

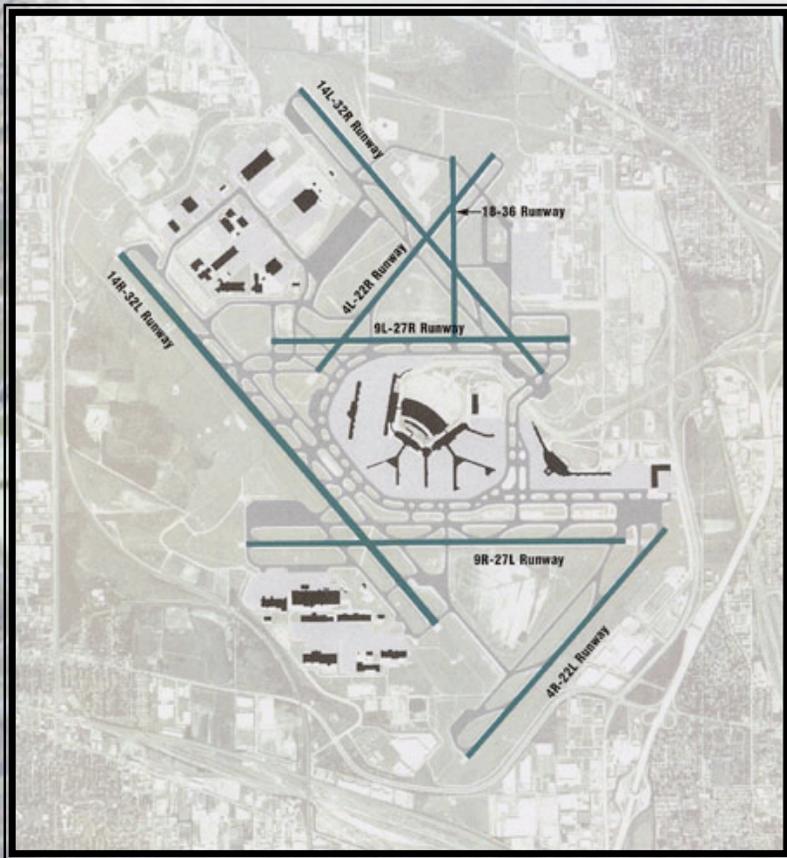
An aerial photograph of an airport terminal and surrounding runways, overlaid with a semi-transparent simulation grid. The simulation shows various flight paths and aircraft positions across the airport's infrastructure.

Operational Insights Gained During a Real-Time Simulation of the O'Hare Modernization Program Airport Layout

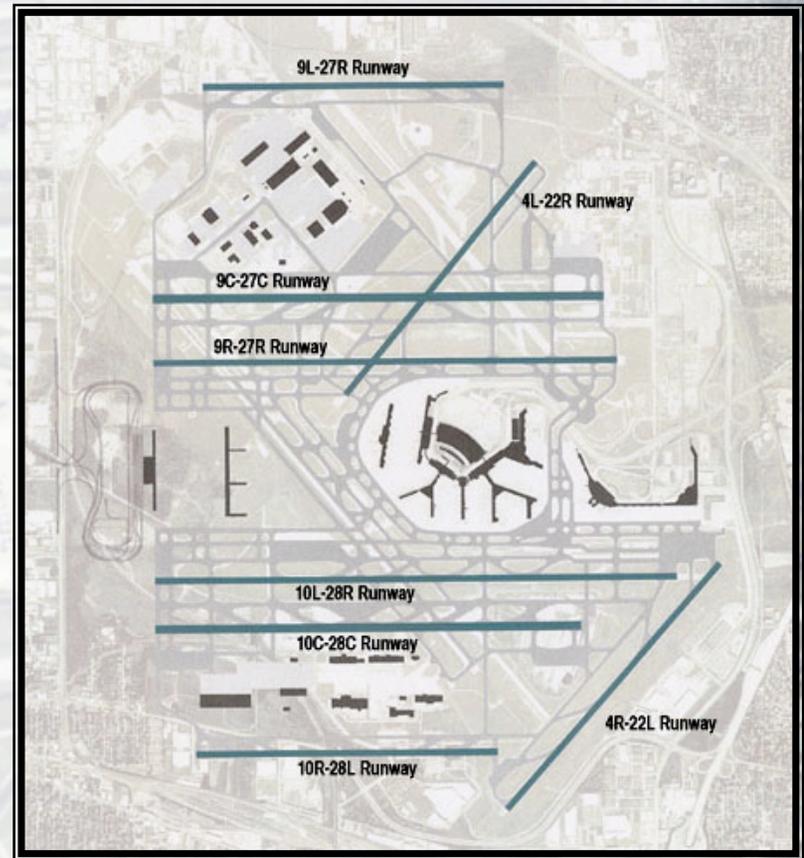
Michael D. Madson
NASA Ames Research Center

FAA/NASA/Industry Airport Planning Workshop
Breakout Session #3 - Modeling and Simulation Solutions
Sept. 12th, 2006

OMP Airport Layout Plan

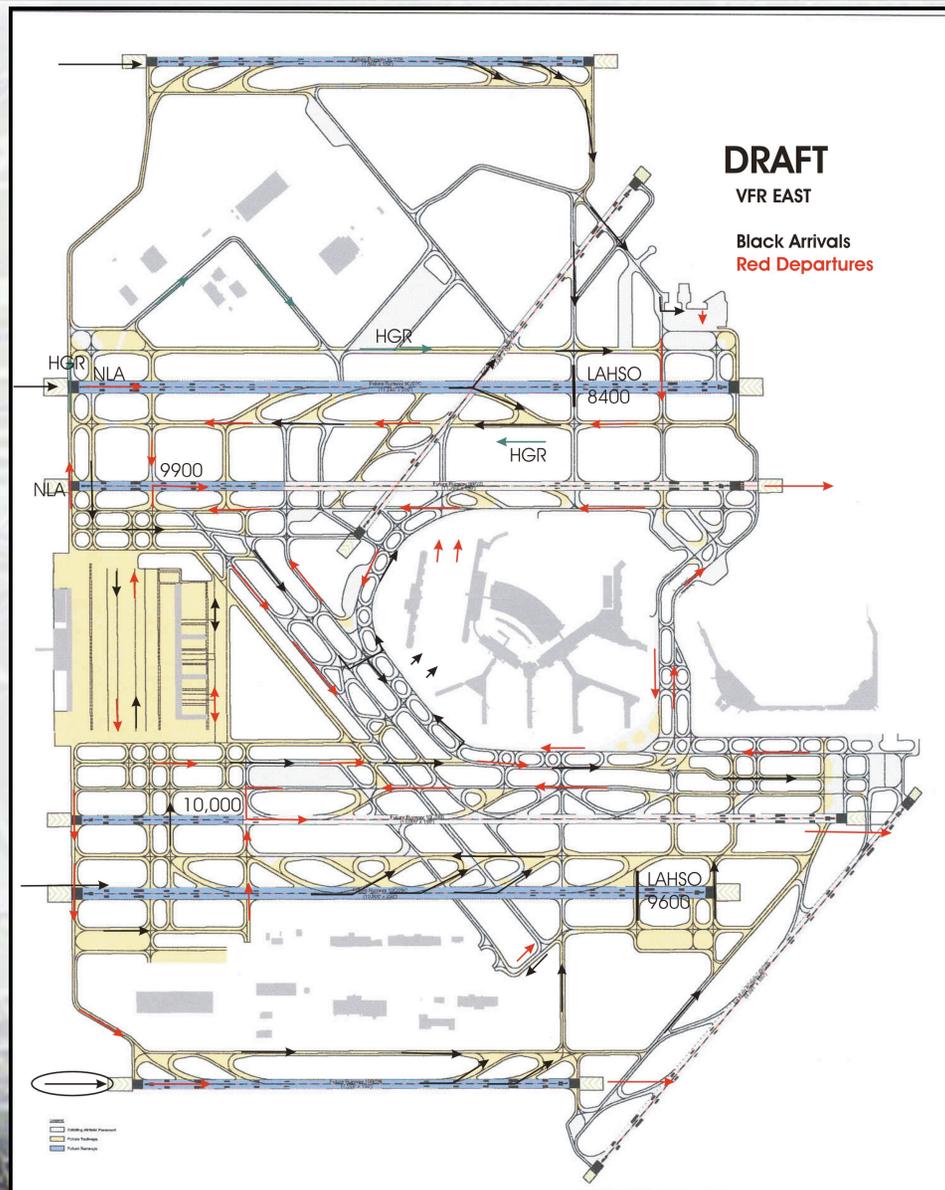


Existing O'Hare Layout



OMP Airport Layout Plan

Traffic Flow – VFR East



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What is FutureFlight Central?



- Real-time air traffic control tower simulation facility
 - 360° presentation, 3-D high-resolution graphics
 - Able to simulate peak traffic operations at largest airports
- Supporting capabilities
 - DBRITE and ASDE displays
 - Digital audio communications
 - Complete audio/visual and surface data-collection



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Simulation Objectives

- Refine controller work loads and areas of responsibilities
- Evaluate center platform, controller positioning in tower
- Evaluate coded taxi-routes and double taxiway letters
- Identify airport chokepoints, develop mitigation strategies

Simulation Development

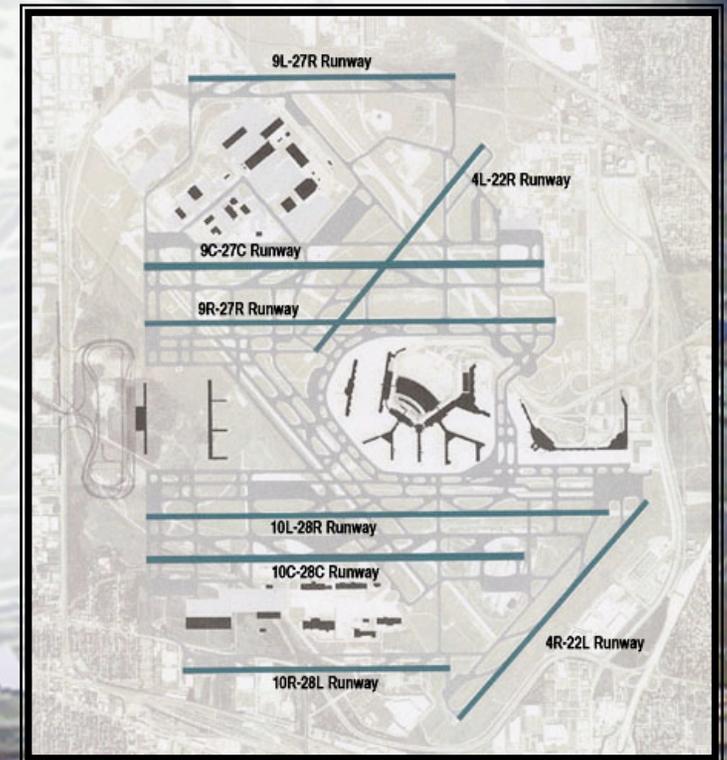
- Simulation Description
- FFC Tower Set-Up
- Graphics/Visuals
- Training
- Data Collection



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Simulation Description

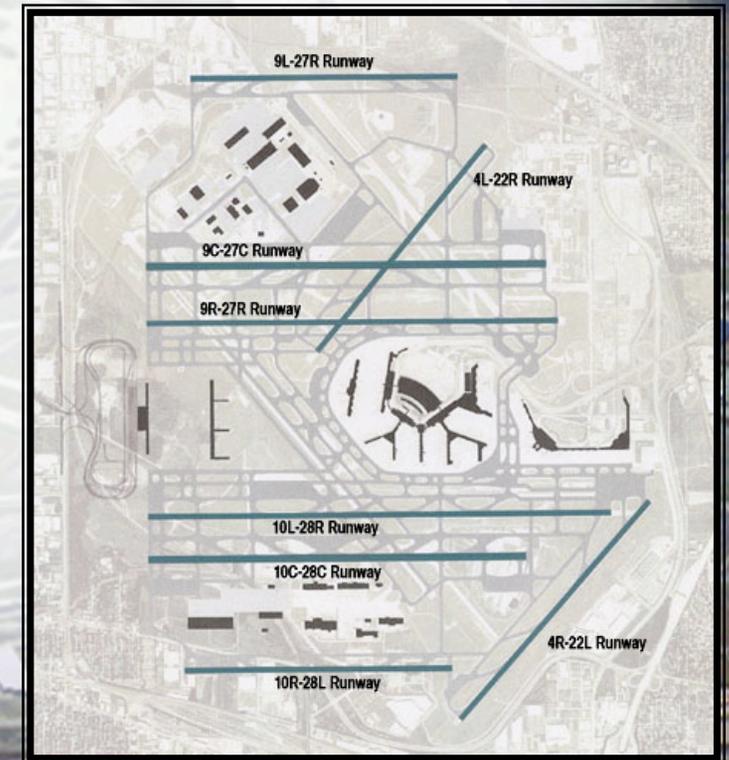
- Operations simulated for OMP Airport Layout Plan
 - Center tower operations
 - Running 2018 (Build+5) traffic based on TAAM simulation
- Traffic scenarios
 - VFR, West flow and East flow
 - IFR, West flow and East flow
- Two days of training for ORD controller team
- Five days of data-collection runs - 20 runs total



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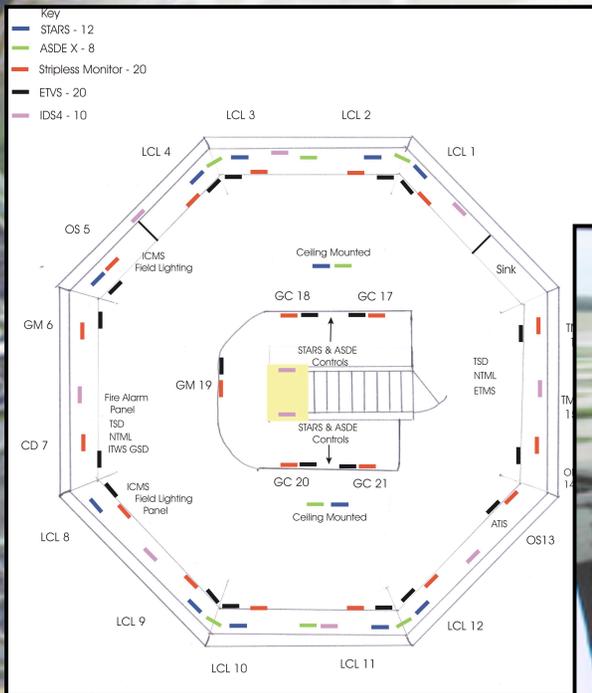
Simulation Description (cont'd)

- Controller staffing configurations
 - Config. #1 - Focus on Ground Control operations
 - Four ground controllers
 - Two local controllers
 - Config. #2 - Focus on Local Control operations
 - Two ground controllers
 - Four local controllers
 - Traffic “automated” through “uncontrolled” areas of the airport
 - Pre-defined routes deliver aircraft to “controlled” areas of airport
 - Sim-pilots shepherd traffic in “uncontrolled” areas



FFC Tower Set-up

- Center platform designed and built to support simulation
 - Based on proposed concept for ORD tower
 - Opportunity for controllers to evaluate concept



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Graphics and Visuals

- Isometric view of new O'Hare ALP visual database



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Graphics and Visuals (cont'd)

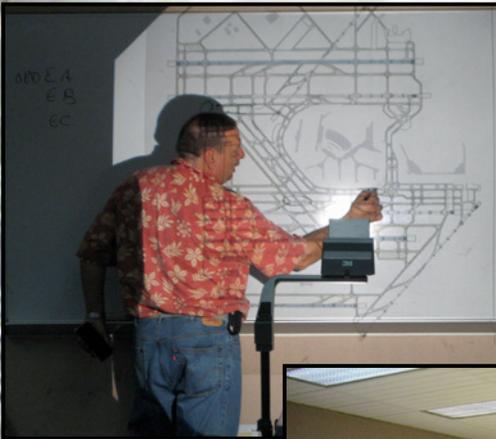
- Partial out-the-window view from FFC tower



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Sim-Pilot Training

- Group of 25 hired for project - all had aviation and/or sim-pilot experience
- 16 pilot stations operated - most ever for a simulation
- Received 18 days of training over 6-week period

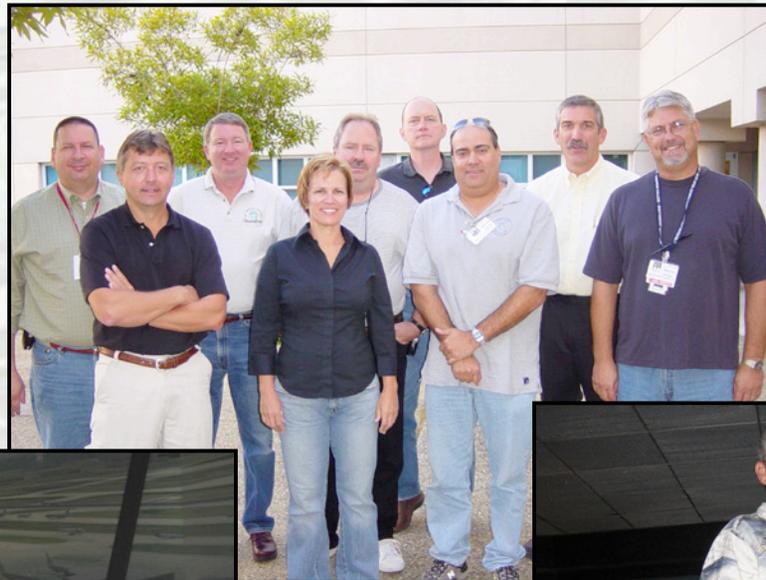


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ORD Controller Training

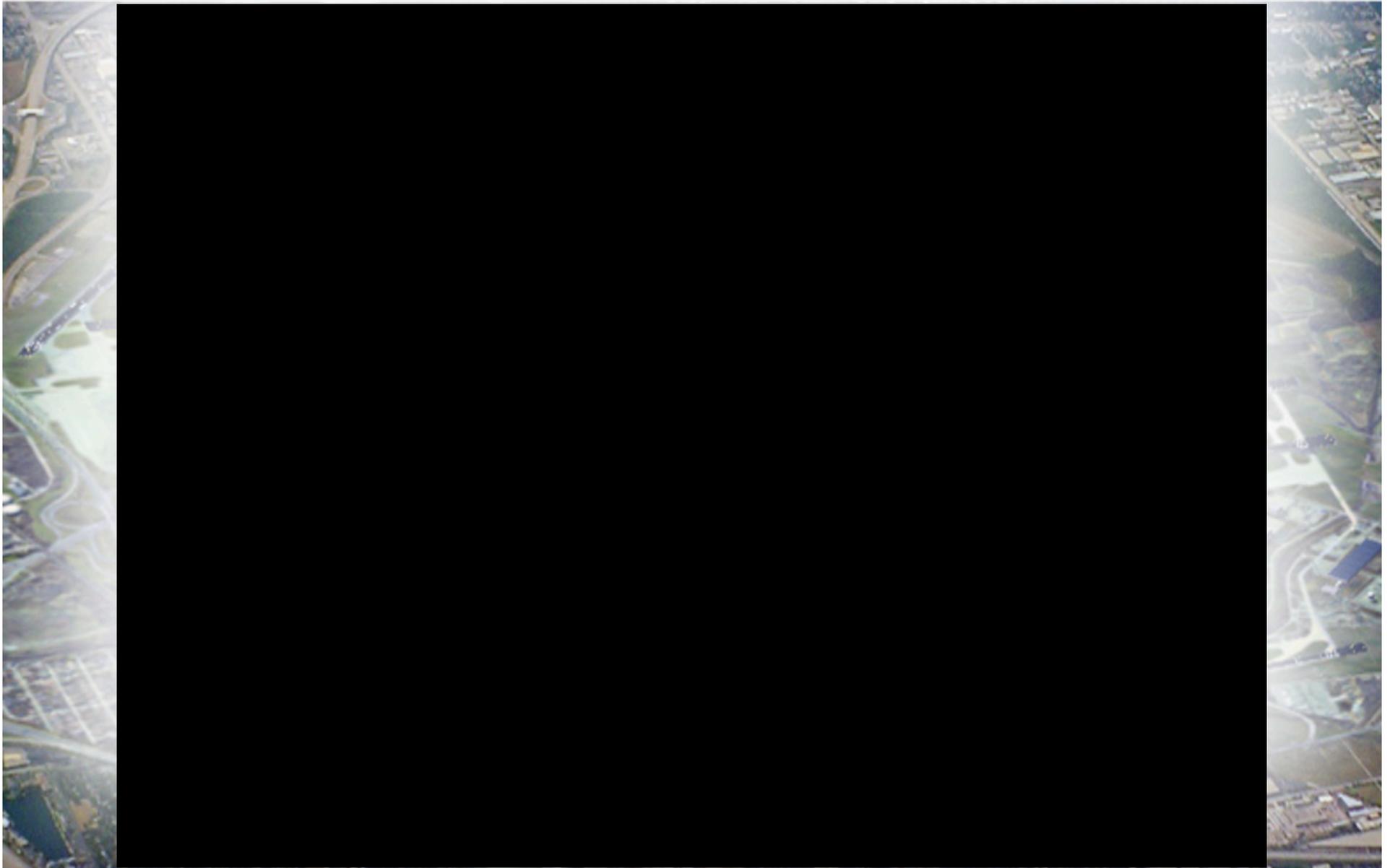
- Participating ORD controllers
 - Nine participants for the simulation
 - All received 2 days of classroom instruction (at ORD) on the new ALP
 - Each spent at least 5 days at FFC as controllers during sim-pilot training



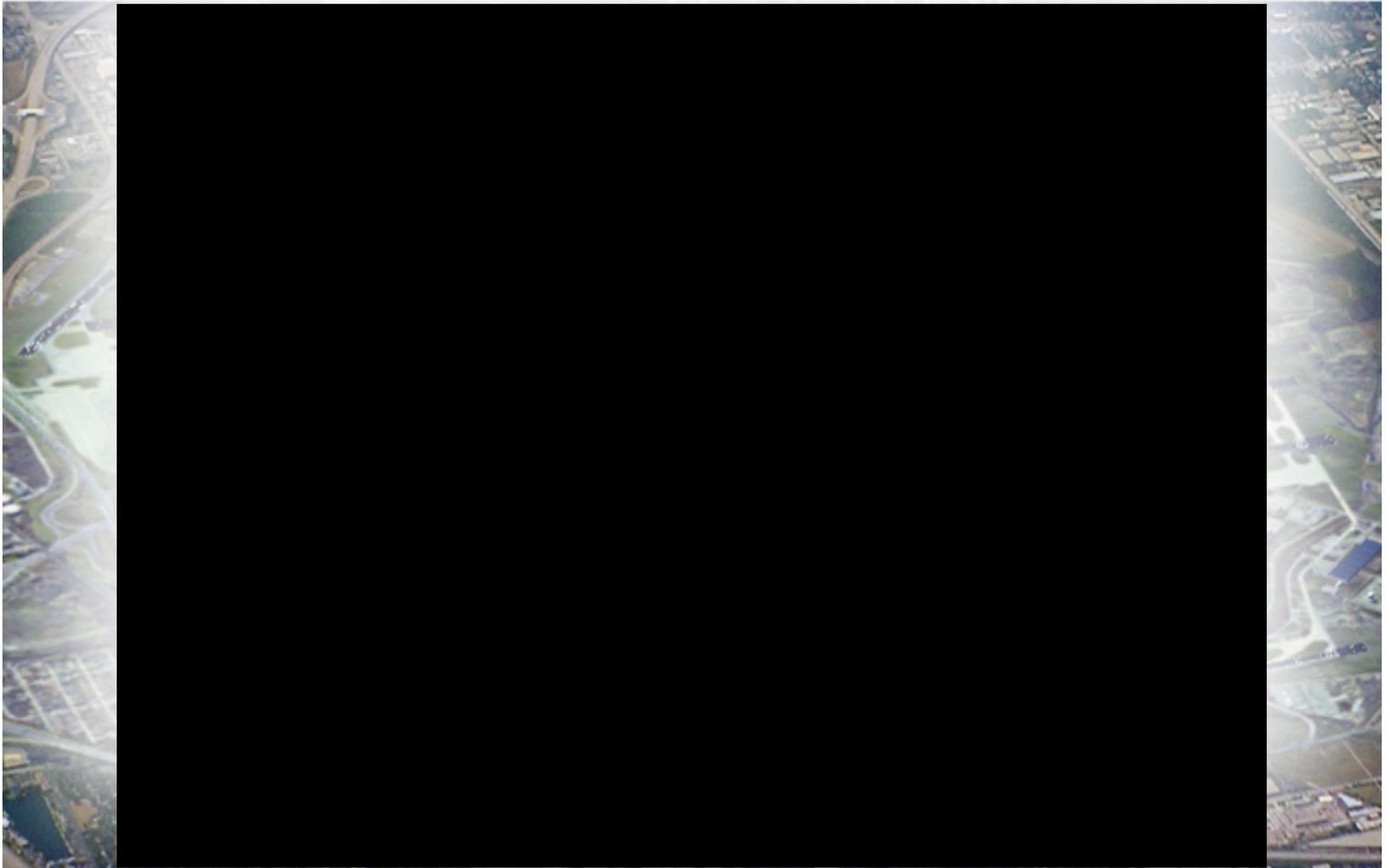
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Simulation Activity - FFC Tower



Simulation Activity - Sim-Pilot Room

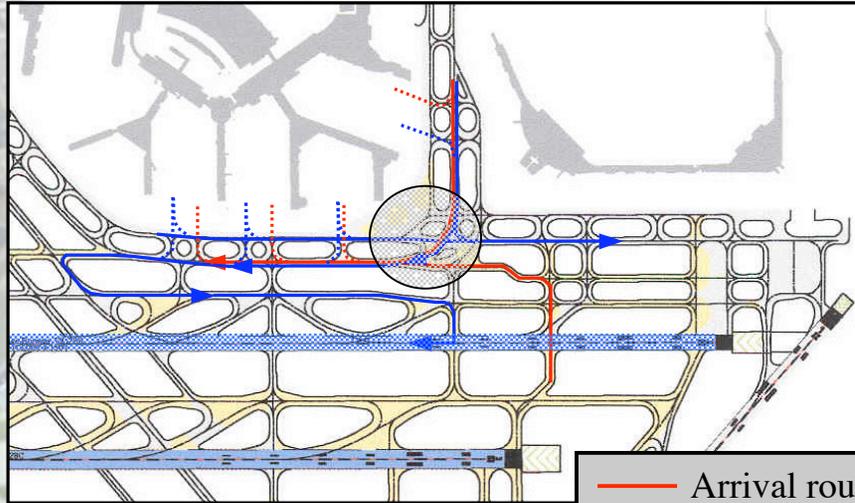


Data Recorded/Collected

- Audio
 - Pilot/controller communications digitally recorded
- Video (recorded on DVDs)
 - Ground control activities on platform
 - Local control activities on each side
- Controller data
 - Surveys after each run
 - Debriefs (audio recordings)
- Webcast of tower activities



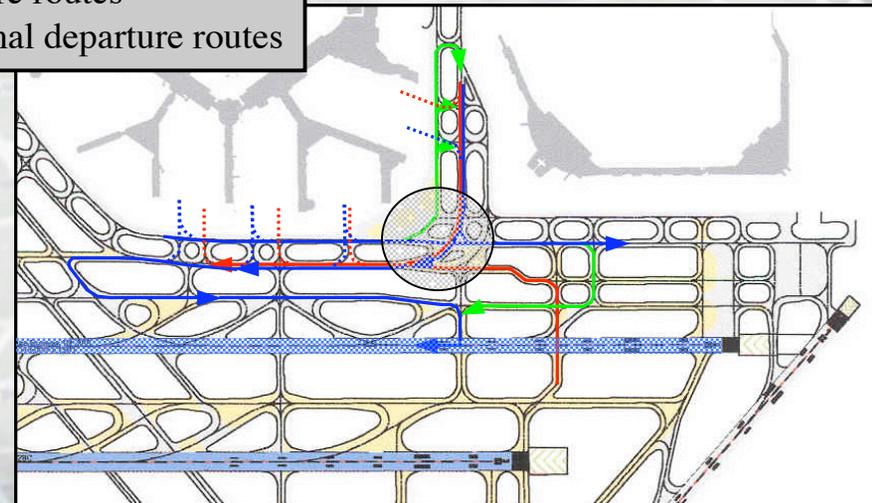
Chokepoint Mitigation - West Flow



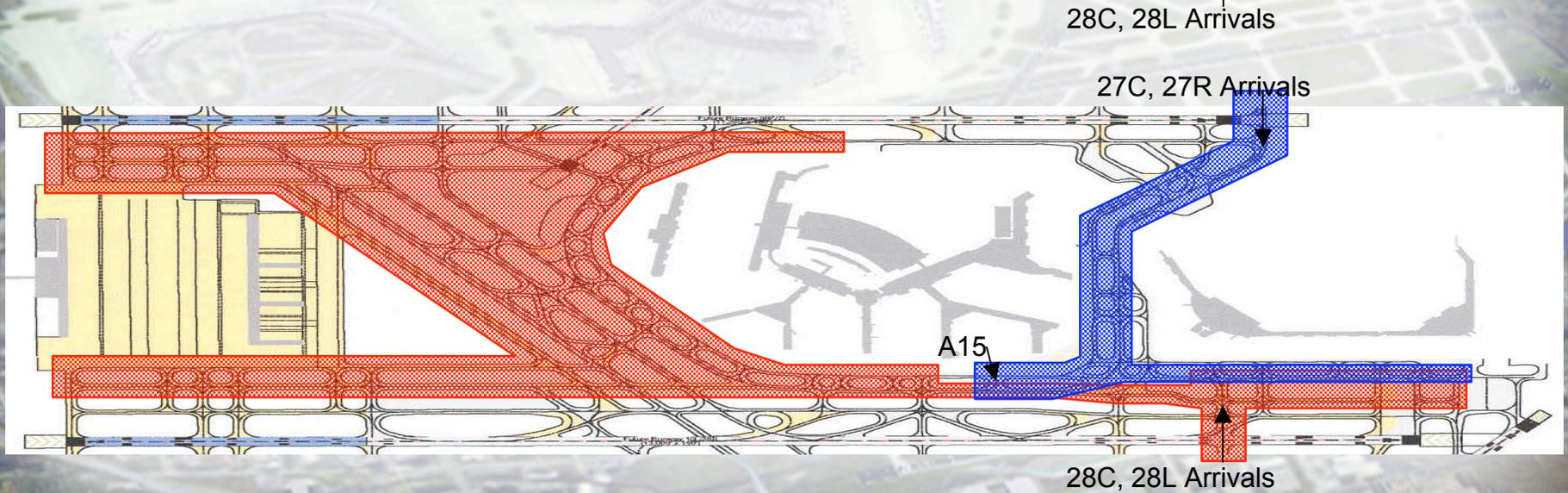
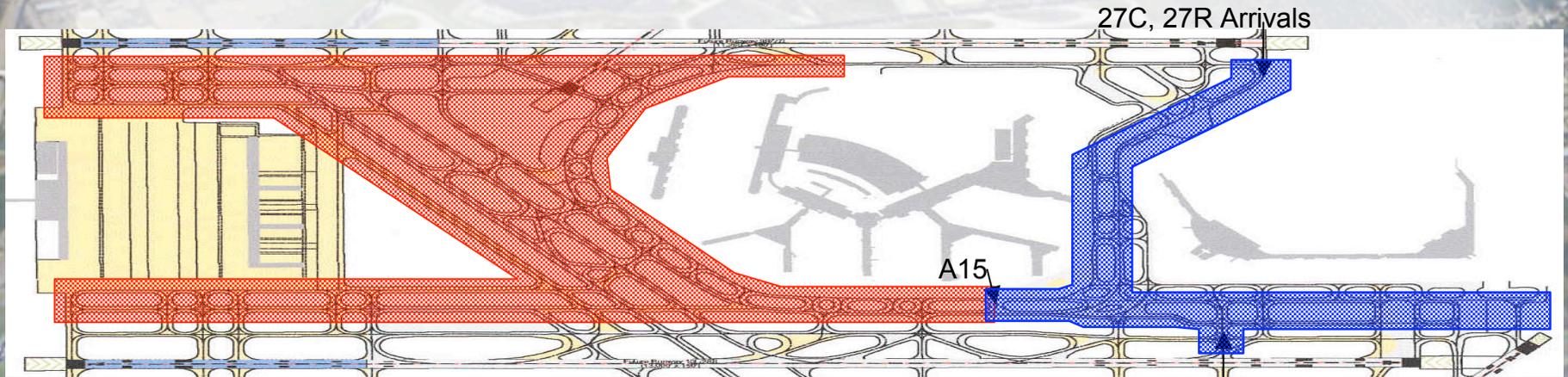
- Original concept
 - Virtually all arrivals through chokepoint
 - Difficulty integrating departures

— Arrival routes
— Departure routes
— Additional departure routes

- Modified concept
 - Reroutes some departures to avoid chokepoint
 - Traffic moves more efficiently



Controller Workloads – West Flow



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Workload Comparisons - West Flow

Position	Transmissions/hr* (Original responsibilities)	Transmissions/hr* (Modified responsibilities)
Inbound Ground West/South	106	223
Inbound Ground East/North	282	271
Inboard Local South	323	293
Inboard Local North	284	262

* Data averaged for two runs

- Reconfiguring controller responsibilities extremely effective
 - Greatly improved balance in workload for inbound controllers
 - Reduced overall workload for the three busiest positions

Overview of Results

- Controllers successfully ran future O'Hare ALP at 2018 traffic levels
 - East & West flows, Visual & Instrument conditions
 - Traffic Management Initiatives (TMI) & gate-holds
- Controller responsibilities were modified to better balance workload
- Modifications to inbound/outbound taxi routes implemented to mitigate chokepoint issues
- Controllers unanimously supported center platform. Design incorporated into present tower modernization
- Use of double-letter taxiway names did not cause unworkable situations
- Coded taxi-routes were supported for inbound traffic, but not for outbound traffic