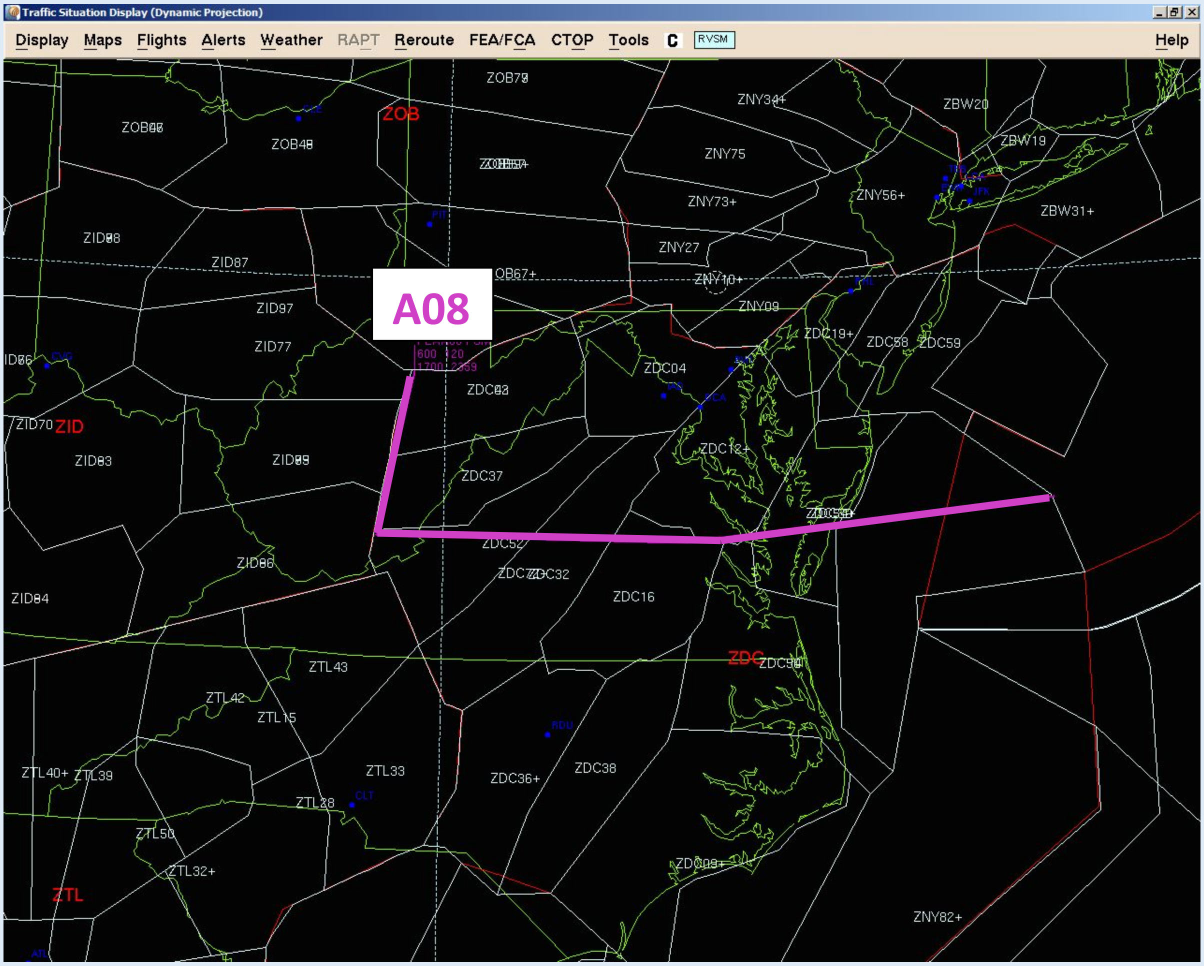
- Measure traffic across the FEA for 2017 through Jan 31, 2020 (Pre-COVID)
- Calculate the average of the top 14 daily values using peak *hourly* periods ***with*** current FEA filters

Below is a small portion of the dataset for the A08 FCA (AFP) with some of the top 14 hours in yellow highlight:

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
5/27/2019	142	126	118	128	126	127	143	132
6/3/2019	141	131	107	129	111	104	122	131
6/10/2019	119	122	125	147	124	110	117	130
6/17/2019	124	100	111	104	129	112	128	127
6/24/2019	117	120	143	123	124	97	122	128
7/1/2019	120	126	112	97	116	117	101	126
7/8/2019	104	118	115	114	123	109	127	125
7/15/2019	117	120	125	114	120	112	110	125
7/22/2019	113	105	127	121	122	116	130	125
7/29/2019	112	123	112	116	124	108	119	124
8/5/2019	119	137	100	154	121	104	125	134
8/12/2019	126	101	110	120	115	114	129	128
8/19/2019	110	116	125	123	114	109	124	124

The FEA:



Current FCA filters are:

Ceiling		600
Floor		120
Primary Filter	Not From	ZDC ZBW ZNY ZOB ZEU CYYZ CYHZ CYUL CYOW
Primary Filter	To	ZBW ZNY ZDC
Second Filters		
A/C Category		J/T

The analysis results for A08 are as follows:

Average top 14 daily average values		Rate Reduction in 10% increments				
		0.10	0.20	0.30	0.40	0.50
Hourly	**153**	138	122	107	92	77

The analysis and calculations for all of the NE AFPs are as follows:

NE FCAs	Hourly Unconstrained FCA Throughput	Low System Impact AFP Rate Range	Medium System Impact AFP Rate Range	High System Impact AFP Rate Range
A08	153	122-153	92-121	91 or lower
BW1	49	39-49	20-38	19 or lower
DC7	131	105-131	79-104	78 or lower
ID1	72	58-72	43-71	42 or lower
OB1	149	119-149	89-118	88 or lower
OB6	117	94-117	70-93	69 or lower

These hourly traffic counts are *not* AFP rates. They are a record of the actual traffic worked by the controllers on an unconstrained, clear weather day. These numbers would be the starting point for an AFP parameter discussion. Those discussions would be the same as they are today – the ATCSCC, the facilities, and the flight operators identify timing and types of weather or other constraints, how long they are forecast to last, amount of airspace lost, amount of traffic expected to move from ZDC to ZOB to ZBW and vice-versa. All the things you do today.

The most important reasons for this analysis and using this data is for accuracy that comes from data driven decision-making.