

Investigation and Support of Integration of Departure Metering Concepts into Surface Capabilities

Project 16

Project managers: Stephen Merlin and Chris Dorbian, FAA
Lead investigators: Hamsa Balakrishnan (MIT) and Tom Reynolds (MIT LL)

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- Airport surface congestion leads to increased taxi times, fuel burn and emissions
- Potential to mitigate adverse impacts through surface congestion management
- Identify opportunities for relatively “light-weight” solutions
- Investigate integration and synergies with Surface Collaborative Decision Making (S-CDM) and advanced FAA surface automation (e.g., TFDM) concepts

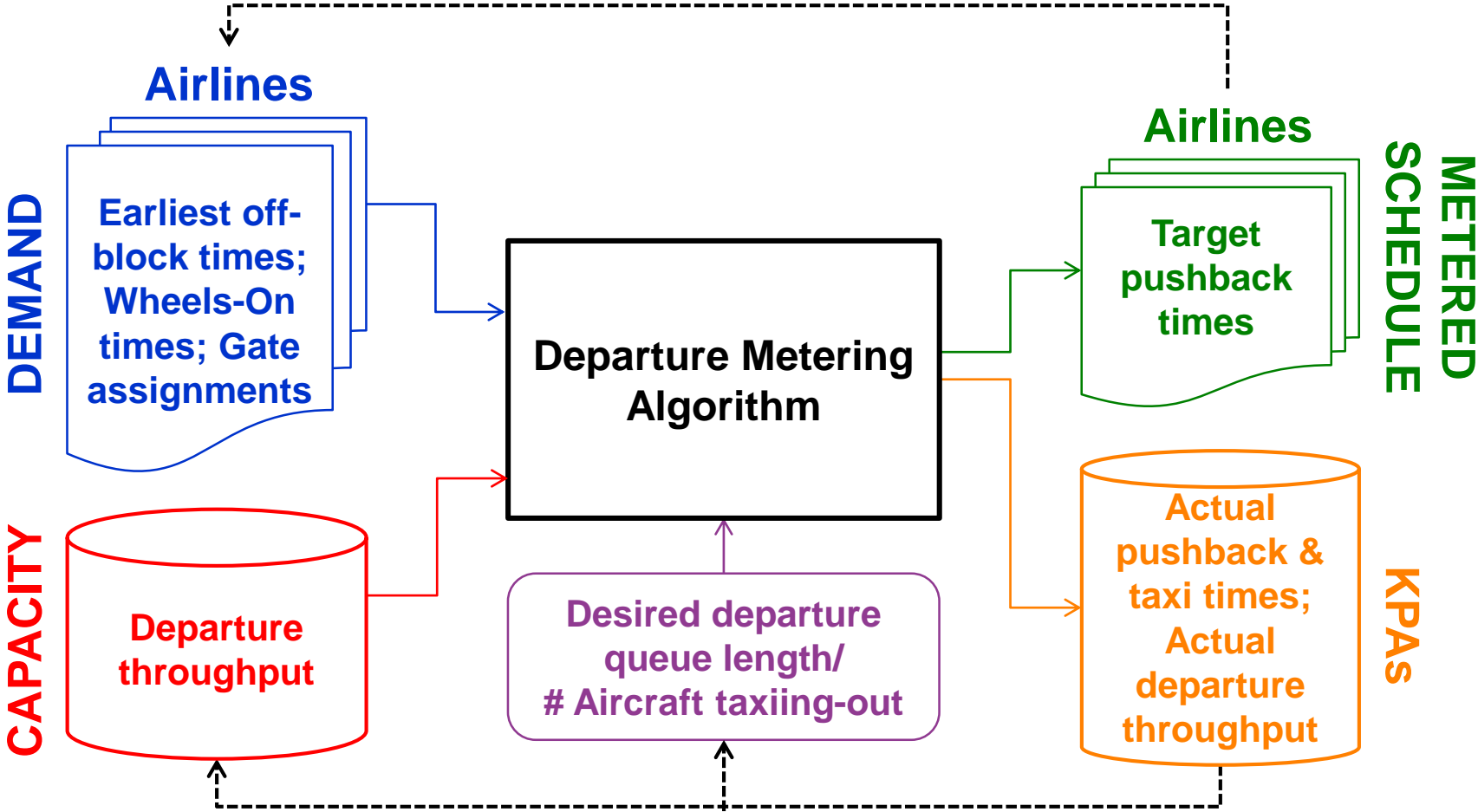
- Incorporation of systematic control techniques into current operational procedures with minimal controller workload and procedural modifications
 - Aggregate control, as opposed to flight-specific control
 - Carefully monitor and address off-nominal events/other issues
- Demonstrate potential benefits (in terms of taxi-out time, fuel consumption and emissions reduction)
- Investigate integration and synergies with Surface Collaborative Decision Making (S-CDM) and advanced FAA surface automation (e.g., TFDM) concepts

Outcomes and Practical Applications



- Outcomes
 - Guidance on operationally-realistic departure metering approaches to inform FAA and other stakeholders
 - Estimates of potential benefits
 - Insights into implementation barriers and opportunities
- Practical applications
 - Support of departure metering in Surface CDM and TFDM
 - Increasing planning time horizon (30-min, 45-min)
 - Target pushback times communicated in advance
 - Uncertainty of throughput predictions increases
 - Increasing time-windows (30-min, 60-min)
 - Rate updated less frequently
 - EOBTs are incorporated
 - Error/uncertainty in EOBTs + conformance to target pushback times

Approach: Interpretation of S-CDM Concept



- Airport characterization methodologies
 - LGA data analysis
 - ASPM, ASDE-X, RAPT
- Algorithm development
 - Modeling and simulation of N-Control impacts at LGA
 - Gate conflict/impact analysis by airline
 - Fairness of gate-holds and taxi-out time savings; pushback/takeoff sequences
- Investigation of integration and synergies with S-CDM and TFDM (ongoing)
- Focus on design of protocols (e.g., time-windows and planning horizons) and impacts of uncertainty

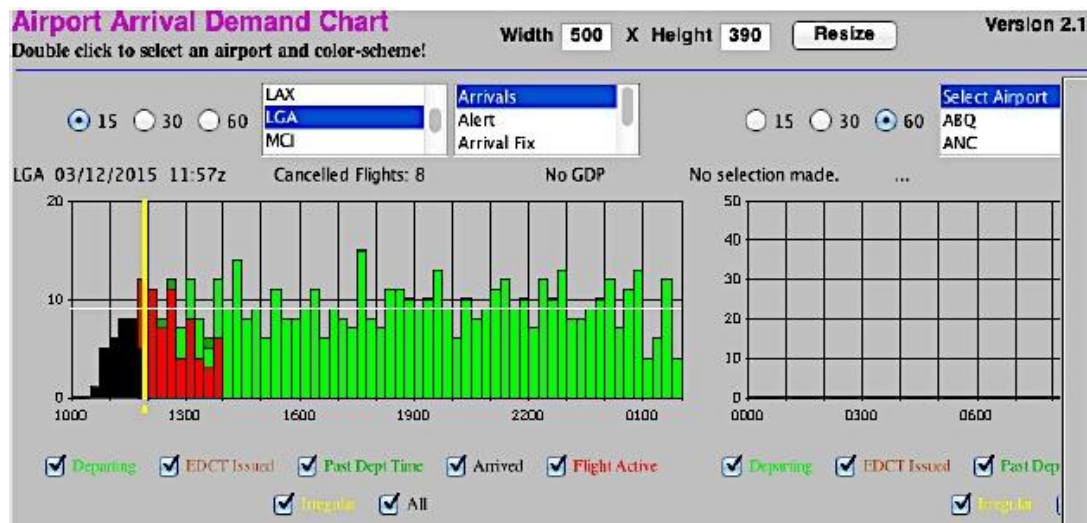
Recent Accomplishments



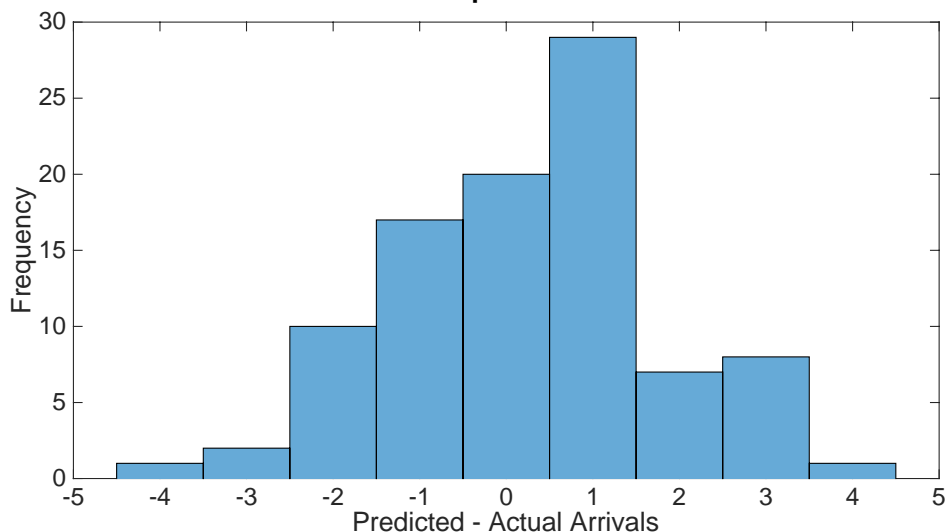
- Simulations of Jul 1- Aug 30, 2013
- Account for runway configuration, RAPT, gate conflicts
- Simulated departure metering (N-Control/Dynamic Programming) over 62 days
 - Choice of time-window (15-min, 30-min, 60-min)
 - Choice of advance planning horizon (0, 15-min, 45-min)
 - Arrival rate uncertainty
 - Departure demand uncertainty
 - Accuracy of EOBT
 - Conformance to recommended pushback times

Recent Accomplishments: Assessment of Uncertainty

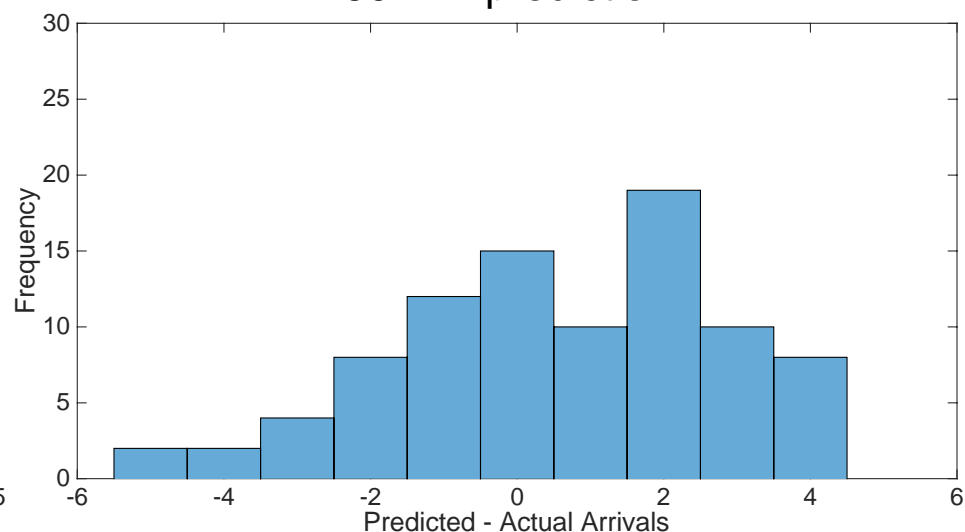
- Arrival rate uncertainty from demand charts
- Departure uncertainty (EOBT/pushback time accuracy): ± 3.5 min



15-min prediction

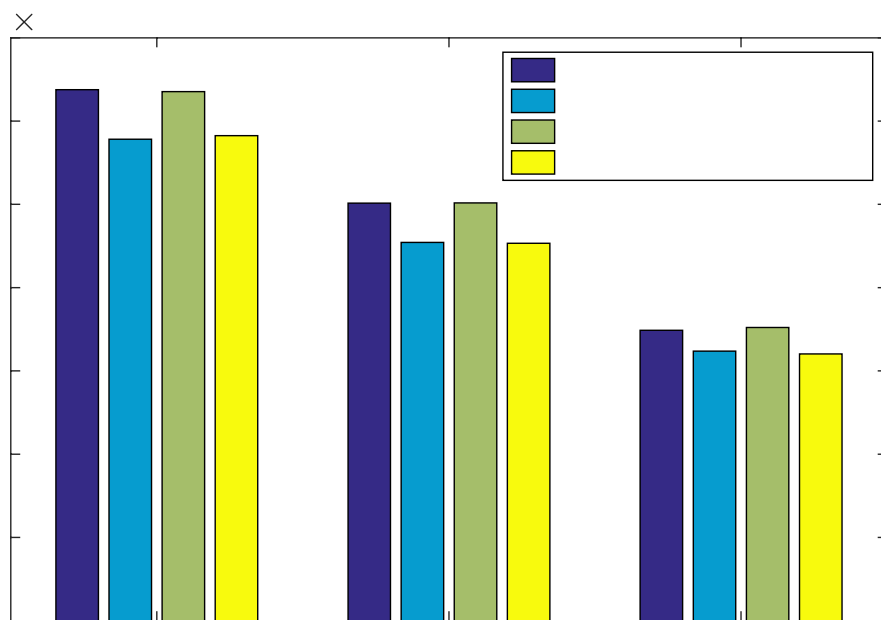


30-min prediction

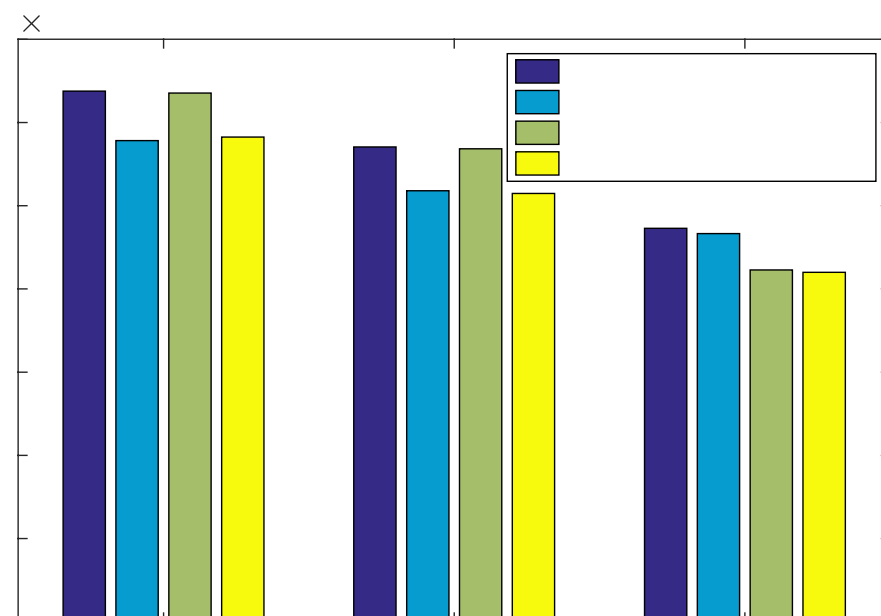


Recent Accomplishments: Impact of Uncertainty on N-Control

- Arrival rate uncertainty from demand charts
- Departure uncertainty (EOBT/push time accuracy): ± 3.5 min



Time-window, no advance planning horizon



Planning horizon, 15-min time-window

- Development of airport characterization methodology
 - ASDE-X analysis
 - Weather (route availability) indicators incorporated into models
 - Discussions with major carriers
 - Refinement of procedures in coordination with facility
 - Development of queuing network simulation model to evaluate departure metering at LGA
- Downstream integration with Surface CDM and surface automation (TFDM) concepts
 - Focus on impacts of uncertainty and information-sharing on the benefits of departure metering