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### Volume 3, Issue 3

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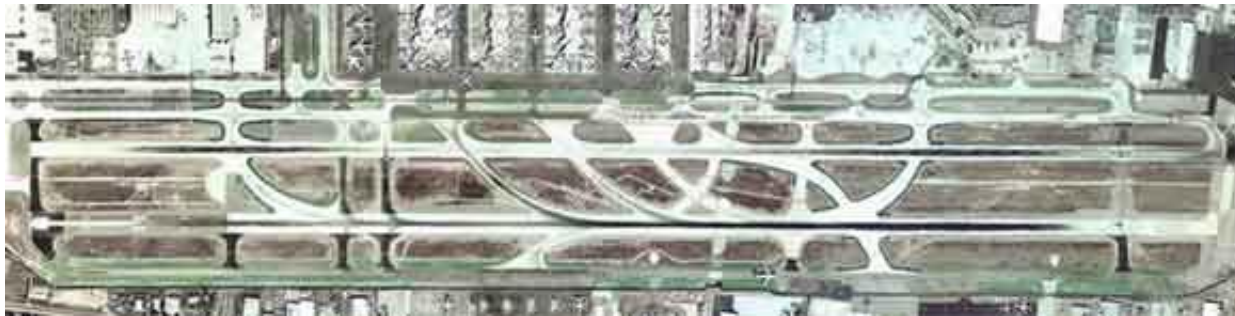
*July 2003*

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### 1. LAX Studies Center Taxiway

In June 2003, Los Angeles World Airports (LAWA) returned to NASA FutureFlight Central to simulate a center taxiway between Runways 25R and 25L at Los Angeles International Airport. HNTB, consultant to LAWA, was the principal coordinator for this study, which was aimed at reducing runway incursions.



**Current South-Side Los Angeles International Airport Layout (LAX)**



**Modified South-Side LAX Layout Showing Center Taxiway**

LAX first came to FutureFlight Central in 2001 for the [Los Angeles International Airport Runway Incursion Studies: Baseline and Alternative Simulations](#).

For the most recent study, four certified FAA controllers from the LAX tower participated in the simulation. A National Air Traffic Controllers Association (NATCA) representative from the LAX tower served as a technical advisor for this study. Representatives from the Air Transportation Association (ATA), Alaska, American, FedEx, and Southwest Airlines attended the simulation as observers.

The simulation ran three days with 12 runs total. Using the proposed center taxiway configuration, controllers managed traffic, ranging from 145 to 161 operations per hour. Traffic was run under full visibility and reduced visibility conditions (VMC and IMC). After each run, controllers evaluated various aspects of the simulation, including safety, complexity, and manageability. Objective data will be compared with 2001 baseline data.

What are some of the preliminary results?

The informal consensus of the LAX controllers was that the concept of a center taxiway could work at LAX. In the debrief session at the end of the three-day simulation, some controller comments were:

"I say it would be completely useful and cut down on runway incursion."

"If the designers build it...and we can land and depart with the largest aircraft in the world holding in-between the runways, it's going to be fantastic. You can see how it's going to eliminate runway incursions."

Preliminary analysis of the survey data indicates that the LC-1 position (south-side local controller) experienced a reduction in complexity and an increase in manageability in comparison with pre-9/11 operations. However, the GC-1 position (south-side ground controller) was rated as somewhat more complex with no improvement in manageability.

**Questions:**

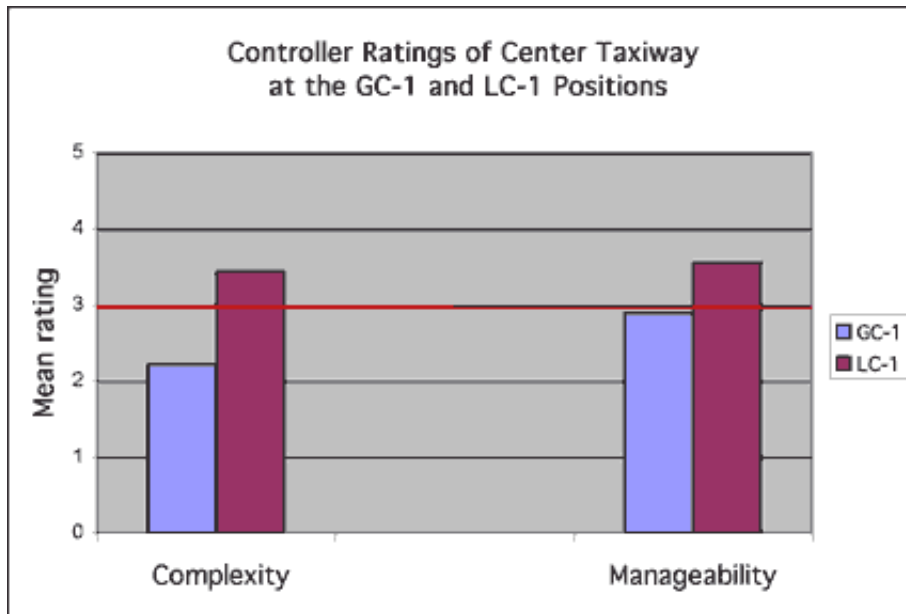
**6: Level of traffic complexity in my area was:**

Scale: 1 = Impossible to Manage, 5 = Easier than Under Pre-9/11 conditions

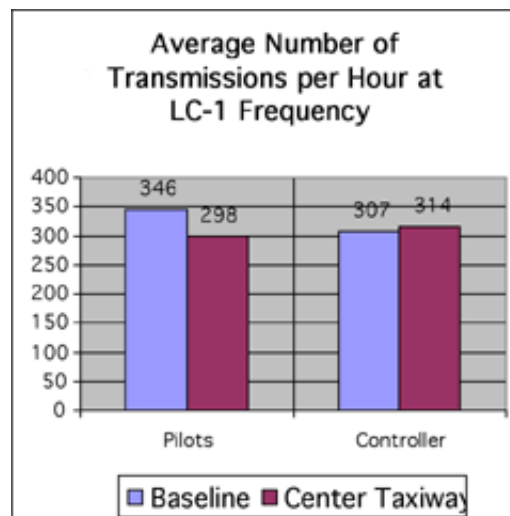
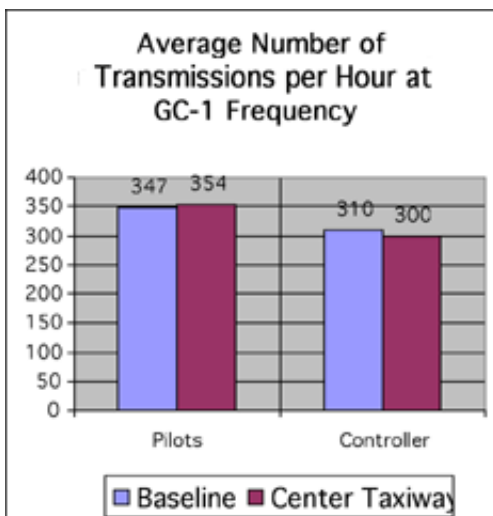
**7: I would rate my ability to manage the traffic flow under this scenario:**

Scale: 1 = Impossible to Manage, 5 = Easier than Under Pre-9/11 conditions

The horizontal red line on the graph represents a rating of “About the same as under pre-9/11 conditions.”



Audio data indicates that the average number of transmissions per hour was not significantly affected while managing traffic with a center taxiway. We note that this is simulation data, not operational data, and there are factors affecting its precision.



LAX will formally release the simulation findings at a press conference at the end of July.

## 2. Controller Training on a Dime

Becoming an effective tower controller in a few weeks could be possible thanks to FutureFlight Central's virtual environment. Here's the situation: you are a certified professional controller promoted to a busy airport tower, such as Atlanta, Dallas-Ft. Worth, O'Hare or Los Angeles. How long does it take you to become competent in managing the traffic at your new facility?

Despite years of experience directing traffic at another busy tower, your training starts over when changing facilities. Even experienced FAA controllers now spend anywhere from six months to two years qualifying at a tower. The problem is that no two airports or towers are the same: the layouts, procedures, restrictions, airspace and mix of traffic vary tremendously. The FAA prescribes hundreds of hours training with another controller on live traffic to gain experience, efficiency and local knowledge, often simply waiting for the right mix of traffic to materialize.



**LAX Controller Managing Traffic in the FutureFlight Tower**

Rob Voss, FutureFlight's air traffic control analyst faces the same problem when he helps prepare FutureFlight Central for simulations of towers such as DFW and LAX. Rob and the staff of facility controllers must rapidly apply their skills of decision making, judgement, working speed, coordination and communication to a new environment since they will be managing the traffic for facilities they may have never worked. This requires extensive research, facility visits and then four to six weeks of intensive simulation rehearsals before the main event. Only if they succeed can FutureFlight Central provide NASA customers with the high quality of simulations they've come to expect.

Rob knows what it is like to control traffic in the real world - he served as an FAA controller for more than 17 of his past 20 years. Most of his experience was at busy San Francisco International: because of its compact design, it's considered one of the most complex. He served there not only as a controller, but also as a training specialist and operations supervisor.

"Working a new position, such as DFW East Local or LAX South Ground, was an incredible challenge, even in a simulator," Rob observed. "I was surprised at the high level of proficiency that we achieved in such a short time. Through repetitive, risk free practice and immediate visual feedback, we were able to efficiently work these difficult positions after just a few weeks."

Observers agreed: several certified controllers and airline pilots who witnessed rehearsals said they were very impressed with the high level of competence shown by FutureFlight's controllers.

While the purpose of these projects wasn't to study controller training, NASA hopes to collaborate with the FAA in a future project to develop a comprehensive simulator training program for controllers. Mr. Voss is convinced: "This experience has shown the enormous potential benefits justifying the FAA's use of quality simulators to enhance facility qualification, proficiency and contingency training."

### 3. DFW Perimeter Taxiway Demonstration Report Now Available Online

On June 12, at a press conference, [Dallas/Fort Worth International Airport](#) formally released the findings of its recent demonstration at NASA Ames Research Center.

The Dallas/Fort Worth Perimeter Taxiway (DAPT) Demonstration [report](#) is available on our website.

For more information, please see:

- ▶ [Dallas/Fort Worth International Airport Perimeter Taxiway Demonstration](#) in the *Our Projects* section of the FutureFlight Central website.
- ▶ [DFW's perspective on the perimeter taxiway demonstration](#)

### 4. Virtual Reality: A Cost-Effective and Zero-Risk Strategy for Airport Capacity Planning

[Synopsis of the presentation given by Nancy Dorigi, FutureFlight Central Manager, at the 75th AAEA Conference, April 27-30, 2003]

Most of us agree that air travel will inevitably grow well beyond the levels we saw in the late 90s. Current forecasts predict a doubling over the next 20 years. Though the hub-spoke/door-to-door demographics may be different, congestion will again bring frequent delays and an increasing potential for runway incursions and accidents unless we take this opportunity to prepare for the future.

A recent Logistics Management Institute study reported that the greatest gains in capacity could be

achieved by improving runway efficiency. Virtual reality (VR), immersive interactive simulation, is an ideal way to optimize runway efficiency, especially where human decision-making is so integral to the operation.

How does VR work for airport planning? Duplicating the environment of the key players at the airport, the air traffic controllers and the pilots, in as realistic a manner as possible, is a good starting point. These environments must be integrated with each other so that the interactions between the operators are also realistic. Only with sufficient realism will the concepts tested in this setting have credibility for the real world. Some elements of realism are high fidelity in the visual scene, authentic tools and displays such as radar and realistic emulation of radio voice communications.

Why is VR planning cost-effective? The high cost of airport expansion, often in the billions of dollars, necessitates getting it right the first time. For example, Seattle-Tacoma International Airport estimates the cost of a third runway to be more than one billion dollars. The total cost includes property acquisition, construction, navigation aids and environmental mitigation.

When planners don't get it right the first time, there are even higher costs, for example, hundreds of thousands of dollars to remove buildings that block the controllers' line of sight or millions to reconstruct a control tower. The true cost of mistakes should also factor in lost opportunity due to inefficient or unusable construction.

Many of these losses were avoidable had advanced technology such as VR been used to "test drive" the changes before construction. VR trade-off studies of competing designs can squeeze every ounce of efficiency out of procedures or construction. Just over a minute reduction in taxi-out time can translate into tens of millions of dollars in annual savings for an airline.

And finally, VR planning is cost-effective when stakeholders contribute feedback early on about the proposed procedures or new technologies. For example, if certain airports had received pilot feedback on land and hold short procedures before construction, the runway designs may have been altered. Human interactive simulation is a powerful way to experience operational changes early enough in the design cycle to make a difference.

How can VR planning reduce risk? Historically, cost-benefit analyses based on fast-time simulations drive airport planning decisions. But the accuracy of those simulations is limited by the assumptions that must be programmed into the models. If those assumptions are about human performance, VR can eliminate the guesswork by validating assumptions and thus reduce the risk of an inaccurate cost-benefit analysis.

New runways, for example, will mean new procedures and operations. Using VR to test the operational assumptions and then train with the new configuration could improve acceptance and accelerate the learning curve before the new runway is opened.

Efficiencies to be gained, reduction of risk and buy-in by users, only possible through human interactive simulation, are reasons why VR is gaining acceptance as a necessary component of any major airport expansion project.

Human-in-the-loop simulations are affordable. Depending on the complexity of the conditions to be modeled, simulations at FutureFlight Central have ranged from \$135,000 and up.

## **5. Upcoming Events & Conferences**

NASA FutureFlight Central will be participating in the following event:

▶ 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/index.hfm?cal=5&luMeetingid=664>

▶ AAAE/FAA/Booz Allen Hamilton Runway Incursion Workshop, August 18-19, 2003, Chicago, Illinois

More information about the conference is available at <http://www.airportnet.org/depts/meetings/calendar/calpub.htm>

## 6. Thinking of Doing Business with FutureFlight Central?

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

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

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