

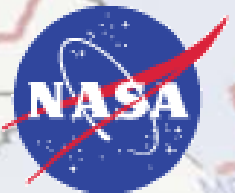
# NY TBO: Integrated Demand Management REDAC Subcommittee Briefing

August 12, 2015

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# Glossary

|             |  |                    |   |
|-------------|--|--------------------|---|
| <b>ANSP</b> | Air Navigation Service Provider            | <b>IDM</b>         | Integrated Demand Management                        |
| <b>CDM</b>  | Collaborative Decision Making              | <b>IDM-<br/>wx</b> | Integrated Demand Management<br>for Weather         |
| <b>CSG</b>  | CDM Steering Group                         | <b>MACS</b>        | Multi-Aircraft Control System (ATC<br>sim platform) |
| <b>CTOP</b> | Collaborative Trajectory Option<br>Program | <b>nCTOP</b>       | NASA CTOP emulation                                 |
| <b>EDCT</b> | Estimated Departure Clearance<br>Time      | <b>PGUI</b>        | Planview GUI  |
| <b>ERAM</b> | En Route Automation<br>Modernization       | <b>RTA</b>         | Required Time of Arrival (assigned<br>to aircraft)  |
| <b>ETA</b>  | Estimated Time of Arrival                  | <b>TBFM</b>        | Time-Based Flow Management                          |
| <b>FCA</b>  | Flow Control Area                          | <b>TBO</b>         | Trajectory Based Operations                         |
| <b>FEA</b>  | Flow Evaluation Area                       | <b>TFMS</b>        | Traffic Flow Management System                      |
| <b>GUI</b>  | Graphical User Interphase                  | <b>TGUI</b>        | Timeline GUI  |
| <b>HITL</b> | Human-in-the-loop                          | <b>XM</b>          | Extended Metering (TBFM<br>function)                |

# NY Trajectory-Based Operations (TBO)

## Multi-year Objective:

- Develop a ‘toolkit’ of TBO procedures and methods to improve efficiency and robustness of NY operations under all conditions.
- Current focus is on improving convective weather operations.

## General Approach:

- Talk to subject matter experts (SMEs) and stakeholders to select problems.
  - Analyze problem and develop solution, leveraging near- and mid-term NextGen technologies and operations.
  - Use simulation “prototype “ to test and refine the concept, evaluate feasibility, and identify benefits mechanisms.
  - Document results and requirements for each solution.
- 
- *Engage stakeholders and SMEs throughout process to insure operational relevance.*
  - *Leverage current and prior work (internal, external) as much as possible*

# Proposal: “Integrated Demand Management for Weather”

## **Concept summary:**

- TFMS (CTOP) “strategically” manages demand into TBFM
- TBFM “tactically” manages delivery to capacity-constrained destination
- RTA provides key delivery mechanism from TFMS into TBFM

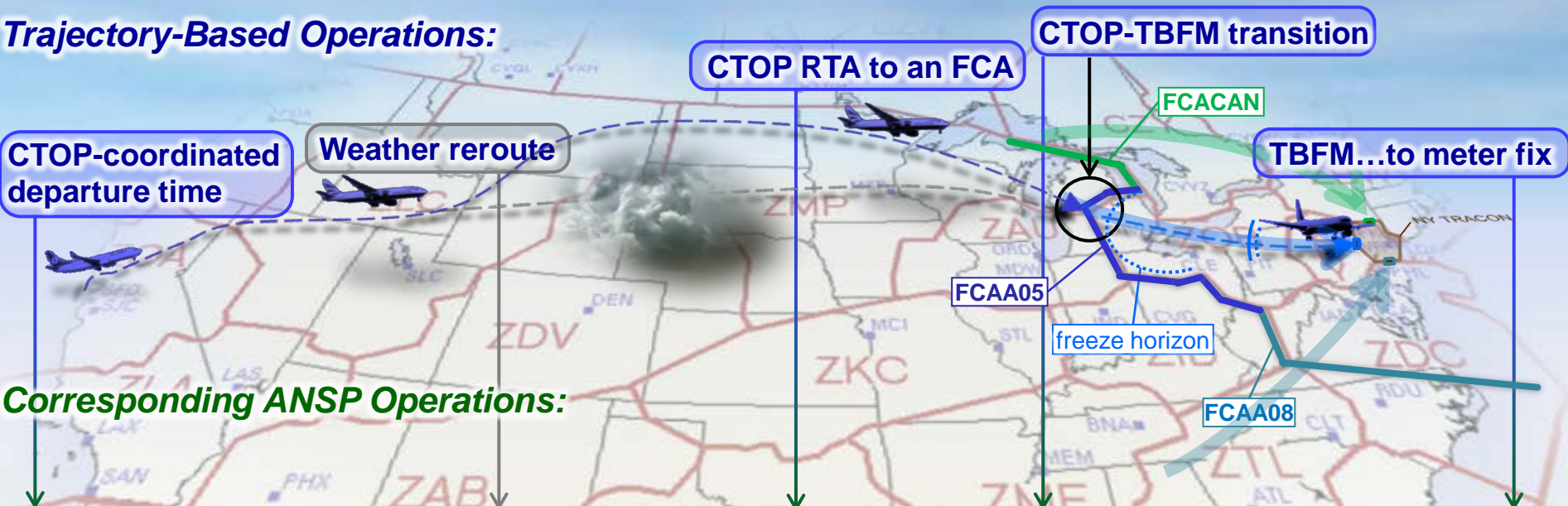
## **Work plan:**

- FY15: Initial integration addresses volume problem (IDM)
- Fy16: Framework used to address demand-capacity issues with weather (IDM-wx)

# Concept: Integrated Demand Management

Develop an air-ground TBO concept that integrates near-term to mid-term NextGen technologies to manage demand through capacity constrained resources to a capacity constrained airport, with an initial focus on New York operations.

## *Trajectory-Based Operations:*



## *Corresponding ANSP Operations:*

### **Develop CTOP**

- Identify constraints, select FCA(s) / FEA(s)
- Establish rates for FCAs
- Initiate program (assign routes, EDCTs, and/or RTAs to manage FCA arrival times)

### **Manage weather impact**

\*2016 focus\*

### **Manage “pre-TBFM” ops**

- Support RTA operations
- Manage non-RTA flights
- Monitor & maintain plan
- Implement revisions (to CTOP; RTA) as needed.
- Conclude RTA operations on transition to TBFM.

### **Transition to TBFM**

- CTOP ends at FCA.
- TBFM takes over.

### **TBFM to destination**

- TBFM to series of meter points conditions traffic to runway threshold.
- Close-in departures are scheduled from TBFM.



# FY15 Outreach Activities

- **Sept 2014:** Met with FAA TFMS Deployment team at Ames; interest in CTOP-TBFM integration
- **Nov 2014:** First workshop at Ames; explored topics/problems with SMEs and stakeholders (Port Authority NY/NJ; Delta Airlines)
- **Jan 2015:** Second meeting with TFMS Deployment Team; briefings on “TMA Flow Program” (TFP) and “CTOP for EWR”
- **Mar 2015:** Attended CDM Spring Meeting; learned about relevant activities, capabilities (ABRR, DFW OAPM release, forecast-based estimates of reduced FCA capacity...)
- **April 2015:** Second Ames workshop: worked on IDM concept with SMEs.
- **June 2015:** Briefing to CDM Co-leads. Third Ames workshop demonstrated initial simulation prototype to SMEs and stakeholders (NBAA, American Airlines).
- **June-Aug 2015:** Began regular telecons with FAA AJV-73, the Technical Analysis & Operational Requirements Group, who offers support for August HITL.
- **Aug 2015:** Submitting request to CSG for CDM sub-team support for FY16. IDM concept demonstration HITL planned for August 24-28.
- **Next year:** *With support from CDM team and TBFM design experts, plan to refine concept and conduct follow-up HITL in January 2016 to complete investigation of non-weather IDM. Work on IDM-wx concept to begin mid-year FY16.*

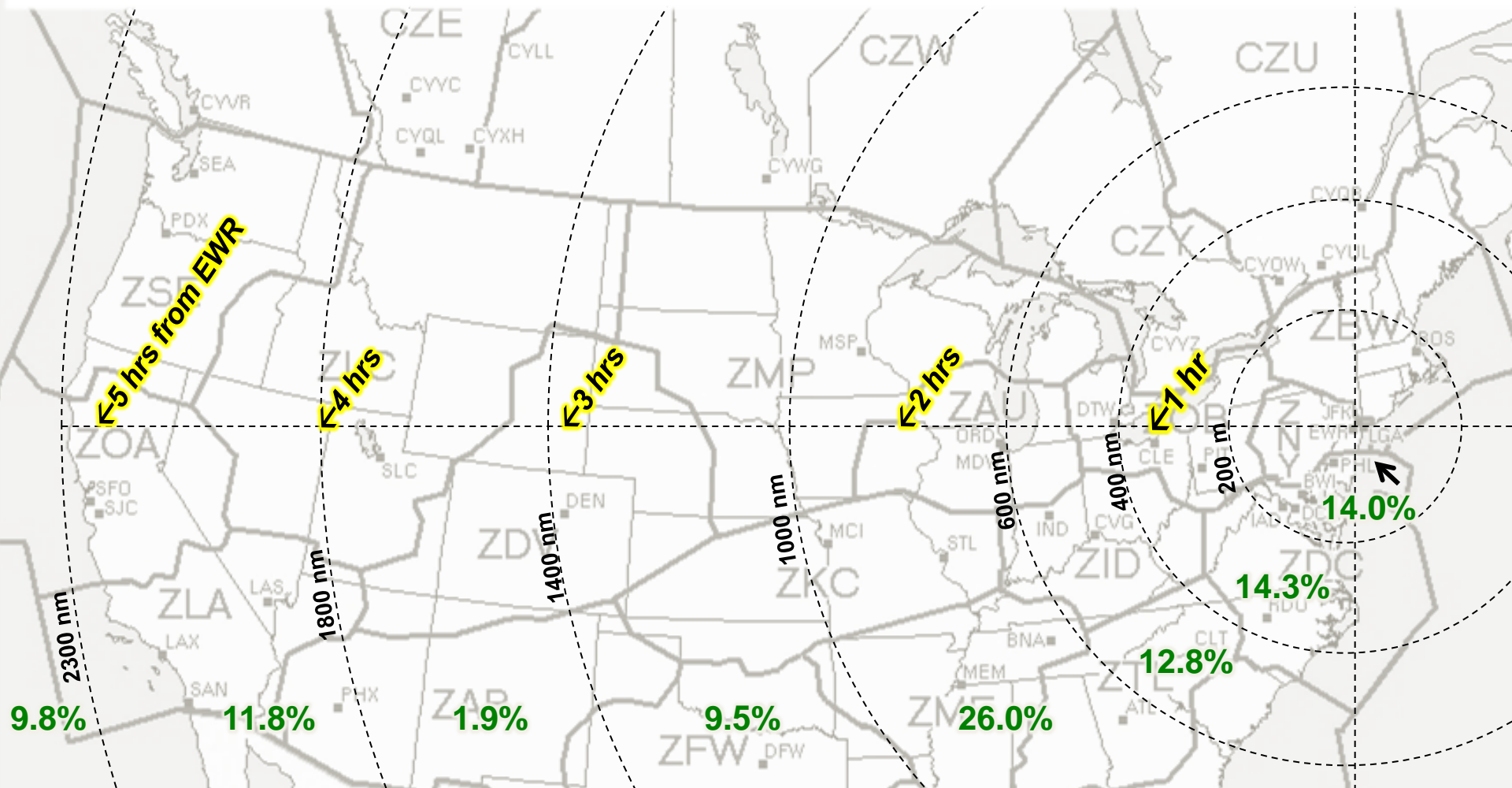
**QUESTIONS?**



## ***[Supplementary Material]***

- Traffic characteristics
- Initial TBFM and CTOP architecture
- Simulation environment
- Simulation plans

# Traffic Characteristics: Newark Arrivals

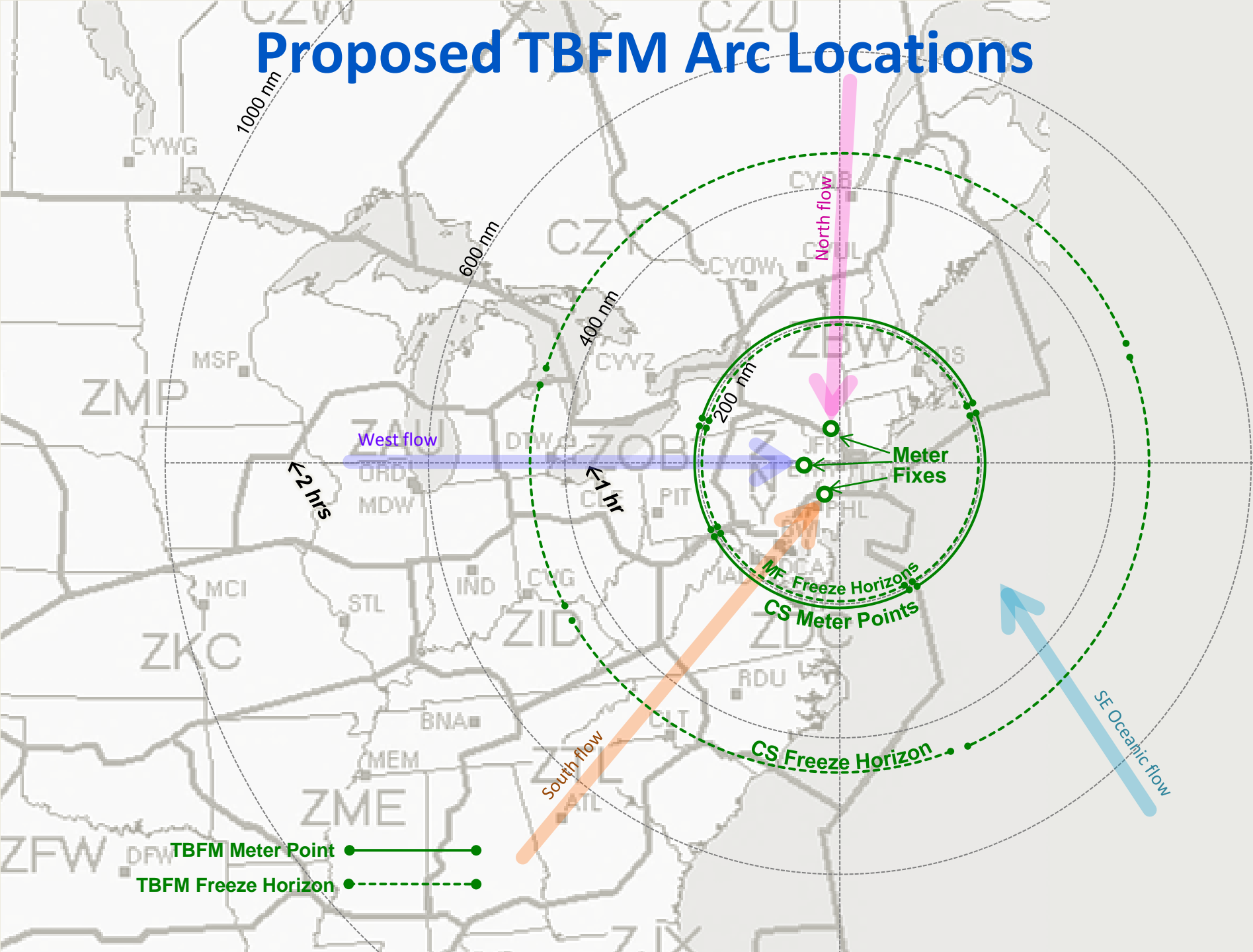


EWR Arrivals: Distribution by Departure Airport Distance, all filed flights, 2013\*

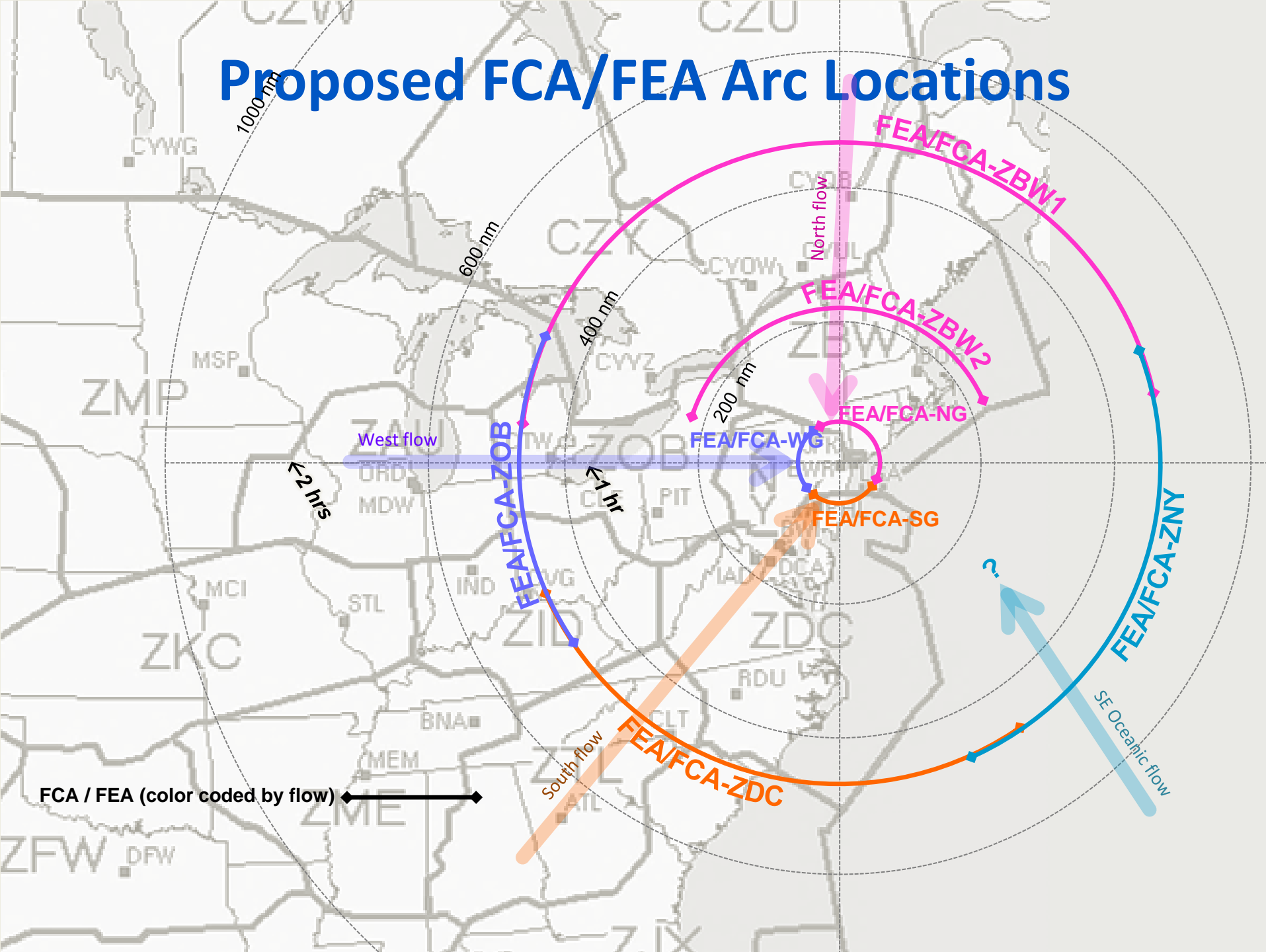
- Selected ARTCCs
- First Tier ARTCCs
- Second Tier ARTCCs

\*Does not include airports with less than 40 flights to EWR in 2013 (ASPM).

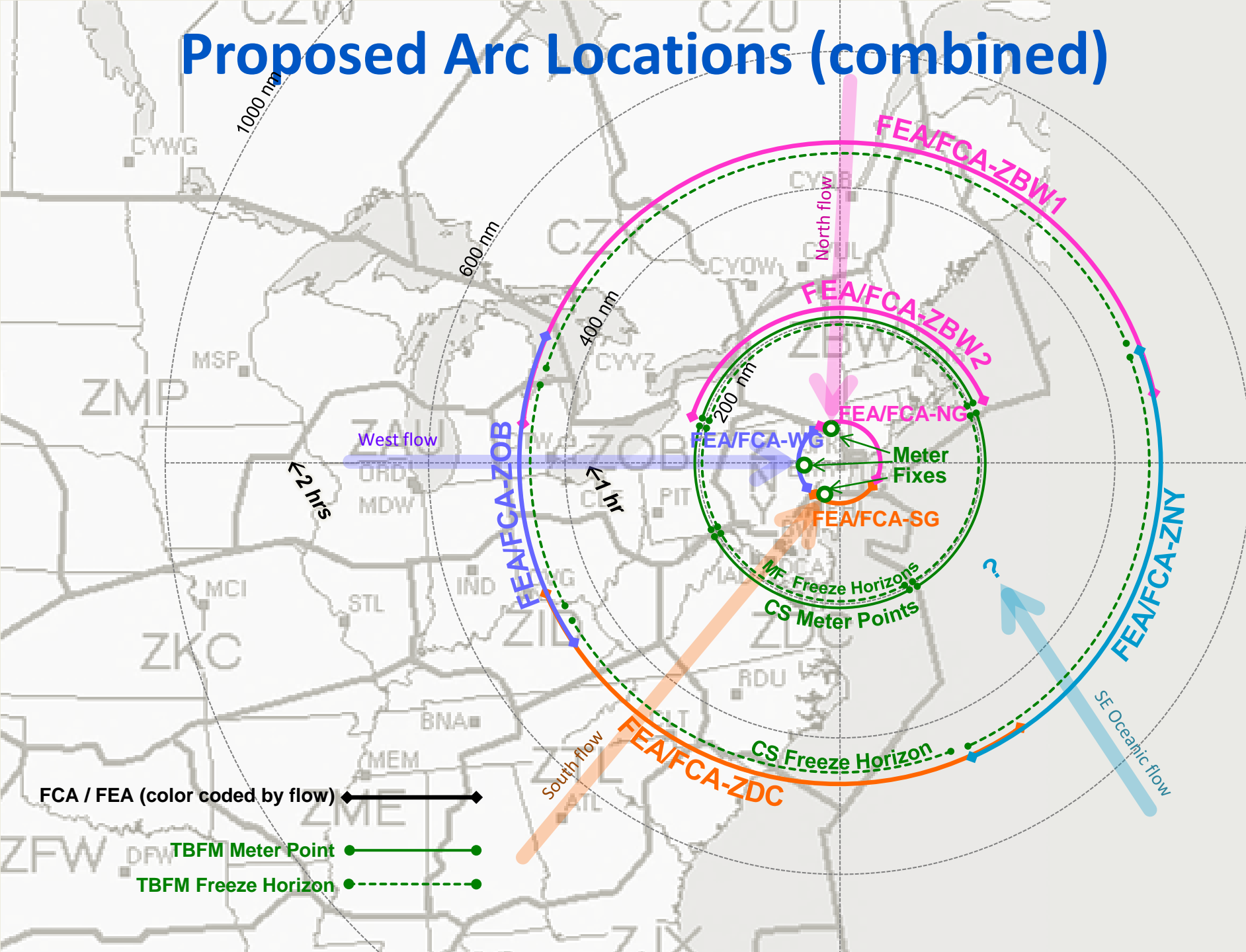
# Proposed TBFM Arc Locations



# Proposed FCA/FEA Arc Locations

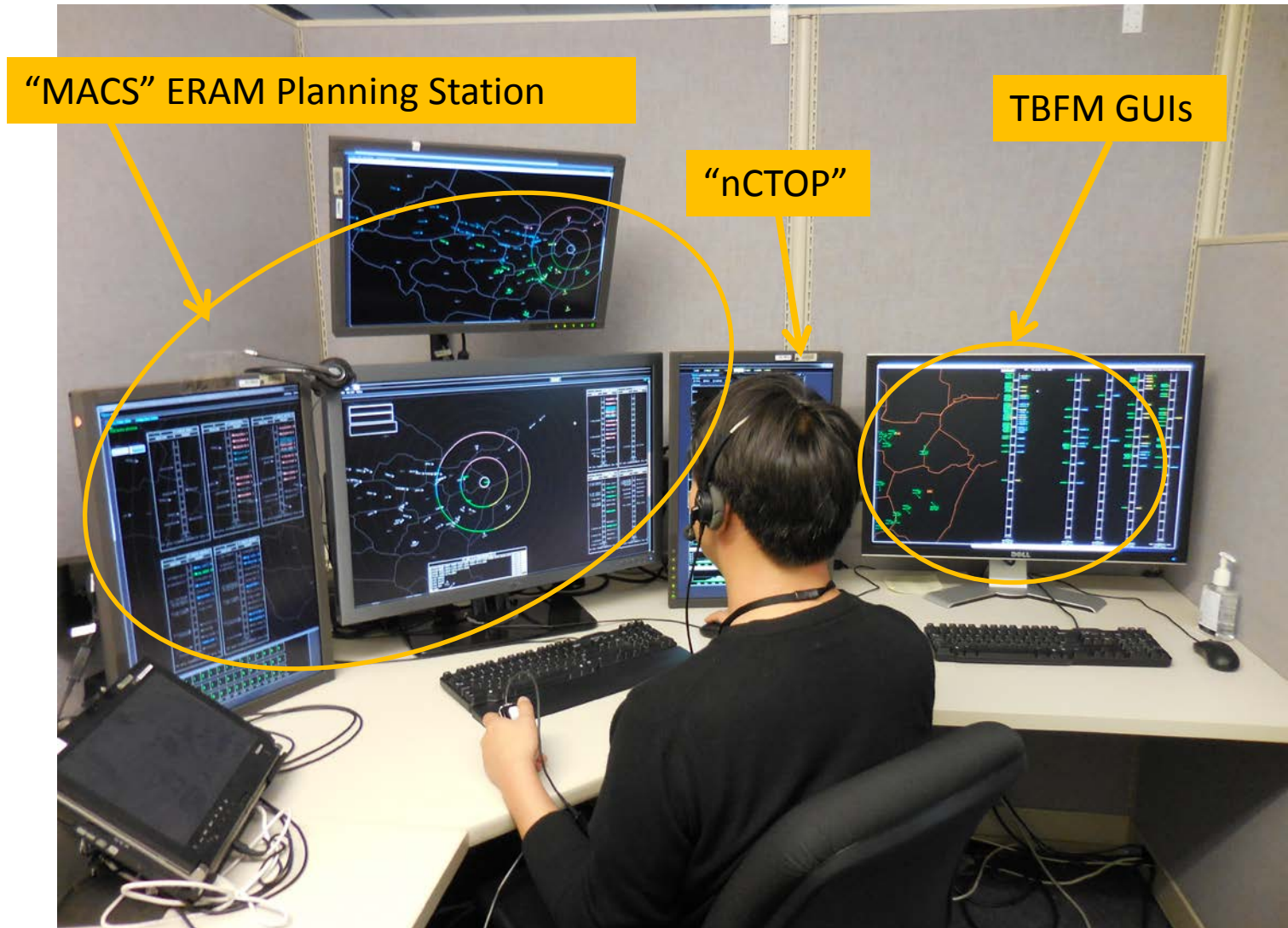


## Proposed Arc Locations (combined)

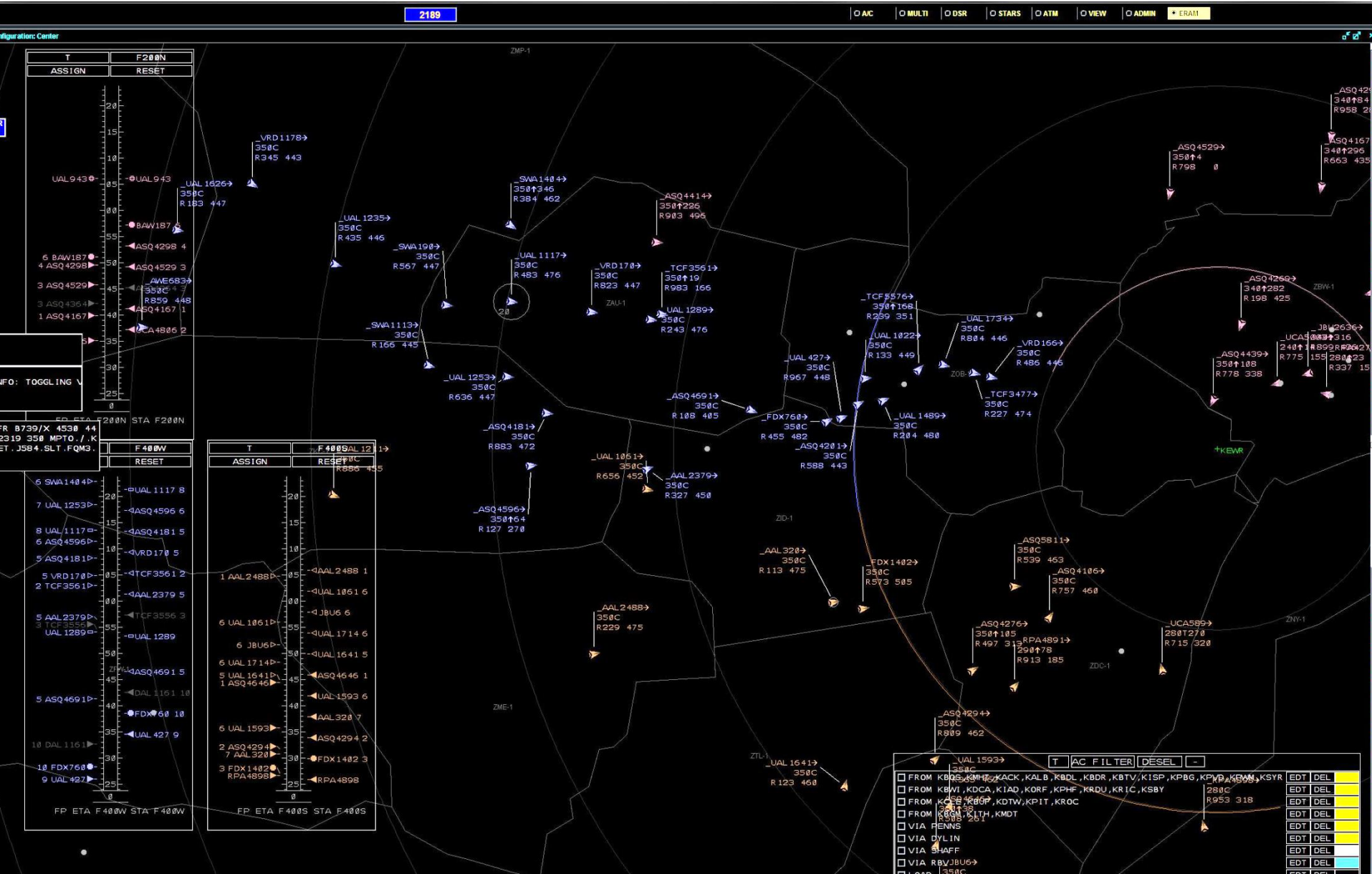




# Station Setup

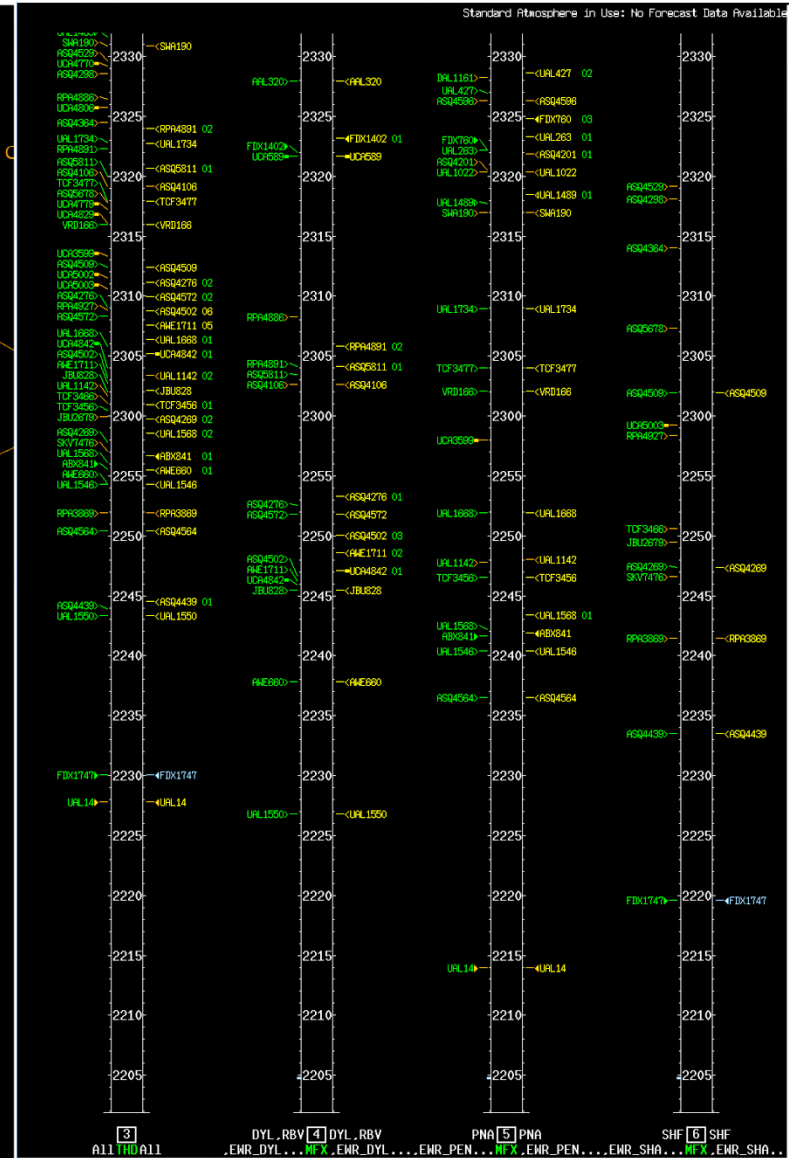
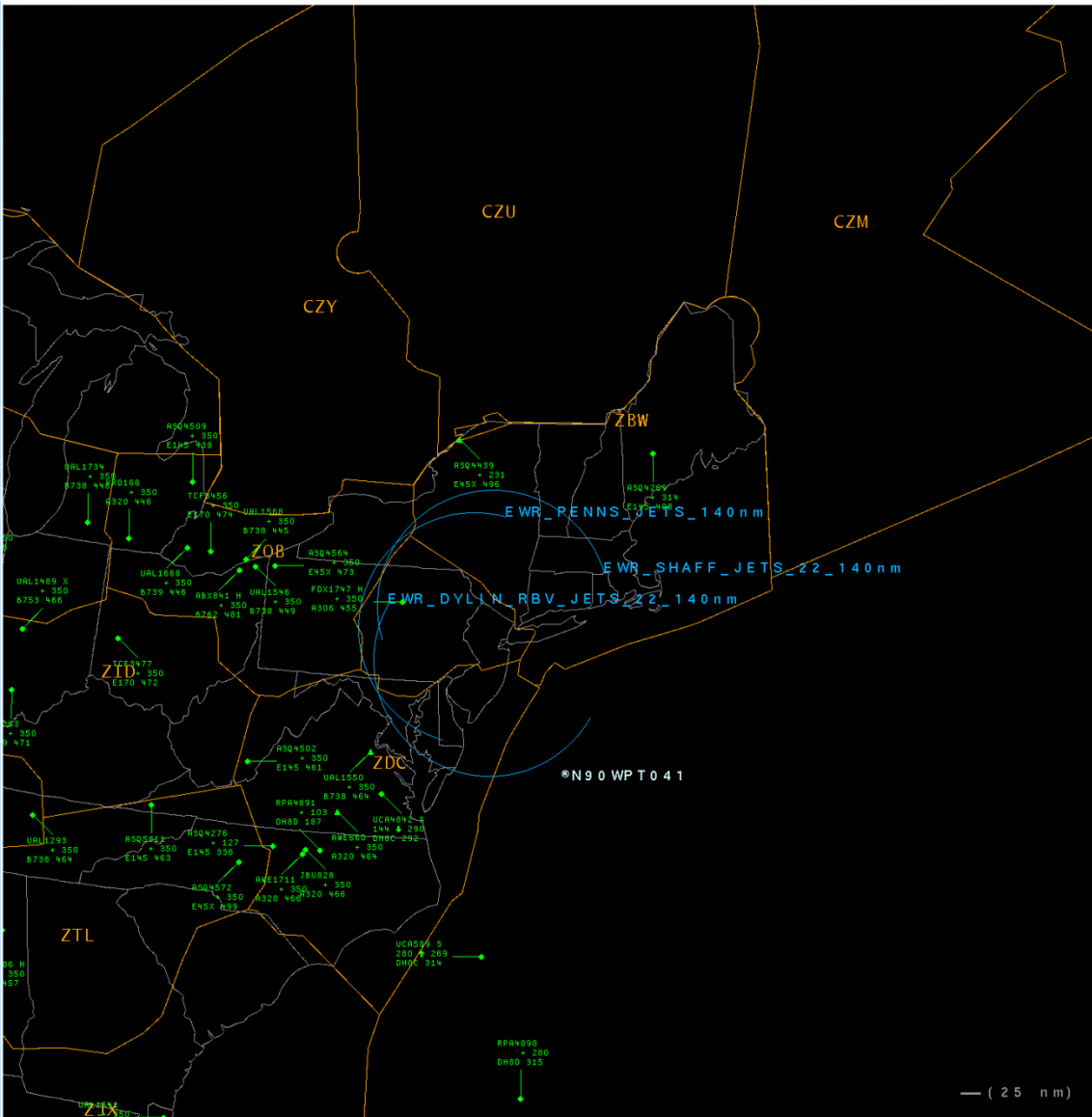


## MACS ERAM emulation / planner display: closeup





# TBFM Display (PGUI, TGUI) with Experimental MFX Freeze Horizons



# Comparison of nCTOP with CTOP



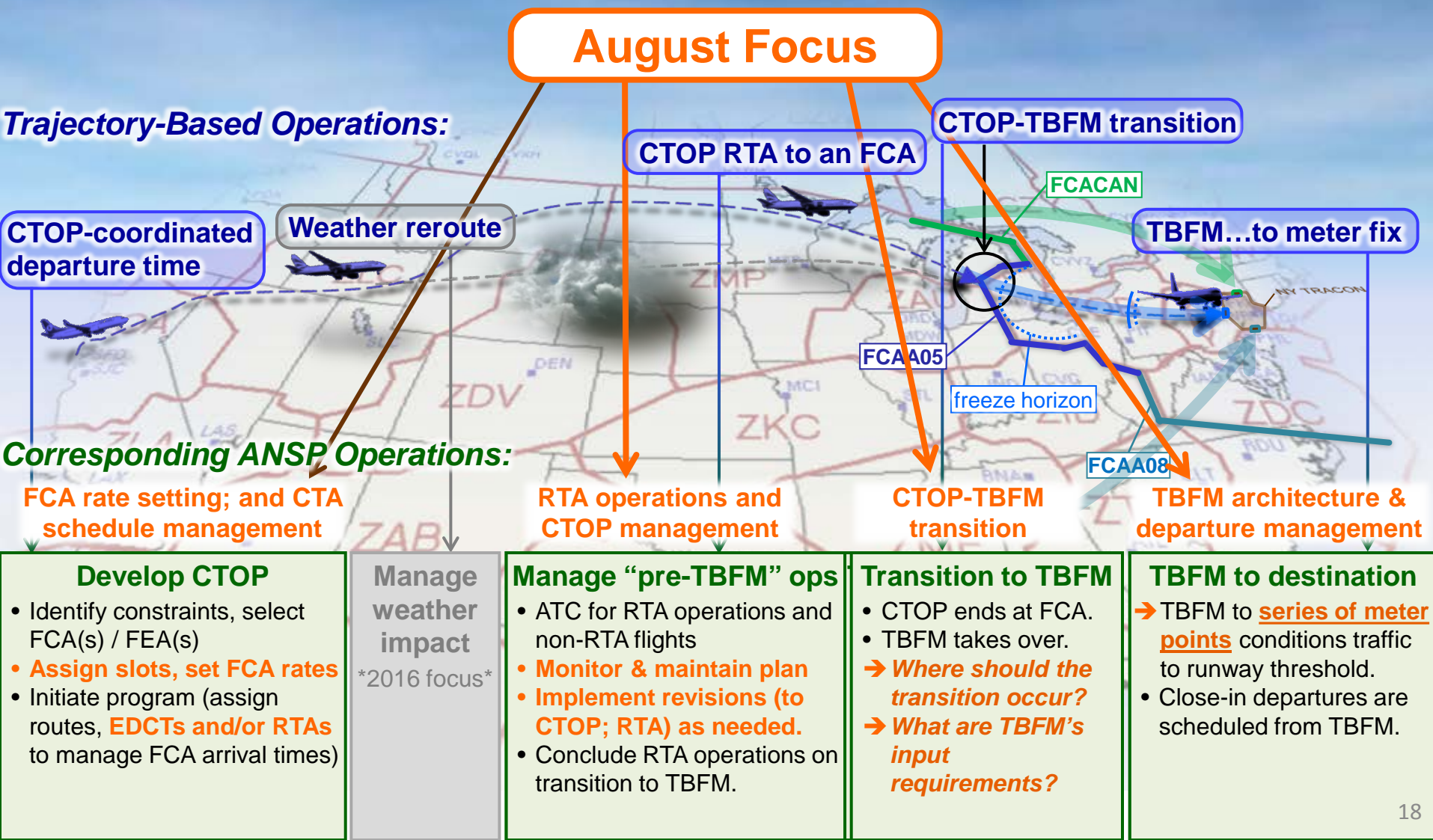
nCTOP



CTOP

# Concept: Integrated Demand Management for NY TBO

Develop an air-ground TBO concept that integrates near-term to mid-term NextGen technologies to manage demand through capacity constrained resources to a capacity constrained airport, with an initial focus on New York operations.



# NY TBO HITL Simulation: Objectives

- Assemble and integrate key components of non-weather IDM concept in HITL environment: CTOP, TBFM and RTA. Conduct initial exploration of IDM operations, including roles and responsibilities, procedures, and tools to gather information for (1) answering open questions about operational concept and (2) support refinement / iteration on design.
- Operational focus: CTOP initiation, pre-TBFM, transition, and TBFM traffic management activities
- Problem focus: successful integration of TBFM-scheduled departures; CTOP use of RTAs and departure times to manage “just right” demand delivery into TBFM

# NY TBO HITL Simulation: Assumptions

- Includes 4-6 traffic management positions:
  - A “Command Center team” responsible for CTOP and upstream (pre-TBFM) flow management (RTA and EDCT coordination and monitoring)
  - A “TBFM team” that includes an EWR TBFM planner/manager (at ZNY or N90) and others to schedule internal departures coming from adjacent Centers
- Scenario begins at approx. noon Eastern
- Clear weather objectives are predictability, equity, throughput, efficiency
- Assume good conformance to scheduled times to begin with (i.e., departure times and RTAs are all within tolerance), then introduce deliberate non-compliant behavior to explore response options

# NY TBO HITL Simulation: Schedule (flexible)

## **Monday, Aug 24 (participants only):**

Initial briefing, followed by full day of training and practice in simulation lab.

## **Tuesday, Aug 25 (FAA observers arrive):**

**AM:** Introductory briefing and discussion, followed by lab demonstration of tools and concept. Final, partial scenario practice session for participants.

**PM:** First long simulation run, followed by debrief and plans for Wednesday.

## **Wednesday, Aug 26:**

**AM:** short briefing, followed by 3-hour simulation run.

**PM:** Debrief discussion, observations, and suggestions / ideas for next day

## **Thursday Aug 27 (additional observers / stakeholders arrive):**

**AM:** Introductory briefing, followed by simulation lab session.

**PM:** Debrief discussion, observations, and suggestions / ideas for next day

## **Friday, Aug 28:**

**AM:** 3 hour run, followed by discussion.

**PM:** Continued discussion and wrap-up.