

# Next-Generation Model of the National Airspace System

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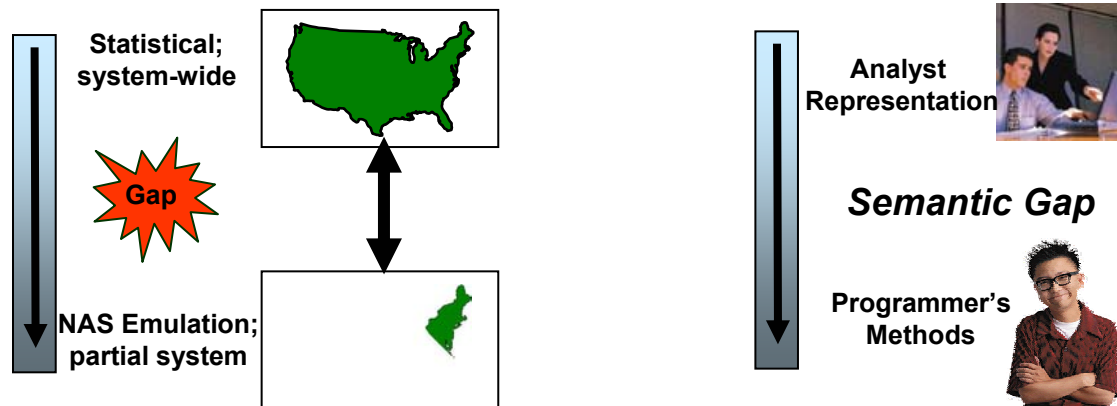
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The logo for the MITRE Technology Program, featuring a stylized graphic of stacked blocks in yellow, orange, and blue on the left, and the text "MITRE Technology Program" in yellow and white on the right.

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# Problem

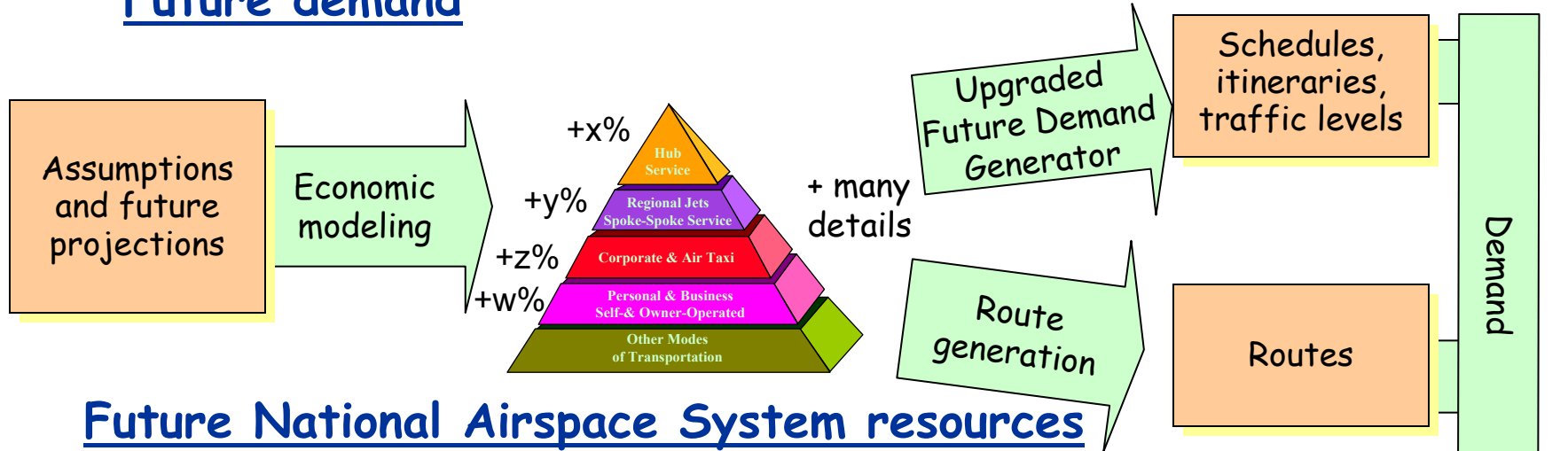
- Need a capability enabling us to answer questions of the form, “What is the system-wide impact of proposed National Airspace System change X?”
  - Example: system-wide benefits and tradeoffs of alternate traffic flow management strategies (different ground delay programs, alternate playbooks, etc).
- Need to bridge the *semantic gap* between aviation analysts and computer programmers



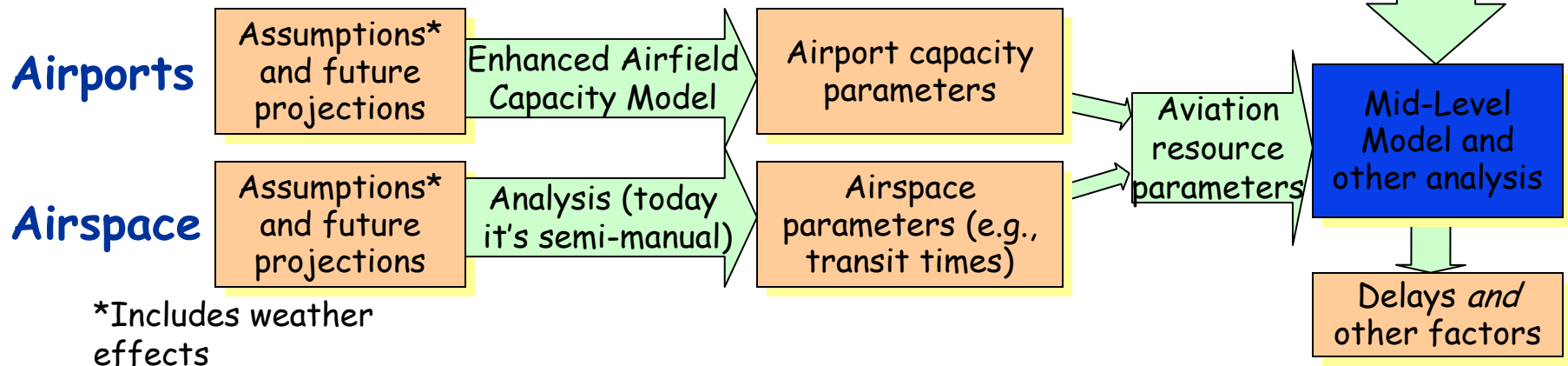
- Need to estimate time tables based on underlying demands for passenger and aircraft operations

# Background

## Future demand



## Future National Airspace System resources

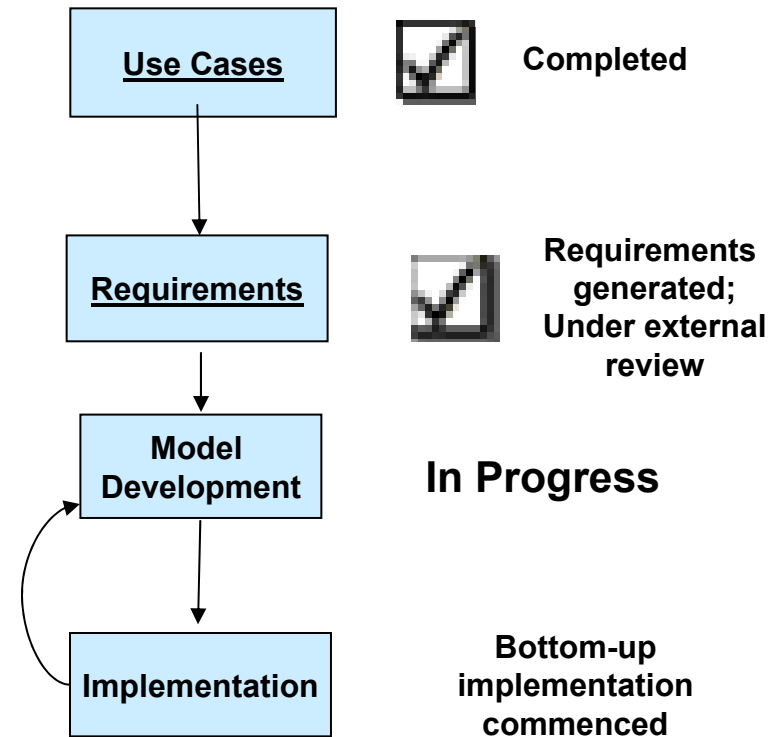


# Objective

- To answer questions about the system-wide impact of proposed changes to the NAS
- To develop a model that is capable of representing the National Airspace System at multiple levels of abstraction: some of it statistical, some of it in detail
- To create estimates and forecasts of:
  - passenger demand,
  - aircraft fleet, including general aviation (GA),
  - route networks
- Using these forecasts, create timetables that will drive air traffic management modeling and simulations for evaluating future National Airspace System operations

# Activities

- Step 1: Solicit “use cases” from analysts in different areas
- Step 2: Generate model requirements from the use cases
- Step 3: Model development
- Step 4: Implement the model (concurrently with Steps 3 and 4)



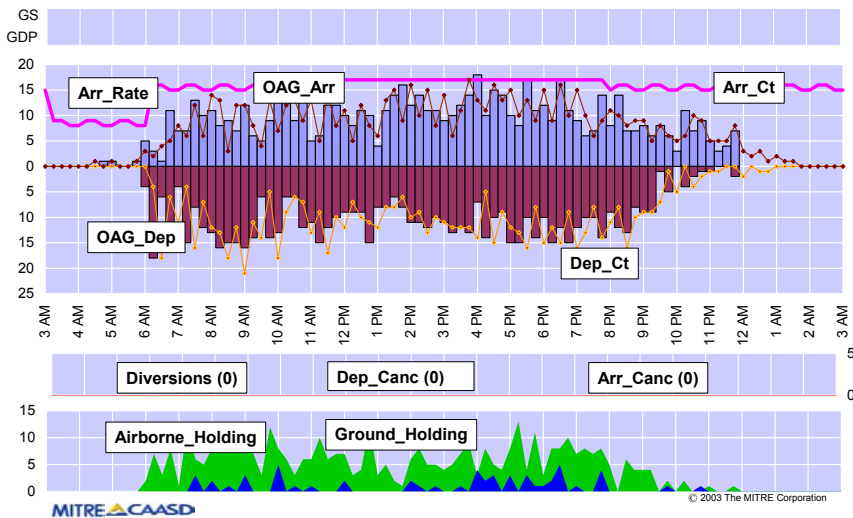
# Highlight

## The Simulated World: Operations at Boston Airport

Mid Level Model: BOS Wed, May 9, 2001  
IAH Scenario

	Late Arr	Departure	Arrival	TMS
	2	1	1	0

% Arrival Ops delayed = 0.12%    Average Lateness = 24 minutes

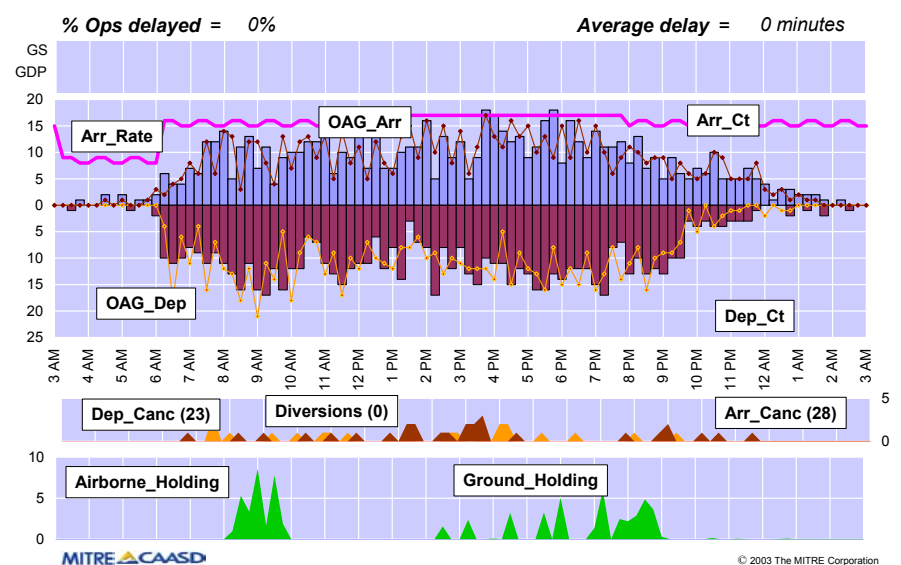


## The Real World: Operations at Boston Airport

BOS: Wednesday, May 09, 2001

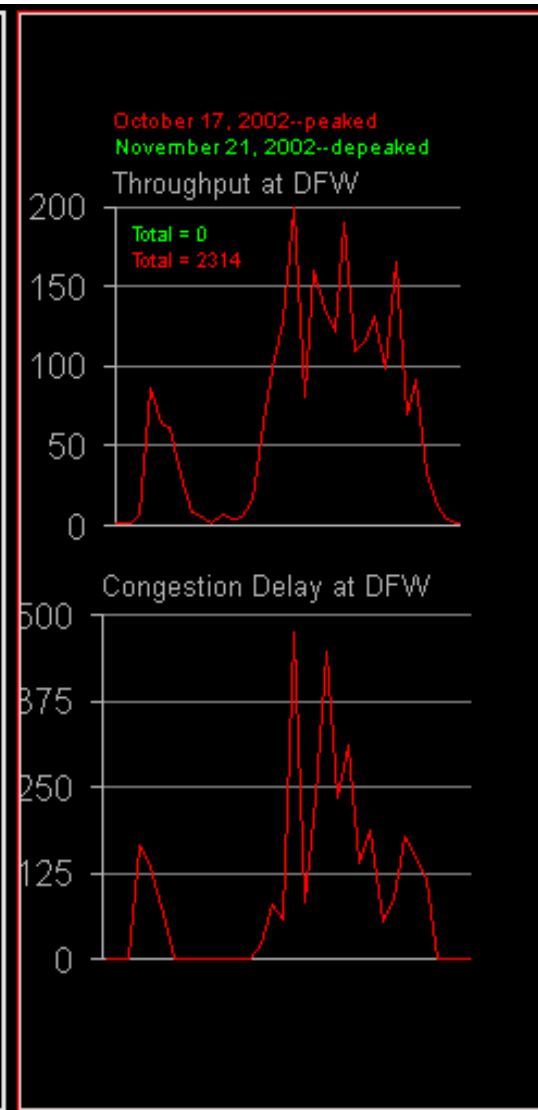
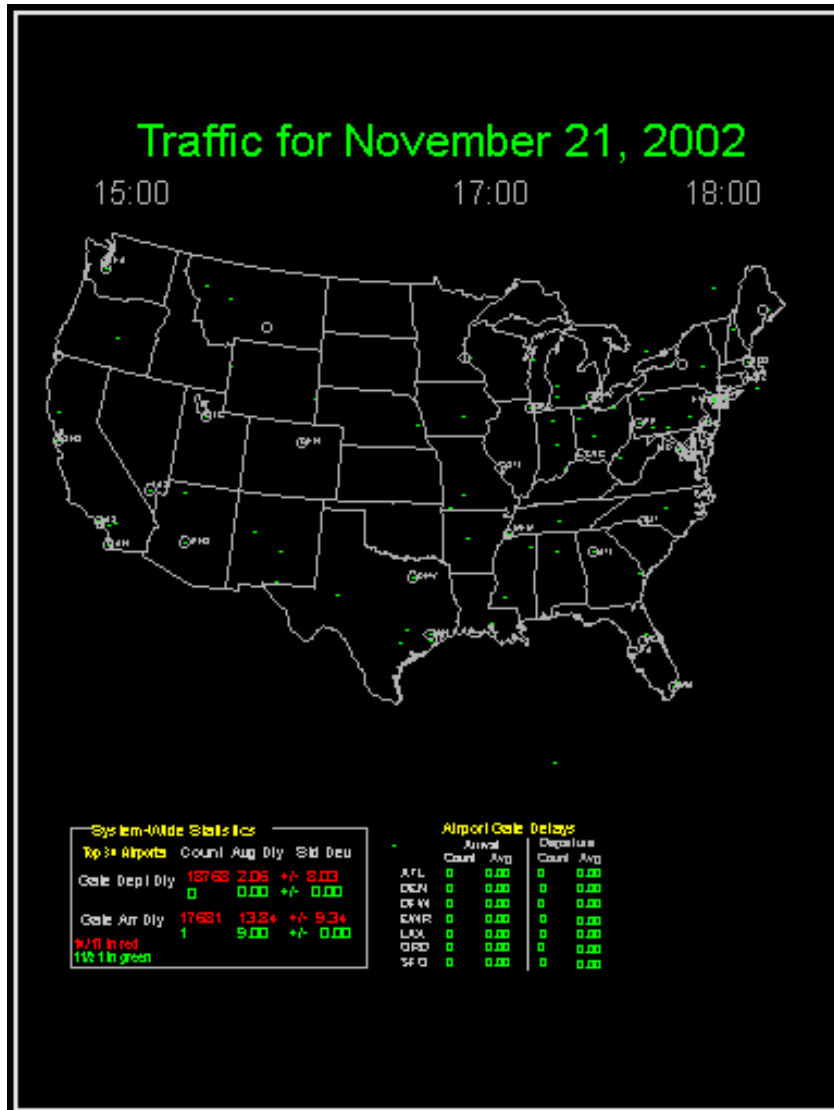
	Delays	Departure	Arrival	TMS
	0	0	0	0

% Ops delayed = 0%    Average delay = 0 minutes



**Validation of models like this one requires comparison of model-produced parameters to real-world parameters. Such comparison is simplified if the model produces results in a format that is a standard format for real data analysis.**

# Demonstration



# Impacts

- Comparison of alternative NAS scenarios is made easier by combining a flexible model with animation capabilities.
- Intuition in the reason *why* a particular change impacts the system is gained by studying the model outputs and through animation.
- Infrastructure improvements, avionics enhancements, procedural changes, and decision-making policies can all be analyzed quickly.
- With the econometric analyses, we will produce better estimates of the operational impacts of possible changes in NAS policies and procedures.

# Future Plans

## Fast, integrated analysis environment



Problem statement, i.e.,  
“Impact of User Request  
Evaluation Tool in  
12 centers?”

Analyst develops  
scenario (few days to  
a few weeks)

Programmer/analyst  
runs model

Results  
reported

## Reconfigurable model development process

