GRASP and TARGETS for Airspace Analysis

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National Airspace Redesign

Terminal Redesign and Optimization
• New Runways
• Consolidation of airspace
• New technologies

En Route Redesign and Optimization
• Accommodate terminal changes
• Volume and workload balancing

Cross Facility Coordination
• National redesign
## Tools Used by CAASD for Airspace Redesign

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Airspace Analysis

• Current toolset has gaps for both en route and terminal modeling
  – En route modeling needs are more challenging
• Combinations of tools sometimes are necessary to support analysis of proposed airspace changes
  – Additionally models can be built from scratch
• Better design tools to be used by design team members helps to create a more streamlined and efficient process
Existing Gaps in En Route Modeling

• Altitude restrictions
  – Erroneous sector counts
    • Modeling trade-offs for existing tools are needed to provide workarounds for existing shortcomings
    • GRASP used to support analysis not requiring delay
Existing Gaps in En Route Modeling (continued)

• Appropriate location for delay
  – Current capabilities suitable for estimating aggregate delays
  – Appropriate location of delay for NAS/Regional/En Route studies more difficult to model

• Traffic Flow Management initiatives
  – There is no accepted workload model in United States
  – To overcome current limitations in modeling the need for Traffic Flow Management initiatives, parametric analysis using controller input can be used
GRAIL Airspace Toolkit (GRASP)

• GRASP
  – Provides tools which allow analysts to quickly examine the impact of changes to airspace and aircraft routes
  – Capability 1: conversion of flight plan to trajectory
    • Includes restrictions, aircraft type
  – Capability 2: report generation
    • Uses trajectories and flight plans
    • SDAT traffic file
    • Sector population history report
    • Airspace boundary crossing report
    • Additional utility reports

• GRASP used to support large scale airspace projects involving changes to routes and altitude restrictions
En Route Analysis

- Simulated en route traffic for playback and analysis
- Adaptation and traffic data
- New routes and altitudes
- 4D trajectories
- SDAT traffic file
- Sector population history report
- Airspace boundary crossing report
- Display and analysis of results
- Conflicts
- Sector counts
- Route time/distance
- SDAT
- MapInfo
- Reroute Insertion Tool

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GRASP Output

- GRASP output used to:
  - Baseline and alternative sector counts
  - Alternative route depiction
  - Fix loading
  - Sector count differences
  - Flight time and distance differences
  - Traffic animation
Shortcomings for En Route

• No tool able to collectively address each shortcoming
  – If multiple tools used, changes in airspace design may need to be updated in each model
• However, workarounds for current en route modeling gaps still exist for
  – Altitude restrictions
  – Appropriate location for delay
  – Traffic Flow Management initiatives
Terminal Modeling Issues

• Existing toolset has limitations for terminal modeling needs
  – Holding
  – Paired operations
  – Ground movement

• Many limitations can be overcome
  – Workarounds
  – Post processing of data
  – Building models from scratch

• These efforts can be costly
Terminal Area Route Generation Evaluation and Traffic Simulation (TARGETS)

- GIS capability tailored to procedure and airspace design and analysis
- Full Procedure Builder
  - En Route, Common, and Runway Transitions
  - SIDs, STARS
- Used to design arrival and departure routes
  - May be adequate to determine feasibility of new design if delay is not important
  - Designs can be used to input into other tools
    - TAAM
    - SDAT
Terminal Area Analysis: 
*No Delay Analysis Needed*

- Simulated traffic on arrival and departure routes for analysis
- Adaptation and traffic data

**TARGETS**

**SDAT**

- Conflicts
- Sector counts
- Route time/distance
Terminal Area Analysis: 
Delay Analysis

TARGETS

- Simulated traffic for playback
- Arrival and departure routing definitions

EACM

- Runway usage and traffic levels

TAAM

- Delays
- Conflicts
- Sector counts
- Route time/distance