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NASA FutureFlight Central Second Quarterly Newsletter

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1. The LAX Story (Part II): Sneak Preview of the LAX Airport Model

On Tuesday, February 20th, NASA began validation testing for the upcoming runway incursion studies to be conducted in cooperation with Los Angeles World Airports, the FAA Runway Safety Program and United Airlines. On April 10th, the LAX Simulation, Phase II will begin. In this simulation, LAX will study potential changes aimed at making the airport safer and more efficient.

NASA FutureFlight's LAX Airport model (including moving real-time graphics as well as operational behaviors based on SIDs, STARs and flight schedules) took some two months to develop. The complete model was built by computer graphics experts from NASA FutureFlight and its partners Adacel and SGI.

Below we provide a few links to static images taken from two of the twelve "Surround-Eye" channels within the

FutureFlight facility. Each photo depicts 60 degrees of viewing area. (Note this contrasts with the real FutureFlight experience, which offers a 360-degree or "Surround Eye" view of the airport from any position.)

If you click on each of the links, you can pan through the scene. The following narration allows you to understand what you are viewing.

LAX Scene 1: [FutureFlight Model View of LAX South Side Scene](#)

This Tower Cab view of the LAX airport model depicts the airport's south side terminal area overlooking Terminals 6, 7 and 8. This is a heavily trafficked gate area for LAX's major carrier, United Airlines. In the middle of the scene can be seen LAX's longest 12,091 ft Runway 25R/7L and the parallel 11,096 ft long runway, 25L/7R.

The scene also affords a good view of the high-speed taxiways J, which flow into United's Terminal 7 area as well as carrier-shared Terminal 6. Current runway usage at south-side LAX has most arrivals landing on the outboard 25L runway. Obviously aircraft arriving on 25L cannot get to their gates without crossing 25R. Given the natural pressures to get to the gate as quickly as possible, one of the proposed solutions would be to use the inboard runway. (25R) as a primary arrival runway and the outboard runway (25L) as the primary departure runway. The NASA FutureFlight study will evaluate this alternative configuration.

FutureFlight has multiple eye point capability. Customers can view their airport from any arbitrary viewpoint, including from different controller positions within a given tower. This allows evaluation of location and height decisions for ramp and ATC tower siting studies as well as planning optimal position locations within a tower.

LAX Scene 2: [Future Flight Model View of LAX North Side Scene](#)

This view oversees LAX's north side Terminal 1 and the gates of carriers Southwest Airlines,

The scene shows the detail of the NASA model for even non-airport structures and scenery such as cityscapes, freeway traffic, and parking structures. FutureFlight's computer graphics experts make great attempts to reproduce in high fidelity as much of the detailed visual scene as possible, from rubber tire tracks on the tarmac to oil spills to the glint of metal off an inner city building some 5 miles off the airport.

Why such attention to detail? The goal is to recreate the entire situational experience for ATCs so that any real-world impact of procedural changes can be realistically tested in the environment. Human factors studies indicate that even minute visual cues are used by ATCs to maintain orientation and keep track of aircraft.

Note the LAX airport database you are viewing is more than simple photographic data and detailed computer renderings. Article 3 in this newsletter tells you more of the details of how we build the airport models so they correctly represent spatial relations and details of the real LAX airport.

2. Waiting in the Wings: A Simulation of DFW

In collaboration with the Advanced Air Transportation Technology (AATT) Project at NASA Ames, the FutureFlight Central team is next embarking on a simulation of Dallas Fort Worth International Airport (DFW). DFW is the second largest airport in the U.S. in square footage (3rd in the world) with seven runways (5 N-S parallel runways and 2 diagonal runways) with an 8th runway planned.

As part of the research and development of the Surface Management System (SMS), the AATT Project plans to conduct two simulations using FutureFlight Central and the new DFW model. SMS is a decision-support tool that will help controllers and air carriers better manage surface operations. The initial version of SMS will focus on improving the management of departures while they are on the surface. The first simulation will focus on evaluating human factor issues including user-interface concepts, and is scheduled for Fall 2001.

The second simulation will evaluate an SMS prototype and will study the interoperation between SMS and the CTAS Traffic Management Advisor (TMA.) The Center-TRACON Automation System (CTAS), which operates at DFW and is currently being deployed to other sites by the FAA, is a suite of decision support tools being developed by NASA Ames and the FAA. A complete description of these tools can be found at <http://www.ctas.arc.nasa.gov/>

3. FutureFlight Airport and Aircraft Model Libraries

NASA FutureFlight Central's library of airport models currently includes:

- Chicago O'Hare International Airport (ORD)
- Dallas Fort Worth International Airport (DFW) (In progress.)
- Los Angeles International Airport (LAX)
- San Francisco International Airport (SFO1)
- San Francisco International Airport (SFO2) Master Plan Alternative

Visual Realism. Each of the models provides a 360-degree computer-generated 3-D visualization of the airport. Each model is built up from successive layers of data including:

- Digital satellite data for a high-fidelity terrain model
- AutoCAD drawings of the runways, taxiways and airport terminal structures
- High resolution aerial survey imagery
- Close-up digital photography for realistic texture mapping
- 3-D models of the aircraft and ground vehicles.

Operational Realism. Each model is also pre-programmed to behave according to airport Standard Operating Procedures (SOPs,) including traffic flow patterns, flight paths (SIDs and STARS) and taxi routes.

The FutureFlight aircraft model database currently contains over 80 three-dimensional aircraft models and 11 types of ground vehicles.

The airport and aircraft models are currently in use for tower siting studies, ramp tower training, runway incursion studies as well as assessing navigational and ATC requirements for experimental aircraft.

4. The Only Airport Simulator with its Own Real Airport

NASA FutureFlight Central is fortunate to be located in Silicon Valley adjoining a 1,500-acre former naval air station, now known as Moffett Federal Airfield. The base has its own airport with two parallel runways (8200 and 9200 feet). Subject to review of requests, the Moffett Air Field manager grants permission to land to aircraft that are conveying passengers doing business with NASA Ames.

FutureFlight visitors who have questions about their use of Moffett Field should call **Patty Bergin at 650.604.6314** or email her at pbergin@arc.nasa.gov.

A brief description of its history is available at: http://www.arc.nasa.gov/about_ames/moffett.html.

5. Who's Visiting Our Virtual Skies?

One of the secrets of NASA FutureFlight Central is that it is one of the main "tourist attractions" of Silicon Valley for the aviation community. Known as one of the worlds only "indoor airports," our planes fly inside...and safely! Some of our guests visit us by flying directly onto the NASA Ames site at Moffett Field, California.

Over the past several months, the FFC has hosted a number of distinguished visitors, luminaries and key aviation community participants.

These include:

- AENA (Spanish Airports and Air Navigation Organization)
- AvSTAR (Aviation Systems Technology Advanced Research) Conference
- Airport Group International
- Airport Business Magazine
- Boise Airport
- Eugene A. Conti, Jr., U.S. Assistant Secretary for Transportation Policy
- Denver International Airport
- DFS (Deutsche Flugsicherung), Germany
- FAA

- FAA Academy, Oklahoma City, Oklahoma
- FAA/CAAF, Madrid, Spain.
- General Aviation Manufacturer Association (GAMA)
- George Schultz, former U.S. Secretary of State
- Houston Airport System
- Lambert-St. Louis International Airport
- Los Angeles International Airport
- Madrid-Barajas Airport
- NASA Advisory Council
- NATCA President John Carr
- National Academy of Sciences Board of Directors
- National Airspace Transportation System, United Kingdom
- Newsweek Magazine
- Northwest Airlines
- San Francisco International Airport
- The Young Economic Policy Advisors of the Ministry of Economic Affairs, Netherlands
- U.S. Joint Aeronautical Commanders Group
- U.S. Navy/U.S. Military Council ATC School
- United Airlines
- University Space Research Association/Research Institute for Advanced Computer Science (RIACS)
- Wharton International Forum
- White Sands Missile Range

6. FutureFlight Applications Tip: Reducing Fuel Costs by Taxi-Out Planning

According to the Air Transport Association's "Approaching Gridlock" report published in 2000, taxi-out time, as opposed to "taxi-in-to-the-gate" or "en route time," continues to represent a large component of air traffic related delays for scheduled airlines. In 1999, the average delay time in aircraft taxi-out times was 9.56 minutes, compared to only 3.81 delay minutes for taxi-in times. In 1998 dollars, the taxi-out delay amounts to an airline cost of \$1,787 per aircraft hour per taxi-out delay. Given that fuel prices rose over 50% in 2000, such delays represent considerably more cost-dollars.

NASA FutureFlight Central can be used by an individual airline and airport's "taxi out team," i.e. ATC controllers, airline pilots, and ramp operators, to optimize procedures on taxi-out during simulated departure rushes or arrival rushes. The FutureFlight facility allows a customer team to quantitatively measure their taxi times under different "What If" scenarios to better understand and optimize their routes and procedures.

This and other FutureFlight applications, describing how your airport or airline might use the NASA FutureFlight Central facility, are described in our recently published FutureFlight Applications Sheet <http://ffc.arc.nasa.gov/applications/index.html>

7. The DOT Report

On December 15, 2000 the Department of Transportation's Office of the Inspector General (OIG) issued its latest review of ATC operational errors and deviations. The report reviews the goals and measures associated with operational error reporting as well as FAA progress in accomplishing these goals.

Highlights of the report include the following:

- From FY 1996 to FY 2000, the number of ATC operational errors increased 51 percent from 764 to 1,154.
- Operational error rates also increased. Per 100,000 air traffic operations, the rates were:
 - 1996: 0.51
 - 1997: 0.49
 - 1998: 0.56
 - 1999: 0.57
 - 2000: 0.68

The report emphasizes that the safety risks associated with these errors are unknown

- Four of the five facilities (all en route) with the most operational errors have not improved over the past five years.
- Operational errors at terminal ATC facilities are at risk of being under reported as, unlike en route facilities, no automated system for documenting errors exists.

The complete December 2000 OIG report can be found at: http://www.oig.dot.gov/show_txt.php?id=27

8. Upcoming Events and Trade Shows

NASA FutureFlight will be participating in the following events:

- April 10-13, 2001: FutureFlight Simulation of New Runway Usage Patterns for LAX, Moffett Field, CA (by invitation only)
- April 24-27, 2001: Future Flight Simulation of New Runway Usage Patterns for LAX, Moffett Field, CA (by invitation only.)
- June 4-6, 2001 FAA International Summit on Runway Safety
- August 27-30, 2001 International Aviation Training Symposium (IATS) for the FAA Academy Myriad Convention Center, Oklahoma City

If you are attending any of these events and would like to book an appointment in advance to speak with us, please call **Nancy Tucker at 650.604.5575** or send an email to: ntucker@mail.arc.nasa.gov

9. Thinking of Doing Business with FutureFlight Central?

Contact **Nancy Dorigi**, FutureFlight Central Manager, Nancy.S.Dorigi@nasa.gov or call **650.604.3258** for more information and to explore what we can do for your airport or airline needs.

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

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