

# Flow Management Data and Services Design Prototype



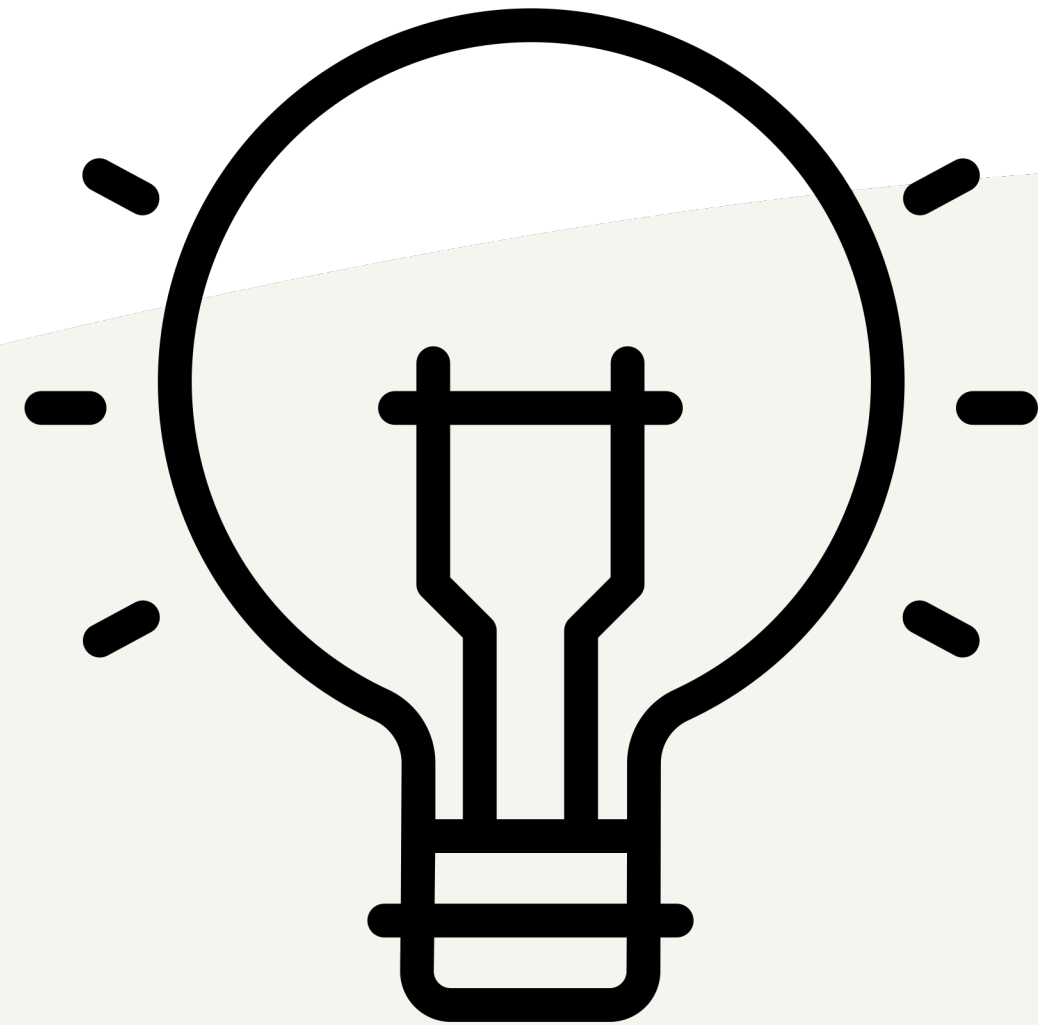
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# Introduction and Overview

- Background
- Design
- Prototype Demonstration
- Conclusion



# Background

## The Traffic Flow Management (TFM)-AID Challenge:

- Inspiring a novel Graphical User Interface (GUI) design for the new Federal Aviation Administration (FAA) automation system, Flow Management Data and Services (FMDS)
- A new GUI that can assist traffic management with their task

## Existing System Issues:

- Require multiple application to complete tasks
- "Death by windows"
  - Windows operating system error screen due to crashes
- Lack of visual continuity between applications

# Design Steps

**A**

Understand Air Traffic Control System Command Center (ATCSCC) user:

- Developed user persona to define design goals and user behavior

**B**

User Flows:

- Primary functions definition
- Navigation concept and progression

**C**

User Interviews:

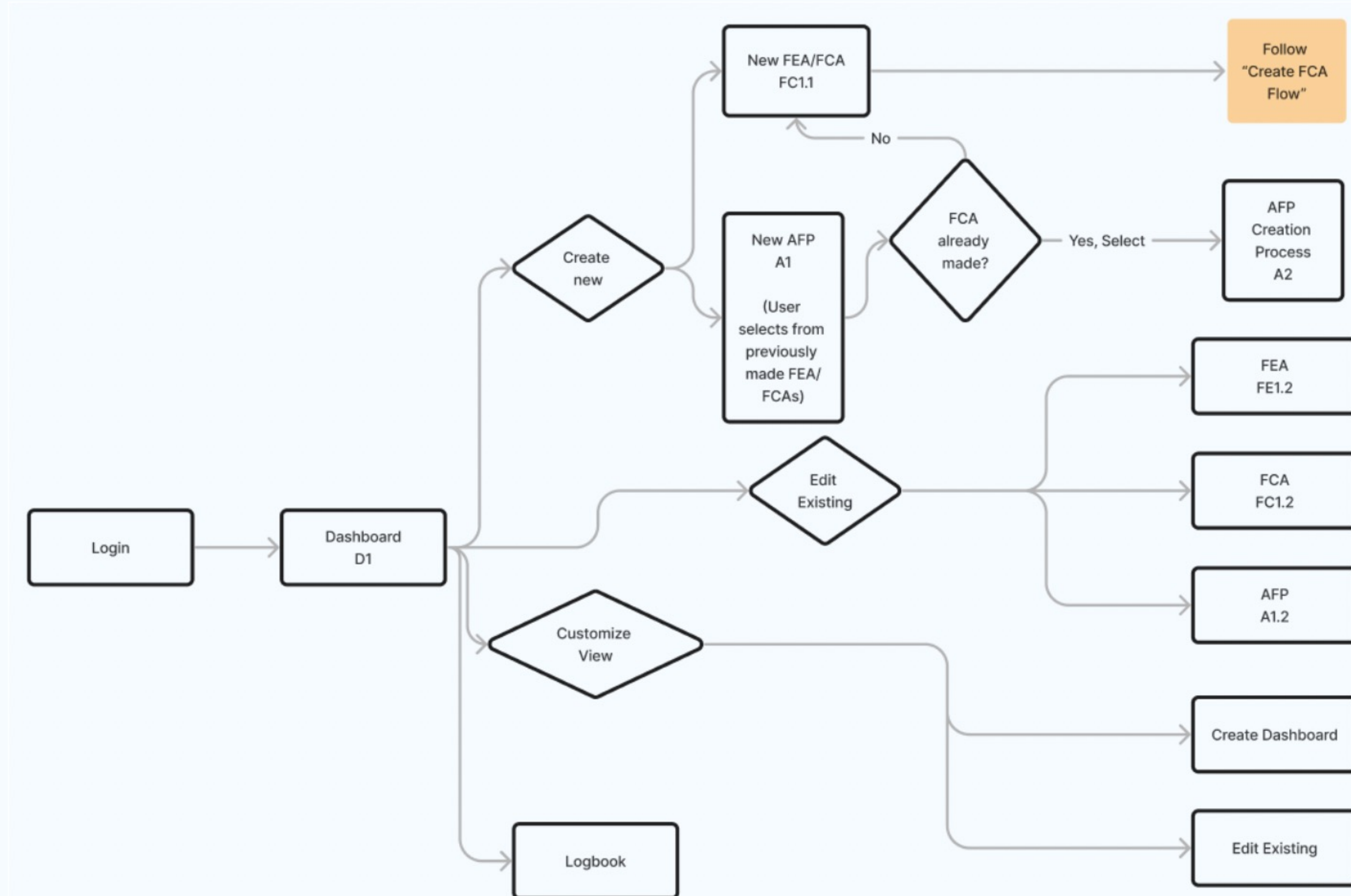
- Three interviews with current and former industry personnel to validate our design and understand the relationship between different aspects of the national airspace

**D**

Design Reviews and Iteration:

- Review design with advisor and industry personnel helped inform next steps as we developed prototype

# User Flow Diagram: Main Dashboard



# User Persona

Our "target" user is an air traffic manager at ATCSCC, whose primary tasks include monitoring air traffic and identifying and creating TMIs to manage traffic flow when issues are identified.

## Identified Needs:

- Modern, scalable, agile interface
- Complete tasks as efficiently as possible
- Preference for graphical/visual based applications versus text/command based
- Experienced users will desire seamless transition from previous software to new system



# Design Goals

- Integrate existing functions into a centralized system

- Reduce repetitive data entering through autofill functions and consolidate windows

- Improve visualization of systems to be intuitive

- Reduce mental workload by maintaining easy access to necessary information


- Ensure system is scalable, agile, and intuitive

# The Design – Dashboard

- Flat design
- Scalable: Easy to add new feature
- Customizable: Modular design allows users to create personalized layouts based on their roles and tasks
- Highly interactive
- Include forecast mode:
  - It allows users to look forwards in time at projected weather
  - Help air traffic control in the development of Flow Evaluation Area (FEA)/ Flow Constrained Area (FCAs) and Traffic Management Initiatives (TMIs)



# **The Design - FEA/FCA & Airspace Flow Program (AFP)**

- Interactive:
    - Interaction with map to better visualize FEA/FCA creation
  - Modern, Concise and Attractive:
    - More visual layout that still retains core functions
    - Consolidated shared functions to improve user experience and flow process
- 

# The Prototype

The screenshot displays the FAA TFM-AID web application interface. At the top left is the FAA TFM-AID logo. The top center shows the date and time: "March 2, 2023 17:32:03 UTC". To the right of the date is a "Live View" button and a "Settings" button with a gear icon. Below the top bar is a "Filter" section with a dropdown menu set to "Continental U.S." and a "+" button. A "Weather" button is located in the top right corner of the map area. The main map shows the United States with various flight information overlays. Labels for cities and airports are visible, including Seattle, San Francisco, Los Angeles, Denver, Dallas, Houston, Miami, Atlanta, St. Louis, Chicago, Detroit, Toronto, Montreal, Boston, New York, Philadelphia, and Washington. Several airports are marked with purple labels: ZSE, ZLC, ZMP, ZOB, ZBW, ZNY, ZOA, ZLA, ZAB, ZFV, ZKC, ZID, ZDC, ZME, ZTL, ZJX, ZMA, ZHU, and ZPH. Two green airplane icons are positioned on the map. At the bottom of the map area are zoom in (+) and zoom out (-) buttons. The bottom navigation bar includes buttons for "FEA/FCA", "AFP", "Log", and "Chat", along with a "+" button.

<https://nnmvq6.axshare.com/>

# Conclusion

## BIG DESIGN CHANGES:

- Integrate existing functions into a centralized system
- Reduce repetitive data entering through autofill functions and consolidate windows
- Improve visualization of systems to be more logical
- Reduce mental workload by maintaining easy access to necessary information

## BY:

- Implementing a scalable, agile, and intuitive system
- Incorporating design principles based on human cognition

# What We've Learned

- The importance of minimizing errors in a safety critical domain, especially with complex systems

- An appreciation for what different perspectives bring to the table

- The importance of empathy when designing for those who have intricate roles

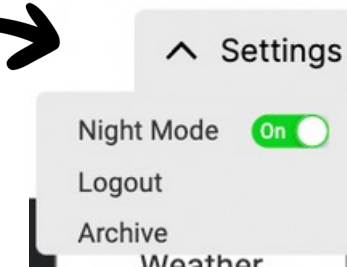
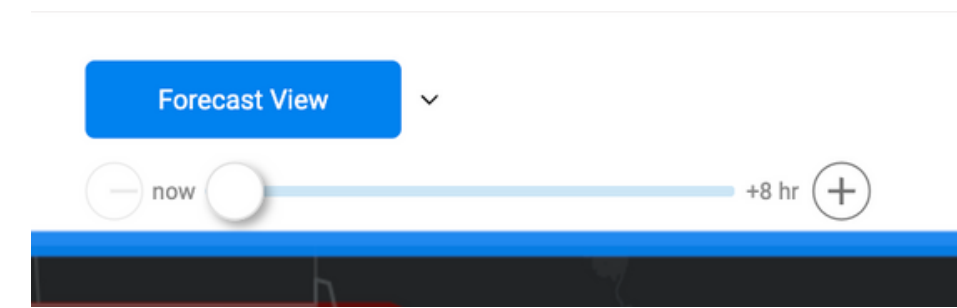


# Thank You!

We are extremely grateful to be given the chance to showcase and improve on our skills

It was an amazing opportunity!

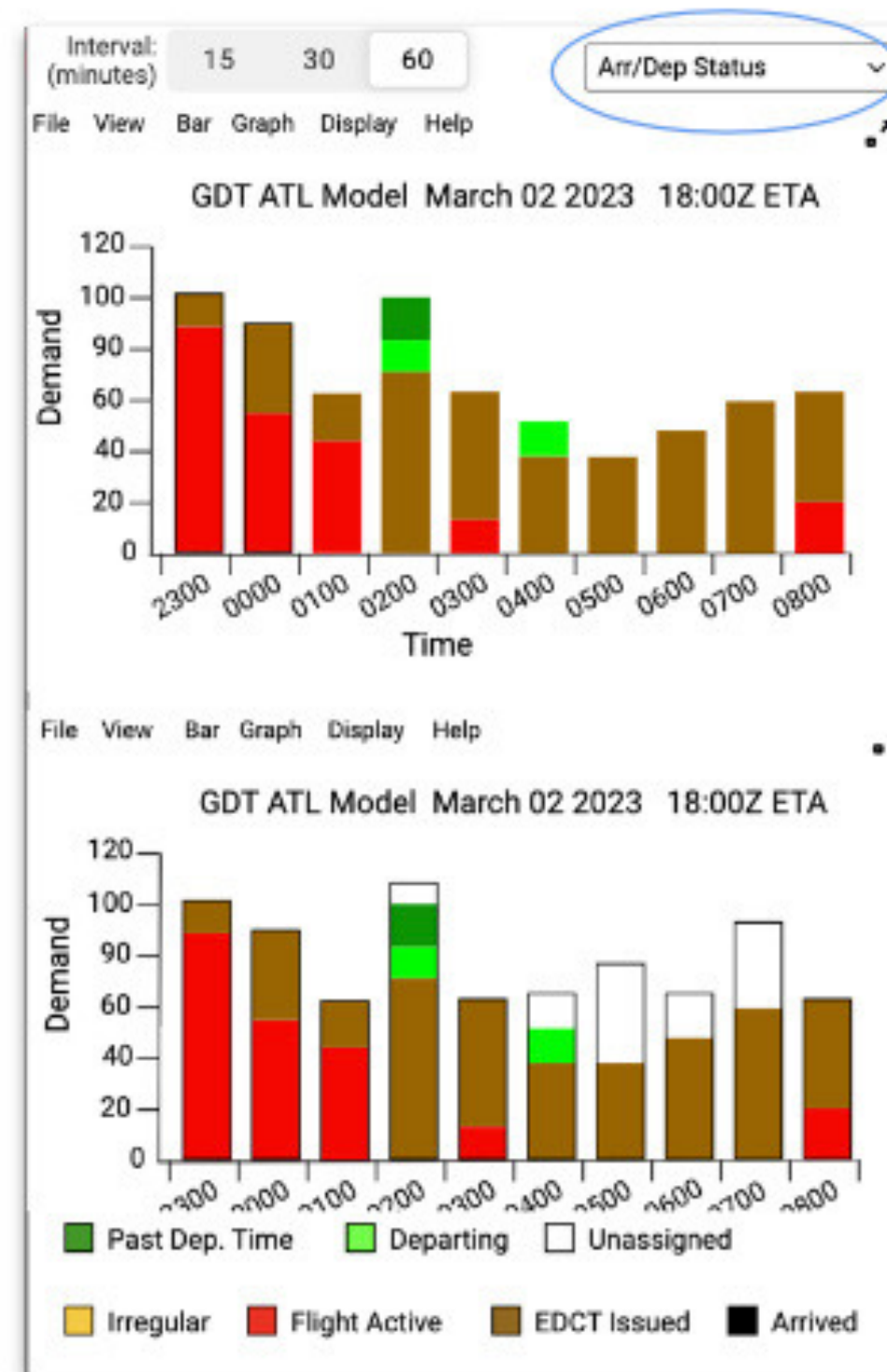
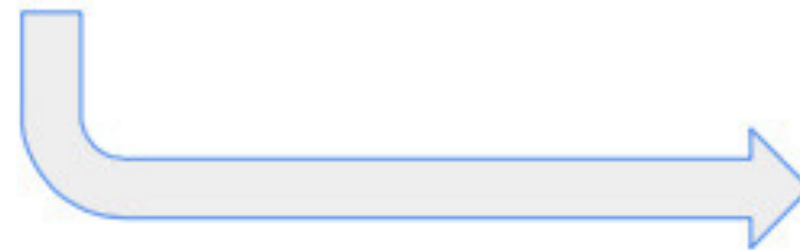
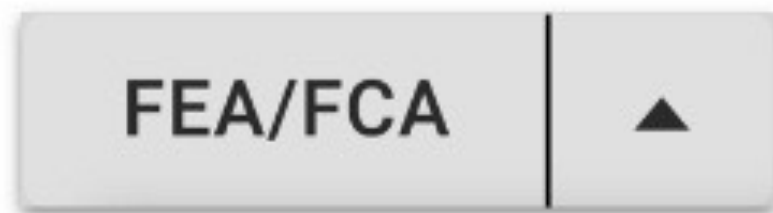
# Dashboard



- Filter
  - Controls which aircraft, FEA, and FCA are visible on map
- Forecast
  - Users can move forwards in time to see projected air traffic and weather
- Navigation
  - Bottom bar can be customized to include features most relevant to each user

# FEA/FCA

- Selecting FEA/FCA icon interaction global navigation bar expands graphs of active FEA/FCAs in area of interest



- ✓ Arr/Dep Status
- Status
- Aircraft Category
- Carrier
- Afix
- DFix
- Centers
- Control Type

# FEA/FCA Menu

- Selecting arrow expands for additional options to create new FEA, recall a previously made FEA, or modify existing FEA





# Active/Recall FEA/FCA

- Side popup details
  - Shows parameter details of the selected instance
- Selection search moved to top

The screenshot displays a flight management interface. On the left, a 'Selection' panel contains a search bar at the top and a list of three items: 'FEA\_Example1', 'FEA\_Example2' (which is highlighted), and 'FEA\_Example3'. Below the list is a radio button labeled 'Retain Saved Start Time'. On the right, a map shows flight paths with various airport codes (ZOB, ZID, ZTL, ZJX, ZDC, ME) and two cyan airplane icons. A detailed popup window is overlaid on the map, providing the following information for the selected instance:

Name	
FEA_Example2	
Timing Range	
Start Time	End Time
09:15	09:30
Altitude Range	
Ceiling	Floor
410	020
Moving Parameters	
Heading	Speed
-	-
Domain	Type
PRIVATE	FEA

The popup also includes a small summary box with the following data:

- name [FEA\_Example2]
- time [ 09:17 | 09:32 ]
- [ 410 | 20 ]
- ceiling | floor

# Create FEA/FCA (Parameters)

Create FEA/FCA

Parameters Primary Filter Secondary Filter Preferences

Name

Polygon Line Circle NAS

**Time Range**  
Enter Start Time   
Enter End Time

Extended

**Altitude Range**  
Ceiling:  Floor:

**Moving Parameters**  
Heading:  Speed:   
 Drawn at start time position

**Characteristics**

Type	Domain
<input type="button" value="FEA"/>	<input type="button" value="Public"/> <input type="button" value="Local"/>
<input type="button" value="FCA"/>	<input type="button" value="Private"/> <input type="button" value="Shared"/>

Eligible for FSM

FEA/FCA | AFP | Log | Chat | +

Polygon Line Circle NAS

Latitude and Longitude

**Time Range**  
Enter Start Time   
Enter End Time

Drawn at start time position

**Characteristics**

Type	Domain
<input type="button" value="FEA"/>	<input type="button" value="Public"/> <input type="button" value="Local"/>
<input checked="" type="button" value="FCA"/>	<input type="button" value="Private"/> <input type="button" value="Shared"/>

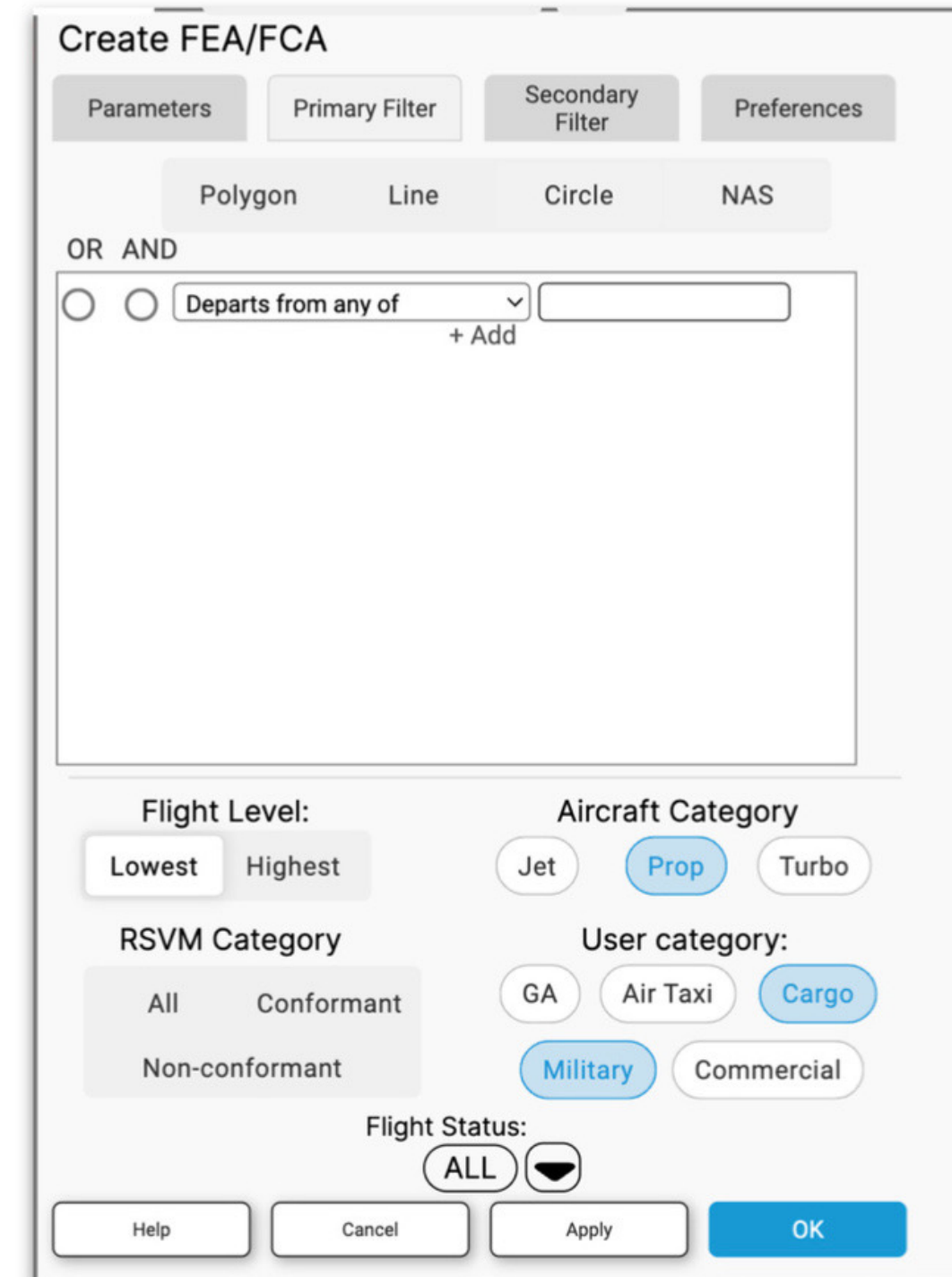
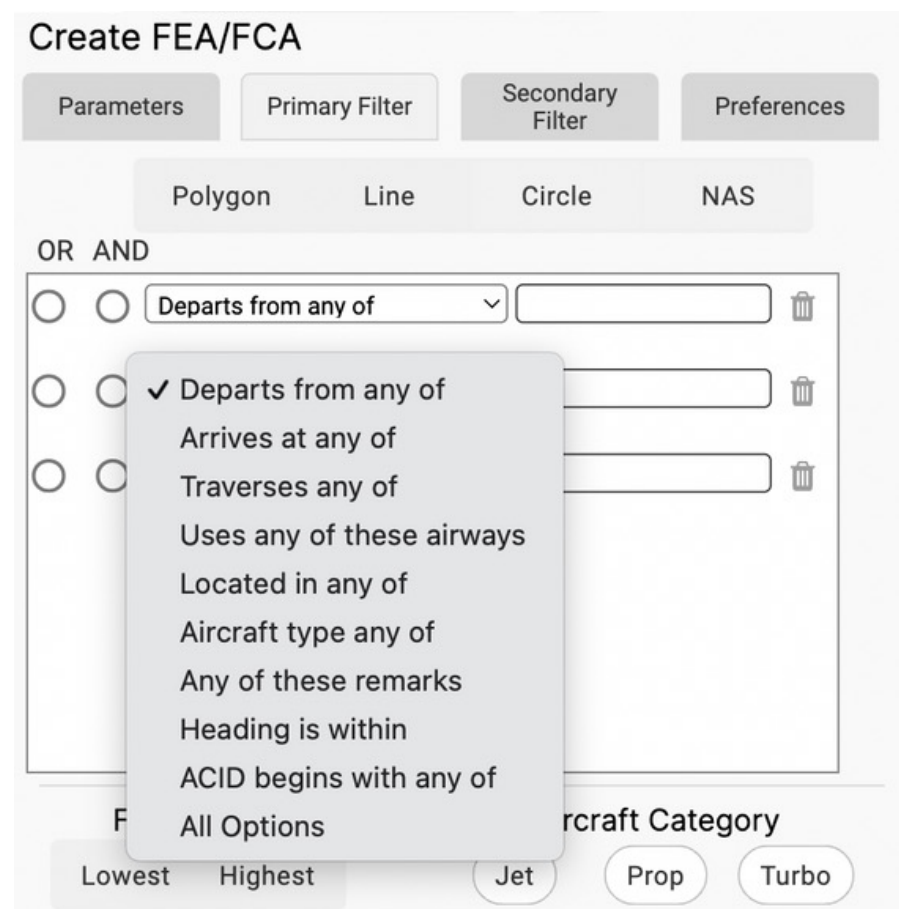
Eligible for FSM

Shared Sites

- Shared Sites and Lat/Lon consolidated as pop-outs on parameters page
- Switched from radio to toggle buttons (Fitt's Law)
- Updated dialog box layout

# Create FEA/FCA (Primary Filter)

- Multi-selection category buttons saliently different from toggle buttons
- Updated layout
- User can add only relevant filters from a dropdown OR select all to start and subtract irrelevant filters



# AFP

Parameters Scope General Options

### Program Time Options

Choose a Time Range

Start Time 2:17:36 End Time 448

Date Time: 02:17:36

**Purge Flights**

Before Revision Start  
 Compress to Last CTA  
 After Revision End

**Program Rate (Applicable only to included flights)**

Load Times Load ADL AAR Historical Pop-Ups

Fill: Select With: Select

From Hour 3 : 12 PM Within Hour 3 : 12 PM

Interval: 15 30 60

Rate	14:00	14:15	14:30	14:45	15:00	15:15	15:30	15:45	16:00	16:15	16:30
PR	10	10	10	10	10	10	10	10	10	10	10
Pop - Up	0	0	0	0	0	0	0	0	0	0	0
Reserve	-	-	-	-	-	-	-	-	-	-	-

AAR  Set AAR to Program Rate  Retain Current ADL AAR

GDT Map

Parameters Scope General Options

### Total Centers

Select By: All Scope: All

#### Centers - Origin

Non- Exempt	Exempt
ZAB	CZE
ZAU	CZM
ZWB	CZQ
ZDC	CZU
ZDV	CZV
ZFW	CZW
ZHU	CZY
ZID	
ZJX	
ZKC	
ZLA	
ZLC	
ZMA	
ZMC	

#### Airports - Origin

Exempt

Non- Exempt

Non- Exempt Notes

Flights

Exempt Active Flights Only (By Status)  
 Exempt all flights departing within  Minutes

GDT Map

- Time parameters have slider to visually represent the selected window of time
- Changes to visuals of time interval graph
- Selecting exempt/non-exempt centers has been simplified to reduce possible confusion



# TFM-AID

TRAFFIC FLOW MANAGEMENT -  
APPLICATION INTEGRATION DESIGN CHALLENGE

## 2023 Challenge Forum

June 28-29, 2023 | McLean, Virginia