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EVALUATION OF THE TERMINAL AREA PRECISION SCHEDULING AND SPACING SYSTEM FOR PERFORMANCE-BASED NAVIGATION ARRIVALS

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- Terminal Area Precision Scheduling and Spacing (TAPSS) System
- Previous Work
- Objectives
- Human-In-The-Loop (HITL) Simulations
- Results



Controller Managed Spacing (CMS) in Terminal Airspace



Traffic Management Advisor with Terminal Metering (TMA-TM)

TAPSS Operational Concept





Performance-Based Navigation (PBN) and TAPSS

- PBN defines aircraft performance requirements in terms of navigation specifications:
 - Area Navigation (RNAV)
 - Required Navigation Performance (RNP)

Classic



 TAPSS system evaluation in Human-in-the-loop (HITL) simulations, 2009 ~ 2012

Research need:

- RNAV and RNP mixed traffic
- Different airport and airspace
- Efficacy with controllers new to TAPSS



Demonstrate that the TAPSS system

- Enables efficient PBN operation, including RNP procedures
- Can be adapted for airspace constrained airport
- Can be effectively used by current controllers new to the system



Terminal Controller Advisory Tools



Simulation Airspace: Dallas Love Field (DAL)





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- NASA Ames ATC simulation facility
- Two scenarios
 - A, B for data collection
 - 20 arrivals, 40/hr
 - 100% RNAV-equipped
 - 25% RNP-equipped
- Instrument Flight Rules (IFR)
 - Two runways
 - Parallel dependent approach
- Participants
 - Four Full-Performance Level Terminal controllers
 - Two feeders and one final position

| Scenario | Tool Condition | Runs |
|----------|-------------------|------|
| A | Baseline | 1 |
| | TAPSS | 1 |
| В | Baseline | 2 |
| | TAPSS | 3 |



Baseline





Success defined by no heading clearances after RNP clearance









Results: Average Extra Track Distance of RNAV Aircraft





0 1 2 3 4 5 6 7 8 9 10 11 12 13 Average Number of Clearances per Flight



Terminal Controller Advisory Tools





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* NASA Task Load Index, Sandra Hart and Lowell Staveland, 1988



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