

# Realistic Schedules for Future Air Traffic Scenarios

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MSR

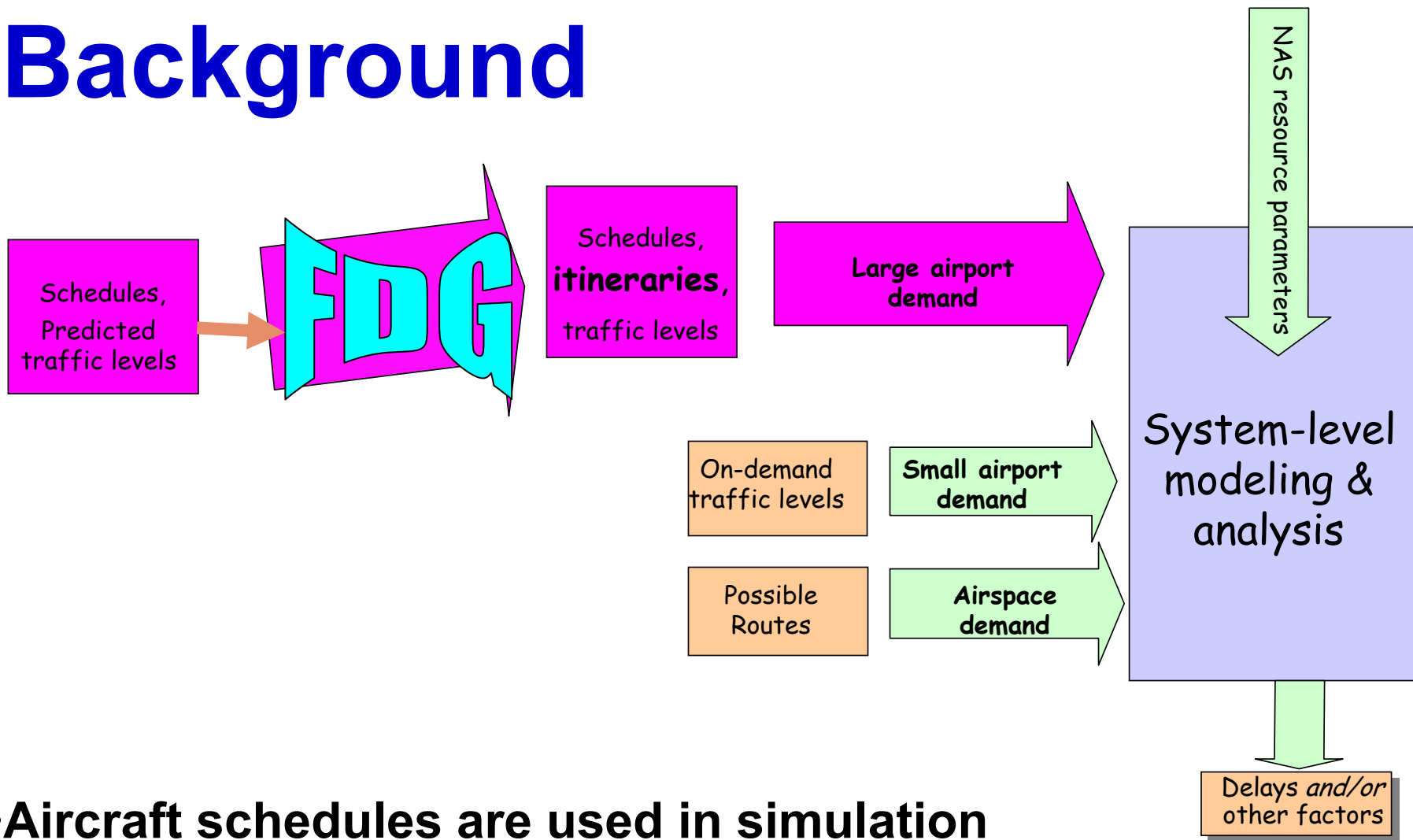
The logo for the MITRE Technology Program, featuring a stylized graphic of stacked blocks in yellow, orange, and blue to the left of the text.

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# Problem

- Different types of air traffic demand are expected in the future.
  - It is difficult to create models that reflect these new types of demand with our current software.
- What does it *mean* to model these new types of demand?
  - What *heuristics* need to be developed to construct AIRCRAFT schedules that reflect changing characteristics of air travel in the future?

# Background

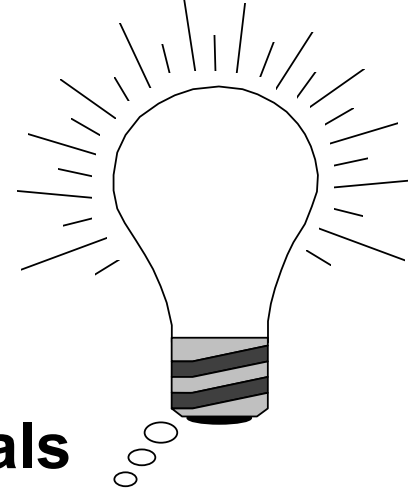


- **Aircraft schedules are used in simulation analyses to propagate delay.**
- **The Future Demand Generator (FDG) is the software used to create aircraft schedules.**

# Objective

- **Determine methods for constructing different types of linked AIRCRAFT schedules that reflect changing characteristics of air travel in the future**

# Activities



## ■ Algorithm development for

1. Facilitating runs for confidence intervals
2. Connectivity: Hub service & Spoke-spoke service
3. New banks & hubs
4. Airline and Aircraft class growth
5. Demand by flight length
6. Schedule generation capabilities based on Future Demand Wheel scenarios

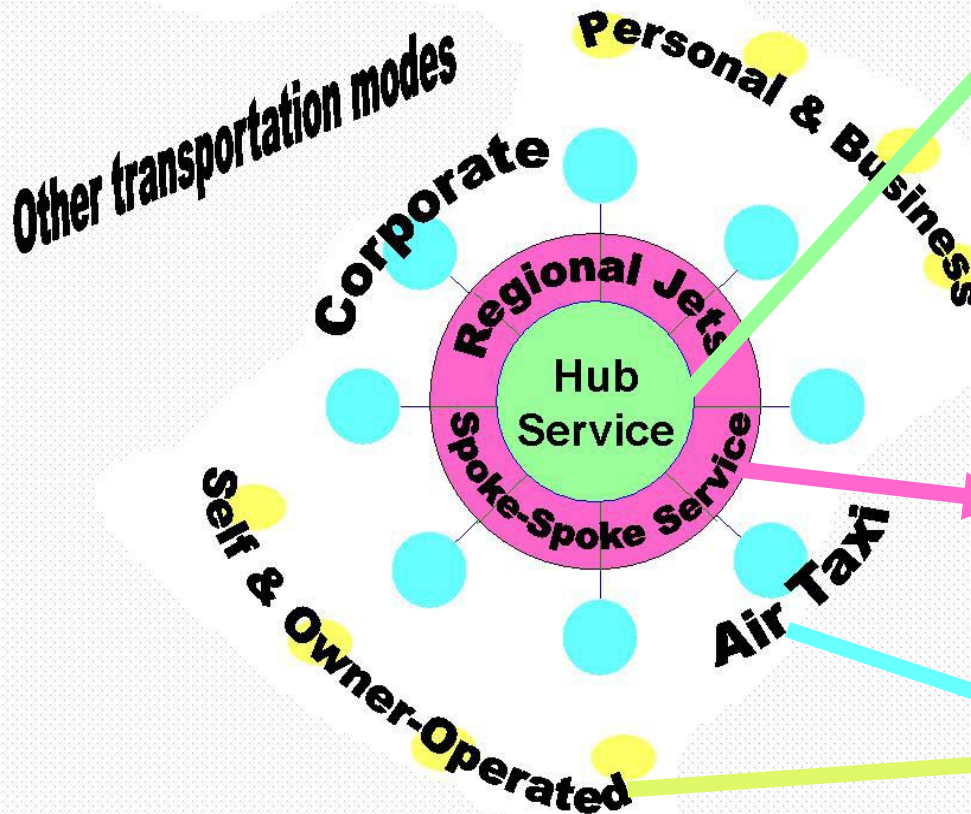
## ■ Programming

## ■ Testing

# Highlight

## NEW CAPABILITIES

### Future Demand Wheel

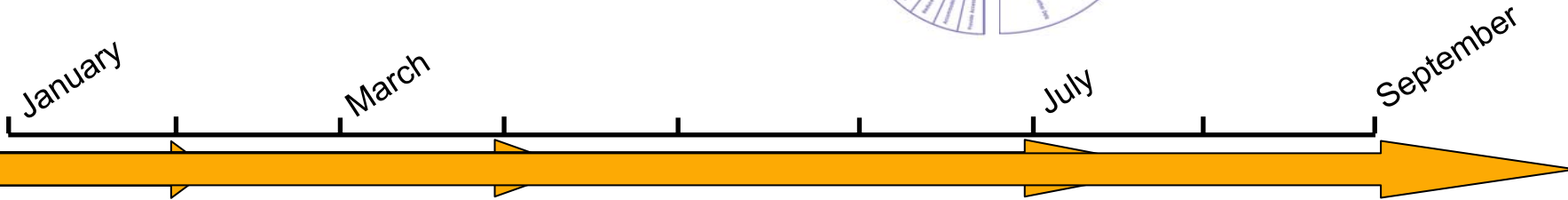
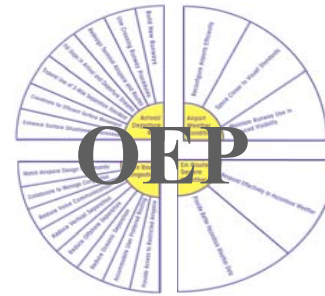


1. Demand between banks and new demand all moves onto banks
2. Demand grows onto existing banks
3. Little change to existing bank structure, non-bank flights adjusted to reduce turn times
4. New flights have point-to-point structure
5. Point-to-point with reduced banks

Unscheduled demand,  
different airspace demand

As transportation moves farther from the hub, future characteristics become less stable, less predictable.

# Highlight



## General NAS Modeling Projects

- Automatic generation of  $n$  itinerary sets (based on different input days)

1. Confidence intervals

- Ability to analyze resulting schedules:

- airport counts
- inter-flight time

Automatic generation of 5 different itinerary sets (based on same input day)

2. Connectivity

## Operational Evolution Plan (OEP) modeling

Special OEP schedule generation capabilities:

3. New banks & hubs
4. Airline and Aircraft class growth
5. Demand by flight length

## Future Demand Wheel

6. Schedule generation capabilities based on Future Demand Wheel scenarios

# Impacts

- **Academic/R&D community**
  - Conference paper on heuristics for modeling increasing hubs and increasing spokes (in progress)
  - Journal article on data needs for heuristics for modeling new types of demand (in progress)
- **OEP studies & other NAS simulation analyses:**
  - Improve the ability to create confidence intervals on results
  - Create the ability to analyze different types of studies
- **Leverages the research investment made in Jet:Wise and Econometrics MITRE Sponsored Research**
- **CAASD Repository System version of Future Demand Generator**

# Future Plans

- Implement methods developed in '02 into CAASD Repository System database
- Process Econometrics MSR output & other data representing GA flights to match modeling format (3rd & 4th layers)
- Enable several output sets of each of the 5 pt-pt=>hub variations by randomization (for confidence intervals)
- Output processing in CAASD Repository System