



# **Federal Aviation Administration**

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## FCA Development for AFP Application Definition and Design Considerations

## **Background**

The development of Flow Evaluation Area (FEA) and Flow Constrained Area (FCA) was to define an area of airspace to capture a set of flights in a constrained area in the NAS (due to weather, excess volume, equipment problems, etc), this allowed for analysis to determine what type of Traffic Management Initiative (TMI) may be applied. FEA's are used to identify and share constraints in the NAS, and FCA's are used to apply TMIs to the filtered flights. By sharing this information, system users have the option to file their flights, in accordance with their own business priorities, around identified constraints. NAS users would be advised that if the demand within the FEA was not adequately reduced, the FEA could be changed to an FCA and required reroutes would be assigned.

This application of FEA's and FCA's is still used (examples... ICR, playbooks routes). FEA's and FCA's can be used to give users other options also: for example, NAS users filing through ZOB over SLT or LVZ to EWR or JFK are required to file Chokepoint Playbook routes, these flights are identified through the use of an FCA, however users can choose file around the FCA to avoid the required routes.

The application of FCA was expanded in 2006 to manage the severe weather impacts to enroute airspace through application of Airspace Flow Programs (AFP). AFP development was to replace the practice of using multiple Ground Delay Programs (GDP) to manage enroute constraints; this was referred to as SWAP GDP's. Through the filtered application of FCA, those flights passing through the constrained airspace were managed by the delay program versus controlling flights to airports that were not passing through the constrained airspace.

AFP and GDP are similar in that they manage demand at a defined capacity rate through the issuance of estimated controlled departure times (EDCT). The difference is the control element, GDP are controlled to a threshold arrival rate, AFPs control to a geographical area or NAS Element defined by the FCA. An AFP might be used, for example, to reduce the flow rate of flights through a center when that center has reduced enroute capacity due to severe weather, replacing Mile-In-Trail (MIT) restrictions for a required reroute, managing airport arrival fix demand, controlling multiple airports within a terminal area, or a sub set of airlines.

The defining component of an AFP is the FCA. The definition (through filters) of the FCA establishes the flights that make up the Aggregate Demand List (ADL) used by FSM to run the delay program. Some examples are: flights flying certain routes destined for certain airports or centers; flights traversing a center in an easterly direction; or flights traversing a particular sector. The FCA tool is extremely flexible and allows almost any set of flights 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 arrival rate for an AFP applies to the rate at which flights should intersect the boundary of the FCA.

## **FEA / FCA Definition**

FEA: A two dimensional line or three-dimensional volume of airspace, along with filters and time boundaries, used to identify flights associated with a potential (or actual) constraint. FEA's can be developed by:

- TMU's
- ATCSCC
- CDM connected Flight Operations Centers with CCSD

FCA: A two dimensional line or three-dimensional volume of airspace, along with filters and time boundaries, used to identify flights subject to an actual constraint.

- FCA's are built by ATCSCC and require a TMI, e.g. a reroute.

Utilizing an FCA or FEA when implementing routes provides monitoring capability through the use of a dynamic list, which updates in real-time as flight plans are filed and amended.

FEA or FCA can be made FSM Eligible, only an FCA can become an AFP. The name of a FSM Eligible FEA or FCA is limited to 6 characters. This limitation is due to the ADL in Flight Schedule Monitor (FSM). FCA required naming format is FCAxxx.

There are four options when creating an FCA

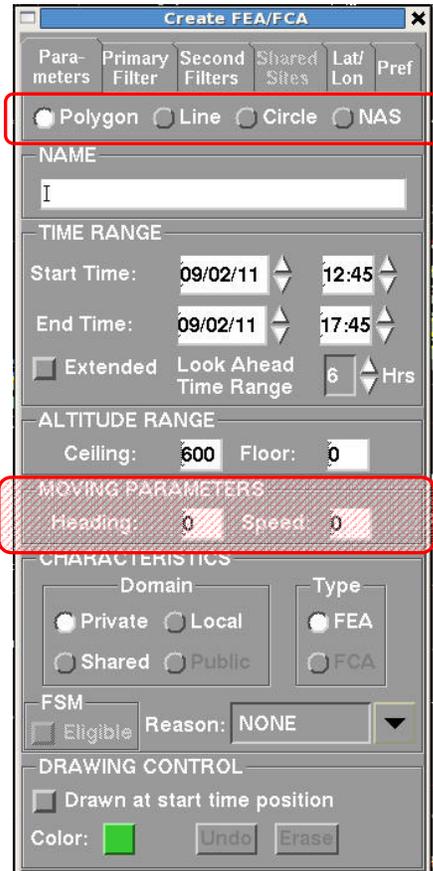
- Polygon
- Line
- Circle
- NAS (element) - Can be an Airport, Center, Sector, Base Sector, Fix, Tracon, SUA

Note: *If the FCA is to be used for an AFP, the NAS option **CANNOT** be used as it has an impact to supporting automation in OIS, Opsnet, Coversheet, etc...*

When using a Polygon or Circle FCA, the flights are captured going through the lateral boundary and the vertical boundary.

- i.e.. If the floor of the FCA is FL230 then a flight departing inside the lateral boundaries to a file or assigned altitude above FL230 will be captured in the FCA.

The FCA **cannot** be a moving FCA for use with ICR, AFP, or CTOP.

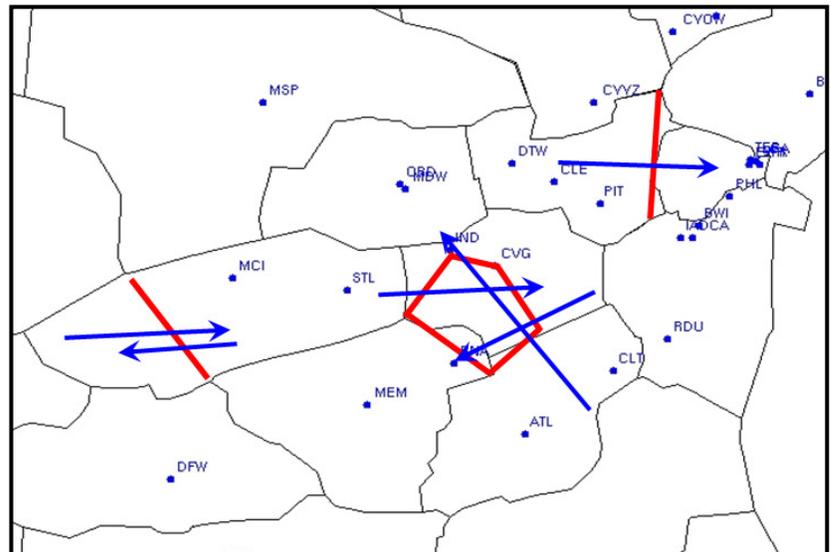
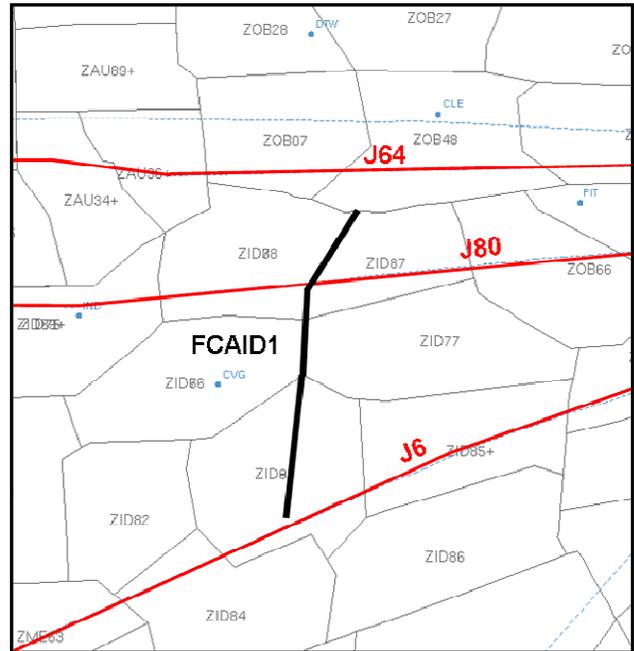


## Geographical design of a FCA for ICR, AFP

**Define the constrained area.** Using the available TSD map functions, evaluate the area of constraint, does the constraint impact the entire center, sector(s), or TRACON.

When drawing the geographical boundaries of the FCA, consider the sectorization and traffic flows:

- How are the center sectors defined; Low, High, Ultra High
- Using the Sector map overlay, consider the sector boundaries; avoid ending a FCA segment in the middle of a sector.
  - Recommend starting the evaluation with Enroute High sector boundaries, the evaluate the Ultra/Super High and Low boundaries
- Evaluate the current traffic flows and alternate routes
- Do you want to include a major traffic pattern
  - I.E... include J6 through ZID or draw just short of J6 so J6 can be used as on off load routes
- Do you want to protect a departure corridor, draw the FCA to prevent flights from filing into the airspace needed for departure routes?
  - I.E... south departure routes out of ORD, J60/J64 out of NY metros
- Are you capturing traffic in a single direction, crossing traffic, all directions? Determining the direction(s) of the traffic flow will help define if a Line, Polygon, or Circle FCA should be utilized.



## Altitudes

When evaluating the vertical assignments for the FCA, consider some of these items;

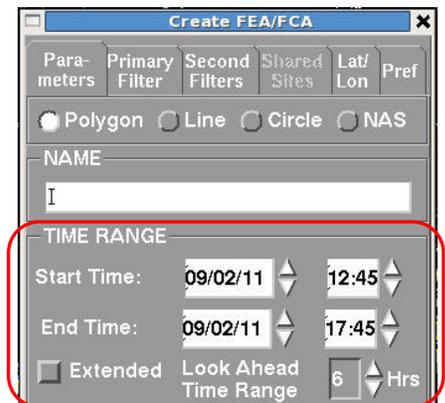
- If the FCA is close to the departure area, it will be more inviting for the flight operators to file below the FCA to avoid the delay.
  - Example. The classic AFP FCAA06 lower altitude is 12,000 feet. This is done to discourage flight from filing at the low altitude with the proximity to the DC metro and consideration of the flights transitioning from Enroute to land at DC, PHL, NY metro.
  - Example 2. FCA used in ZKC for an ICR has a floor of FL240, with flights on long transcon flight plans; it is less likely for a flight operator to file at low altitude. These flights are not entering a transition phase for a few hundred miles.
- What are the sector stratifications where the FCA is drawn? If the floor of the sector is FL240, it is a better practice to put the floor of the FCA at or below the floor of the sector. When looking at the ceiling of the FCA, consider the upper limits. If the High Sector stops at FL370, then consider using an altitude above the top of the High Sector.
  - Prime altitudes for most commercial carriers is FL290-FL410
  - Most of the Business Jet traffic can fly above FL410 and can get out of the core traffic altitudes.

## Time Period

AFP: The minimum time period for a FCA used with an AFP should be 24 hours, an extended FCA can be used to the maximum of 7 days. The AFP program length is defined through the FSM GDT setup panel, utilizing a 24 hour FCA helps ensure that flights delayed past the end time of the AFP program will be handled correctly by automation. This also prevents setting the end time of the AFP program past the end time of the FCA.

- *Note: Extending an FCA with an active AFP will not have an adverse impact to the AFP program, shortening the time period will create “Drop Out” flights impacting the monitoring of the program performance. Avoid reducing the time of a FCA used with and AFP.*

ICR: The time period for the FCA of an ICR is dependent on the window and how long the constraint is expected to last. The time period should reflect the expected length of the constraint.

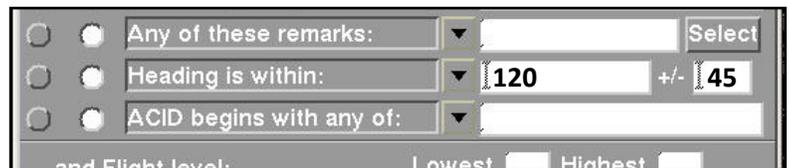
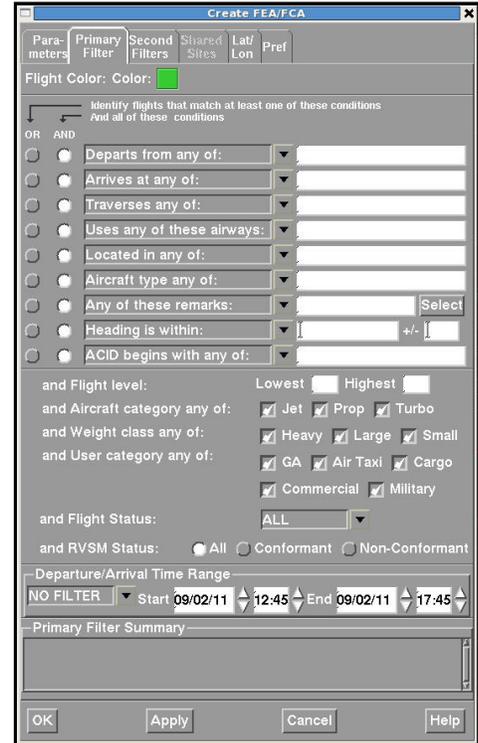


The screenshot shows a dialog box titled "Create FEA/FCA" with several tabs: Parameters, Primary Filter, Second Filters, Shared Sites, Lat/Lon, and Pref. Below the tabs are radio buttons for "Polygon", "Line", "Circle", and "NAS". A "NAME" field contains the letter "I". The "TIME RANGE" section is highlighted with a red box and contains the following fields: "Start Time" set to 09/02/11 12:45, "End Time" set to 09/02/11 17:45, an unchecked "Extended" checkbox, and "Look Ahead Time Range" set to 6 Hrs.

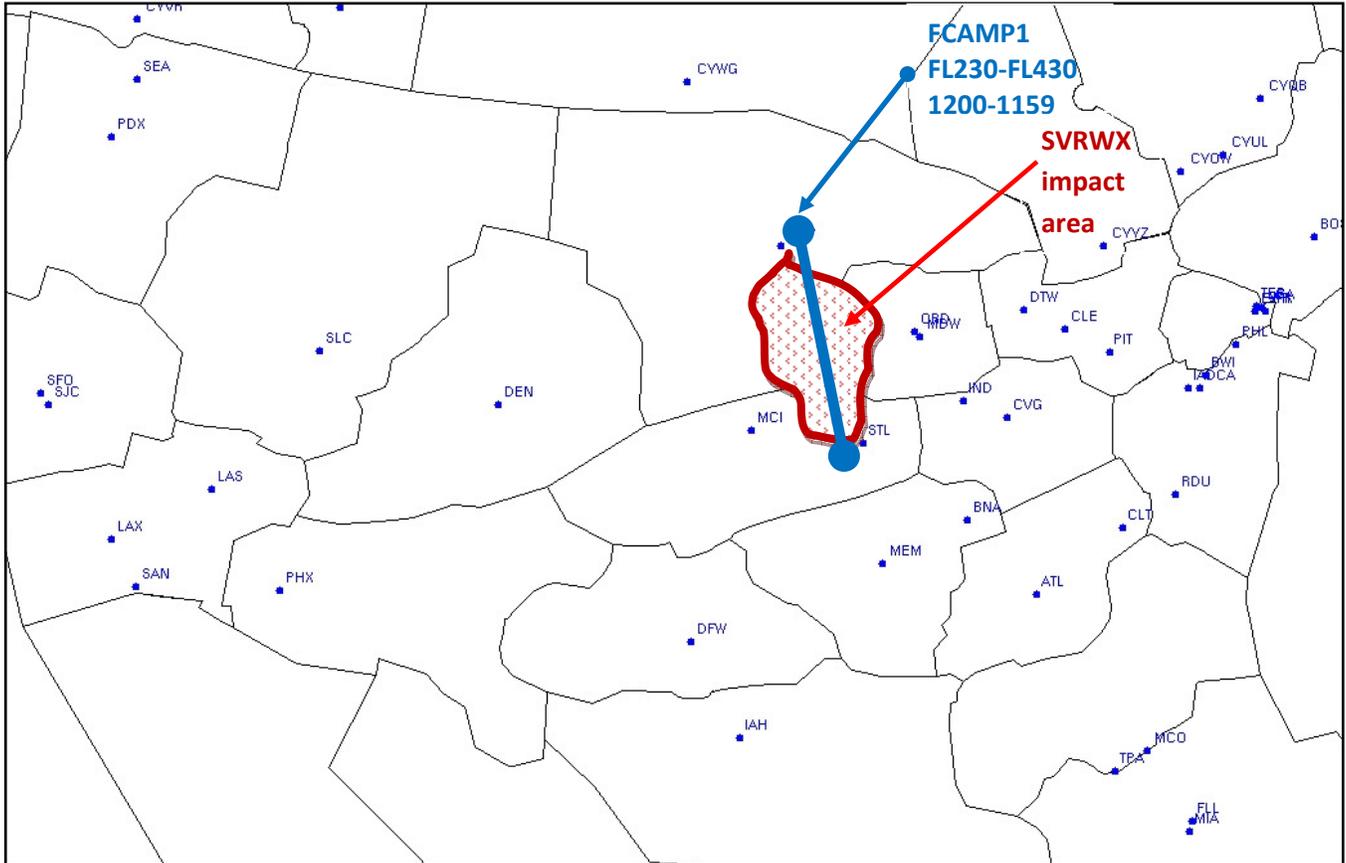
## Filtering

In the Create FEA/FCA tool there several fields in the primary filter tab to define the flights that will populate the Aggregate Demand List (ADL) for the FSM to run the AFP. There are some areas to consider as the FCA is constructed.

- When evaluating the constraint, do you need to capture the impacted centers demand?
  - If there are thunderstorms impacting the area between ORD/CVG/STL, not including the departures out of ZKC/ZAU/ZID allows the facilities to work tactically to route the traffic thru, under, around the constraint area. Including these flights could complicate the coordination and movement around the constraint area.
- Do you need to control traffic in one direction through the FCA or all the traffic through the area? If choosing all the traffic, would it be better with two FCA's instead of one?
- Do you need Props?
  - If the floor of the FCA is low to discourage flights from tunneling, then Prop flights could be captured, are they really part of the constraint?
- Can you filter captured demand by Departure and Arrival or apply for flights tracking a specific heading?



## Example of filtering consideration



With the area impacting ZMP, ZAU, ZKC, the traffic arriving and departing from these centers should be filtered out (or not included) of the demand. They will require more tactical and specific TMI's to adjust to the changing impact during the phases of the constraint life cycle. Consideration may be given to filtering out the ZID demand to allow tactical adjustments to the demand into ZKC and ZAU.

Under this example, the floor consideration is driven by the distance from the included facilities. A concern would be demand out of ZOB filing below the floor of the FCA, then being cleared to a higher altitude through the constraint area. This would require monitoring and enforcement by ZAU and ZOB TMU to keep demand below the FCA.