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1. DFW Perimeter Taxiway Demonstration: The Future is Positive

In February 2003, Dallas/Fort Worth International Airport's study of their perimeter taxiway concept culminated with a simultaneous real-time demonstration at NASA Ames' FutureFlight Central and B747-400 simulators.In collaboration with NASA, the FAA William J. Hughes Technical Center Simulation and Analysis Group provided the simulation design, data analysis, and technical report. (In the January newsletter, we reported on preparations for the demonstration.)

Participants in the demonstration included five certified FAA controllers from the DFW tower and seven pilot representatives from the airlines and pilot unions. Five of the seven pilots were active pilots with large, commercial aircraft experience. For the first time, users jointly experienced a future airport design in real-time.

The demonstration ran for four days with controllers managing DFW traffic at future demand levels, an approximate 20 - 30 % increase over estimated current traffic levels. Traffic was run under the current airport configuration and with the perimeter taxiways for comparison. On conclusion of the demonstration and after each run, controllers and pilots evaluated various aspects of the demonstration.


Proposed taxiway system at DFW

What are some of the preliminary results? FAA ACB and the Titan Corporation's initial analysis reported that both controller and pilot surveys rated the perimeter taxiways as an improvement.

Survey Question: *Based on your experience in the demonstration, do you feel that adding the PTs improves operations at DFW? 1= Not At All, 7 =A Great Deal*
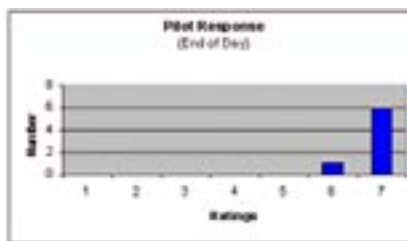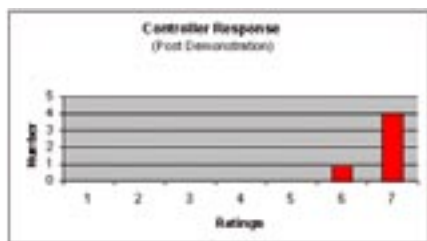
Controllers also asserted that perimeter taxiways reduced frequency congestion and analysis of a sample of recorded voice communication supported this perception: There were fewer transmissions. However, it is important to note that this is demonstration, not operational data, with factors affecting its precision.
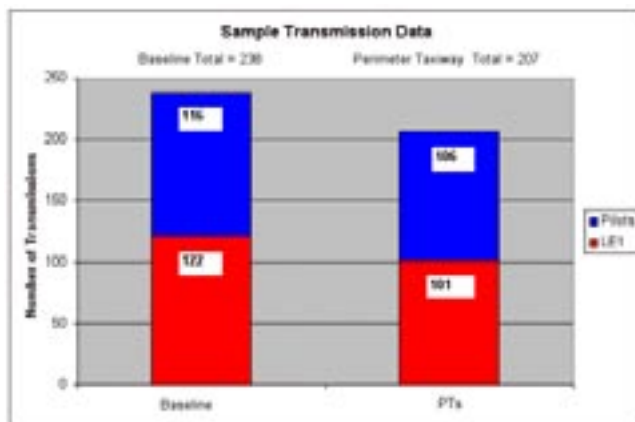
During the Baseline runs, there was an average of 147 runway crossings per hour. Perimeter taxiways completely eliminated runway crossings at DFW under the conditions simulated for the demonstration.

To address concerns, pilots flew profiles of landing and departing aircraft with perimeter-taxiing aircraft below. All participating pilots requested views of a worst case scenario, specifically an engine loss at maximum gross weight at takeoff. Participants seemed comfortable that traffic cleared the perimeter taxiways with at least a margin of several hundred feet and found that all safety standards and clearance boundaries were satisfactory.

Prior to the demonstration week, controllers had the opportunity to refine the operational procedures for managing perimeter taxiway traffic. A choke point was identified during pre-demonstration Shakedown Runs where east and west side arrivals passed through the same intersection. Controllers modified their procedures to alleviate this bottleneck, redirecting some of the traffic from the East Side to a nearby taxiway, thus reducing traffic levels at the intersection.

Jim Crites, Executive Vice-President, Airport Operations at DFW summed up the demonstration: "The perimeter taxiway project has been a labor of love for ten years. However, DFW didn't have the tools to solve the critical question: how the changes would affect the operators. [The FutureFlight and CVSRF] system fills in a critical component."

He concluded by saying that an informational video of the demonstration will be shared with NATCA, ICAO, National Academy of Sciences, International Council of Airports, ALPA, and APA, among others. It will show how both management and the user community were brought together. "This is one of the most critical messages; here we had honest dialogue. It was a big win for all parties."

DFW will formally release the demonstration findings and the informational video at a press conference in June.

2. Waiting in the Wings: LAX Study Targets Safety

Current Los Angeles International Airport configuration

In June, LAX will return to FutureFlight Central to simulate a centerline taxiway between Runways 25R and 25L, one of the options they are studying in an effort to make the airport safer. HNTB is the consultant for this study, which is aimed at reducing and minimizing runway incursions. Four FAA LAX controllers will manage simulated traffic under full visibility and reduced visibility conditions.

LAX was a FutureFlight customer in 2001, for the *Los Angeles International Airport Runway Incursion Studies: Baseline and Alternatives Simulations* . Consistent with a national trend, and despite numerous improvements, LAX had continued to be very challenged by the growing number of runway incursions in 1998 and 1999. Thus, LAX in cooperation with the FAA and United Airlines, undertook a simulation study at our facility. The reports of those studies can be found on our web site at http://ffc.arc.nasa.gov/our_projects/lax/index.html

In February 2003, the LAX Master Plan was placed on the federal priority list; this means that the plan will receive priority environmental reviews under President Bush's Executive order on Environmental Stewardship.

Under the LAX Master Plan with the Enhanced Safety and Security Alternative, LAX will be designed with gate space to accommodate 78 million passengers. (In 2001, LAX saw more than 61.1 million passengers.) The airport's north runway system will be reconfigured to accommodate a center taxiway and increase the separation between the runways. A new center taxiway will be added between the south runway system. The new center taxiways are expected to improve airfield safety and reduce the possibility of runway incursions.

Los Angeles International Airport is ranked fifth in the world for number of passengers and tonnage of air cargo handled.

3. Preparing for Future Simulations
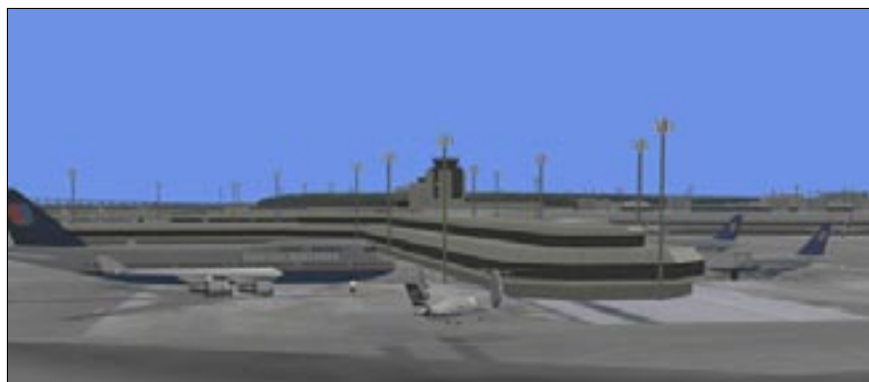
The VMS' civil tiltrotor and the CVSRF's B747 aircraft models appear in FutureFlight Central's tower cab view. On the far right, FutureFlight models are parked at the gate.

NASA envisions new classes of vehicles, including civil tiltrotors, reusable launch vehicles, and unmanned air vehicles, all changing the way we will travel in the future. How this new system will actually work with human operators is a large question.

In order to begin to answer this question, Ames is developing its capability to do non-real time and real time human-in-the-loop modeling and simulation of the National Airspace System. One stepping stone toward this capability is linking NASA Ames' simulators.

In the latter part of April, the three major Ames simulators will demonstrate their ability to perform simultaneous real-time simulations in a richer, fuller environment than has previously been possible. The civil tiltrotor, one of the Vertical Motion Simulator's piloted interchangeable cabs, will taxi to the helipad at FutureFlight's virtual San Francisco International Airport (SFO) and then take-off. In a test of simultaneous visibility with the civil tiltrotor, the Crew Vehicle Systems Research Facility's piloted B747-400 cab will also fly in SFO's airspace. For added realism, FutureFlight Central will generate additional traffic, with tower controllers coordinating the flow of all aircraft into and out of SFO.

A software interface, the HLA "Bridging Technology," under development at Ames, will accomplish the task of connectivity.

This test of connectivity is the third in a series of six interim tests for the Virtual Airspace Simulation Technology Real-Time (VAST-RT) Project. VAST-RT, a cornerstone of the Virtual Airspace Modeling and Simulation (VAMS) Project, is helping NASA and the FAA to revolutionize the National Airspace. The VAMS Project is a multi-year effort, scheduled to run until 2007.

That revolution is beginning now. For example, Bell/Agusta Aerospace Company has developed the world's first commercially available civil tiltrotor, the Bell/Agusta Aerospace BA609, which had its maiden flight on March 7, 2003. NASA's model is similar to the BA609. How will airports manage their airspace with many civil tiltrotors landing and taking off? The suite of Ames simulators may help tell us, thanks to the VAST-RT Project.

4. Software/Hardware Upgrades to Enhance Reality

FutureFlight Central is dedicated to continuous improvement. As technology advances, simulation requirements grow, and the facility continues to upgrade to meet the demands

Working with Adacel Inc., we have recently improved our ability to support the most demanding traffic simulations, such as Dallas/Fort Worth International Airport. In July, we will upgrade to MaxSim 3.2, which will provide such improvements as an enhanced pseudo-pilot interface, making it easier for our pilots to respond with a real-world tempo.

With our software upgrade, we will also install Pentium IV computers at all pseudo-pilot, controller, ramp, and test engineer stations. The new computers will process information with a clock speed of 1.8 gigahertz, especially important in our real-time multi-player environment.

What's also ahead in the next few months? FutureFlight will replace its original voice-communications system with the latest technology. FutureFlight will be the first of the NASA Ames simulation facilities to receive a new system. It is Ames' goal to have all the simulation facilities voice integrated so that joint simulations can be performed easily and efficiently.

5. FutureFlight Video

A five-minute video describing FutureFlight's projects and the facility is now available on our web site. Depictions of SFO and LAX highlight the video as does realistic footage of the facility at work during a simulation.

The streaming video is available in a resolution suitable for viewing with a high speed connection.

The video is in Apple QuickTime format. Apple has released versions for Windows 98, 2000, NT4 and XP as well as for the Macintosh.

View the video at http://ffc.arc.nasa.gov/gallery/movies/index.html

6. Upcoming Events & Conferences

NASA FutureFlight Central will be participating in the following events:

- National Center of Excellence for Aviation Operations Research (NEXTOR) Conference on Air Traffic Management and Control, June 2 - 3, 2003, Virginia Tech

- American Institute of Aeronautics and Astronautics (AIAA) Modeling and Simulation Conference, August 11 - 14, 2003, Austin, Texas.
  More information about the conference is available at http://www.aiaa.org/calendar/

7. Thinking of Doing Business with FutureFlight Central?

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for more information and to explore what we can do for your needs.

The Team at NASA FutureFlight Central http://ffc.arc.nasa.gov