Some Transportation Research in ASAP (with my involvement)

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Overview

• Overview of problems

• Methods
  – Understand the problem, as experts
  – Model the problem
  – Evaluate potential solutions
    • Mathematical evaluation
      – Deterministic problem
      – Stochastic problem
      – Uncertain problem
    • Simulation to handle dynamics
    • Simulation to handle uncertainty
Arrival Sequencing

Obtain good, easily achievable landing sequences

- Separations depend upon aircraft

- Limitations of stacks
  - Costly to take from other than bottom

- Incoming flight paths

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Arrival Stacks

Multiple stacks available
- One flight per level on each
- Usually take from bottom level
  - Can take from bottom three if worthwhile – more workload
- Descend only when next level is empty
- Descent speed faster when two levels below are clear
Sequence-dependent separations:

- Wake vortex – heavier than lighter aircraft is bad
- Routes and speed – keep in-flight separation and avoid excessive downstream workload
A Holding Area (27R)

Consider what can, and should, be done on the ground
Stand hold allocation

- Sequence departures at the stands
- Absorb delay as stand hold
  - Start engines later, save fuel
- Heathrow version – running live since 2012
- Version for less constrained airports in trials
Aim: Reduce environment effect of airports

- Taxi time prediction
- Ground movement
- Improved predictions, fuel saving potential
Allocate stands to improve environmental effects

- Integration: consider effects upon ground movement and runway sequencing
- Restrictions for airlines or aircraft size/type
- Shadowing constraints upon nearby stand occupancy
- Inter-stand pushback or arrival time constraints – scarce taxiway resources
Vehicle Routing

• Considering real-world vehicle routing problems with unusual constraints
When should reserve crew be available to minimise cancellations/delays when some normal crew are unavailable
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