

FPAW – Weather Forecast Performance Requirements Validation

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FAA

Preliminary Weather Performance Parameters from Functional Analysis³

- 102 preliminary weather forecast requirements based off the Mid-Term CONOPS and NSIP, then fleshed out by TRWG.
- Preliminary performance requirements cover onset and cessation of forecasts with look-ahead times of 1-, 2-, 4-, and 8-hours for Convection, Ceiling and Visibility, and Surface Winds.
- Analyze the performance requirements through a lens of CATM operational decisions (i.e., TMIs and responses).

Weather Phenomenon	Location Accuracy	Timing Accuracy	Probability of Detection	False Alarm Ratio
Terminal Convection	✓	✓	✓	✓
En route Convection	✓	✓	✓	✓
Airport C&V		✓	✓	✓
Airport Surface Winds		✓	✓	✓



³ Heuwinkel, Richard, "Statement of Preliminary Functional Requirements for Weather Information to Support Traffic Management Initiatives," March 2014.



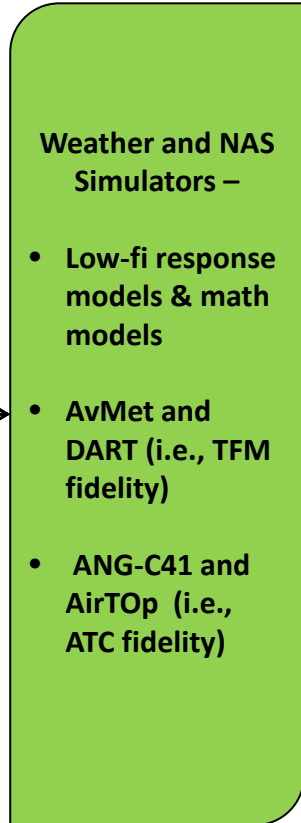
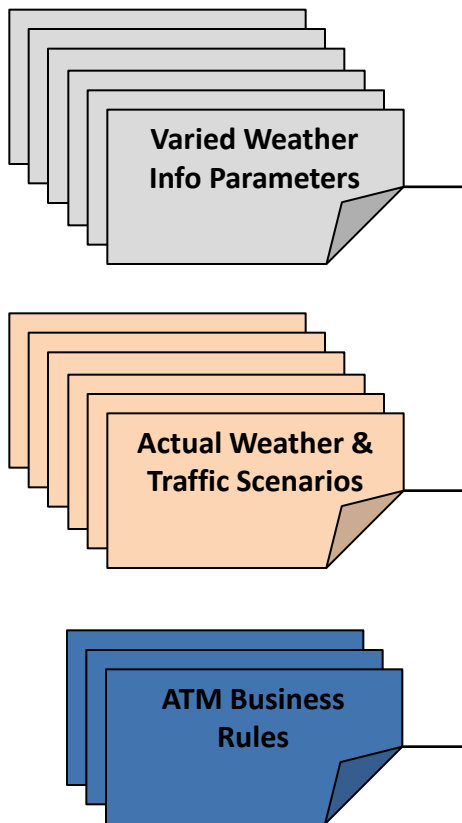
Approach to Deriving/Validating Weather Performance Requirements (Notional Workflow)

Scenario Development

Simulation and Modeling

Analysis of Results

Weather Performance Requirements



NEXTGEN KEY PERFORMANCE INDICATOR AREAS	METRIC
Capacity	Daily Capacity
City Pair	Airborne Time
	Effective Gate-to-Gate
Efficiency	Gate Arrival Delay
	Taxi-In Time
	Taxi-Out Time
Environment	Fuel Burn

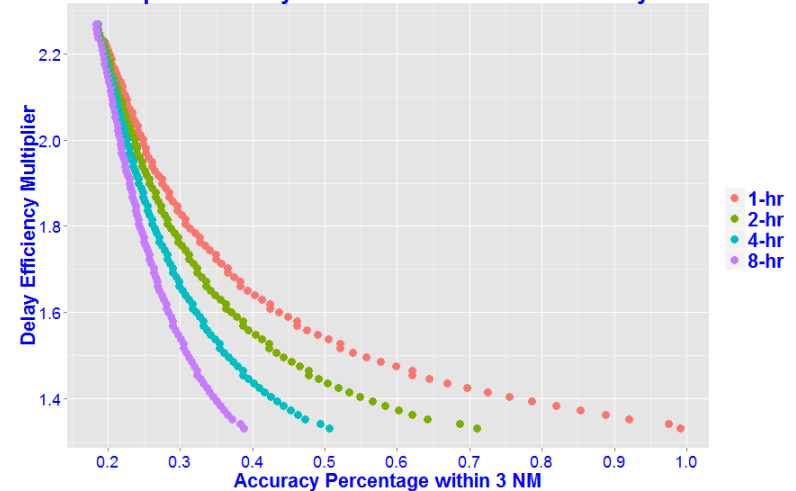
OTHER PERFORMANCE INDICATOR AREAS	METRIC
Airline Schedule	Cancellations
	Diversions
Efficiency	Pre-Departure Delay
	Total Departure Delay
	Arrival Delay
	Distance Flown
Airline Flexibility	Substitution Opportunities
Traffic Management Stability	Airport Program (GDP/GS) Re-planning
	Number of Route Availability Changes



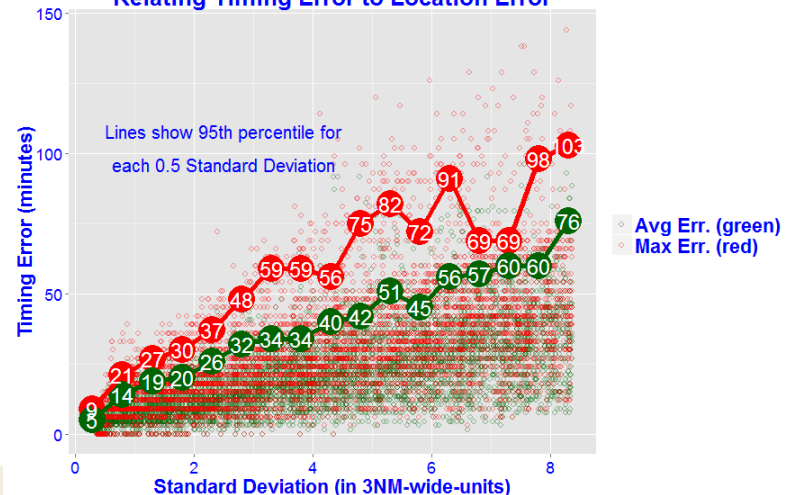
Targeted Outcomes

- Locating an appropriate level of fidelity for each weather scenario/operational efficiency.
 - ✦ Must acknowledge dependencies among forecast look-ahead times.
 - ✦ Incremental planning is a factor.
 - ✦ System that honors previous decisions.
- Must ensure that performance requirements are synchronized.
 - ✦ For instance, within the terminal airspace a moving weather system's location error and timing error are related.

Op. Efficiency vs. Forecast Location Accuracy

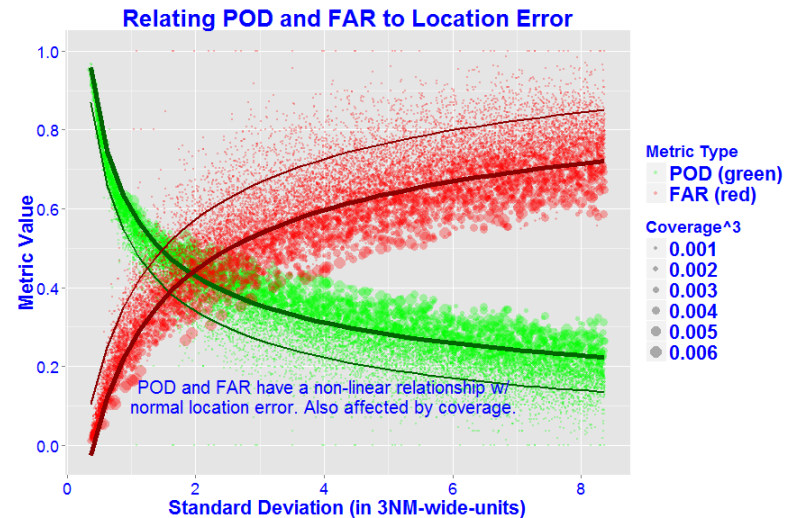


Relating Timing Error to Location Error



Targeted Outcomes

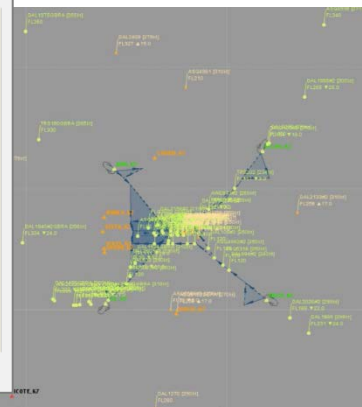
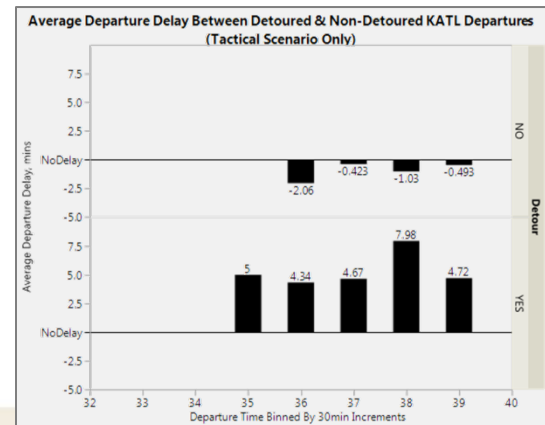
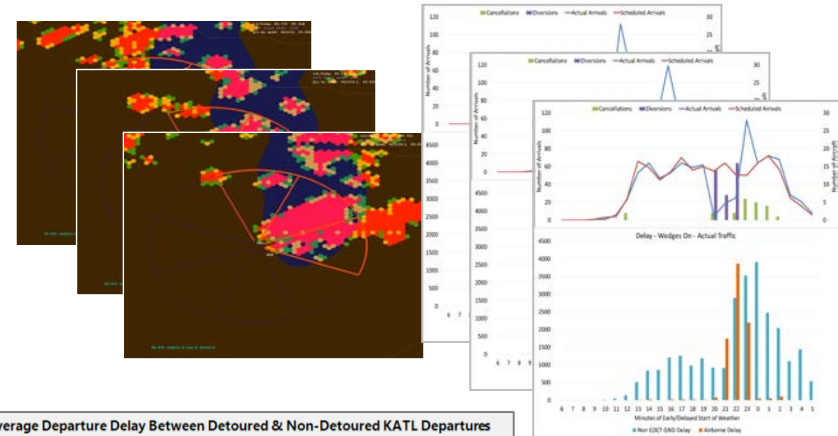
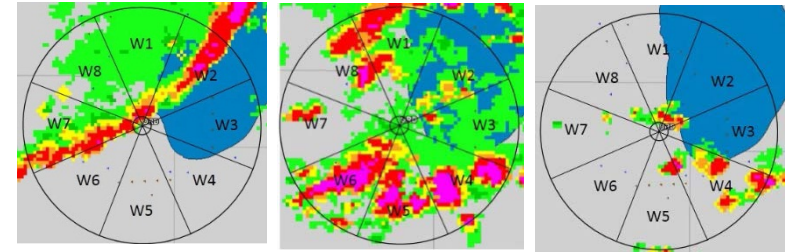
- Understand the relationship between metric definitions (i.e., location error) and established metrics (i.e., POD and FAR).
 - ✦ Acknowledge relationships between POD/FAR and the definition of location/timing accuracy.
 - ✦ Related to weather coverage.
- Design a set of synchronized requirements for each of the weather phenomenon. Requirements include
 - ✦ Location and timing error tolerances.
 - ✦ Target POD and FAR values.
 - ✦ Cast with the appropriate level of fidelity for the CATM WP4 operating environment.



Acc. w/ 3 NM	POD Range	FAR Range	Timing Error
1.00	0.91 - 0.96	0.05 - 0.10	6
0.99	0.76 - 0.81	0.15 - 0.20	8
0.98	0.66 - 0.71	0.22 - 0.27	9
0.96	0.59 - 0.64	0.28 - 0.33	11
0.91	0.54 - 0.60	0.33 - 0.39	12
0.86	0.50 - 0.56	0.38 - 0.44	13
0.81	0.47 - 0.54	0.41 - 0.48	15
0.76	0.44 - 0.51	0.44 - 0.51	16
0.71	0.42 - 0.50	0.47 - 0.55	18
0.67	0.40 - 0.48	0.49 - 0.57	19
0.63	0.38 - 0.47	0.51 - 0.60	20
0.6	0.37 - 0.46	0.53 - 0.62	22
0.57	0.35 - 0.44	0.55 - 0.64	23
0.54	0.34 - 0.44	0.56 - 0.66	25
...

Current status: Generating and Mining Simulated Data

- AvMet developed ~200 scenarios covering CATM operations addressing
 - Terminal convection,
 - En route convection,
 - Airport Ceiling & Visibility,
 - Surface Winds
- AvMet simulating all weather scenarios with DART
- ANG-C41 simulating scenarios with AirTOP covering terminal convection at ATL.
- Preliminary results were delivered at the end of July 2015.



Schedule

