



## Newsletter

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### 1. FutureFlight Tests New Decision Support Tool

FutureFlight Central demonstrated its ability to test new technology in January 2002, when the second simulation of the Surface Management System (SMS) was completed. (In our previous newsletter, we reported on the [first SMS simulation](#).)

Dallas-Fort Worth controllers managed DFW's East Tower traffic while utilizing SMS, an enhanced decision support tool. A key feature of this simulation was the additional installation of TMA (Traffic Management Advisor) so that the functionalities of SMS and TMA could be tested together in a realistic, working environment.

TMA, currently in use at the Fort Worth Center, is one of the Center-TRACON Automation System (CTAS) tools. It assists TRACON and Center traffic management coordinators (TMCs) in arrival flow management planning. SMS helps tower controllers and TMCs manage departures. The successful linking of SMS's departure management and TMA's arrival management may improve the overall efficiency of the airport.

How can FutureFlight interface with new technology? Susan Lockwood of Seagull Technology, Software Engineer and Coordinator for the SMS simulations, explained, "In the field, SMS will get aircraft position information from a radar feed; in the simulator, we got the same information from the High Level Architecture (HLA) link."

HLA, resident in Adacel Technology's simulation software, MaxSim, creates a communications link where different software applications can receive information specific to their needs. "By using the HLA link, we sent aircraft position updates to SMS and were able to simulate the radar feed that SMS will receive in the field," Lockwood continued.

During this simulation, the tower TMC, using the information provided by SMS, evaluated the arrival and departure demand for the coming hour. He or she then determined when the runway usage should be changed so that arrival and departure capacities would best match time-varying demands. For example, during a departure push, the arrivals into the airport are slowed to increase departure capacity.

This new runway usage schedule was entered into TMA, which calculated new arrival times for inbound flights. Finally, MaxSim activated flights according to the new schedule. In this way, arrivals incurred "delay" in the simulator just as they would in reality, according to a schedule generated by TMA at the request of the tower TMC.

Lockwood concluded, "We created a realistic experience for the TMC and the controllers," who used SMS to help manage traffic within FutureFlight's simulated, true-to-life environment.

Tower cab staffing included five DFW controllers: three working at controller positions and two acting as TMCs.

The SMS simulations were a cooperative effort between NASA, Raytheon, Seagull Technology, Metron Aviation, Inc., and Booz-Allen Hamilton.



This photograph taken in FFC's tower cab shows a controller utilizing SMS to manage DFW east side traffic.

## 2. Waiting in the Wings: FAA Runway Safety Office Plans Simulations of NTSB Recommendations

The FAA Runway Safety Office is planning simulations in NASA FutureFlight Central related to the NTSB's (National Transportation Safety Board) recommendations regarding implied runway crossings as part of "taxi to" instructions, the "taxi into position and hold" procedure, and multiple landing clearances (ref. NTSB #AA-00-68, -69 and 170). The studies will be conducted in collaboration with MITRE Corporation, VOLPE National Transportation Systems Center, and NASA Ames Research Center. The purpose of the simulations is to determine the recommendations' impact on airport safety and capacity.

## 3. Finding Solutions: FutureFlight's Sophisticated Data Capabilities

The FutureFlight Central air traffic control tower simulator is a sophisticated way to analyze how we play the game of airport surface management. We at FFC, just like offensive/defensive coordinators preparing for the Super Bowl, can analyze every move the air traffic controller, pilot, vehicle driver, or ramp controller makes. At FFC, we win our game by helping airports and airlines evaluate changes to an airport layout, to operating procedures, or to new technological tools.

At the Super Bowl the final score tells us the conclusion but the game stats and videos tell the story. At FFC, our data also tells the story. During a simulation run, FutureFlight can collect objective measurements of surface performance for ground vehicles and aircraft, controller/pilot communication, and audio/video observational data. In addition, the facility can also gather subjective data from the air traffic controllers or others who experience the simulation.

How does FutureFlight collect surface performance data and what kinds of data does it collect? There are two types of surface data that FFC can obtain: higher resolution data obtained from the HLA (High Level Architecture) interface and lower resolution event-based data.

High-resolution data is time-based; it is updated at regular intervals in order to capture data such as aircraft position and velocity. It would allow FFC to profile the events surrounding an accident, for example and produce an "instant replay" of the entire 360-degree simulation run.

Low-resolution data is event based; each time a change of state occurs, it is time stamped. In essence, we are recording the time it takes for the virtual aircraft to pass through programmed points, permitting the calculation of our summary "game" statistics such as average runway occupancy time, non-movement area time, inbound taxi time, and outbound taxi time. Using the same information, we could also calculate statistics for each flight in the simulation.

Some say that communication is everything. Wouldn't the opposing team love to listen in on the huddle? At FutureFlight we can do that. We can digitally record and playback the radio transmissions of both the controllers and the pilots during the simulation. From this digitized data, we can report the following:

- Number of controller transmissions per hour
- Number of pilot transmissions per hour
- Average duration of each transmission
- Total air time occupied by controller transmissions
- Total air time occupied by pilot transmissions

We can also record and analyze informal coordination between positions in the tower cab.

By analyzing voice communications, for example, FutureFlight could determine if a proposed new procedure or airport configuration would increase controller workload or if specific phraseology contributes to miscommunication.

Audio is only part of the story. They say a picture is worth a thousand words. The FutureFlight tower cab has movable cameras installed throughout the cab so that detailed studies of controller movements can be made. In evaluating the use of a new screen display, for example, it might be important to note the amount of time a controller spends looking at the screen and out-of-the window.

To see our data collection capabilities at work, please see the LAX Phase I and Phase II studies on preventing runway incursion at: [http://ffc.arc.nasa.gov/our\\_customers/lax.html#summary](http://ffc.arc.nasa.gov/our_customers/lax.html#summary)

When the Super Bowl is played, there will be a winner and a loser. At FutureFlight there are only winners as airports evaluate ways to operate surface traffic more safely and efficiently.

#### 4. New Faces Contribute Expertise

Since FutureFlight opened its door on December 13, 1999, we are happy to report that the team continues to add expertise. New staff members include:

##### **Jim Gibson, Computer Scientist**

Jim brings 15 years of NASA programming expertise to FutureFlight. He has worked on major aviation projects, such as the design of the CVSRF (Crew-Vehicle Systems Research Facility) and the Surface Movement Advisor whose prototype was tested at Hartsfield Atlanta International Airport. Jim earned his Ph.D in physical chemistry from U.C. Santa Barbara.

##### **Chris Murphy, Facility Support**

Chris, a former VMS (Vertical Motion Simulator) electronics technician of 20 years, contributes network support, develops test scenarios, and trains the pilots used in the simulations. As a flight instructor and general aviation pilot, he also operates real aircraft while twice a year he continues to demo the virtual shuttle aircraft. Chris earned a certificate in computer electronics from Mission College.

##### **Chau Bui, Web Curator**

After earning a Bachelor of Science Degree from UC Riverside, Chau has chosen Internet technologies and graphic design as her career field. Chau is responsible for ongoing improvements to our web site.

To meet the complete FutureFlight team, visit us at: <http://ffc.arc.nasa.gov/about/team.shtml>

#### 5. NASA Gets New Administrator

The U.S. Senate confirmed Sean O'Keefe, former Deputy Director of the Office of Management and Budget, as the 10th NASA Administrator on December 20, 2001. He assumed the responsibilities of his new position on January 2, 2002. O'Keefe has served as a former Secretary of the Navy, professor of business administration, and congressional staffer. In his appearance at the House Science Committee on November 7, 2001, he declared that the space station's cost growth should not "be offset by cuts to NASA's Space and Earth Science and Aerospace Technology activities." Read his complete bio at: <http://www.nasa.gov/bios/okeefe.html>

#### 6. Upcoming Events and Trade Shows

- 2002 FAA Airport Technology Transfer Conference May 5-8, 2002 at Atlantic City, New Jersey. The conference web site is located at: <http://www.airportnet.org/depts/meetings/calendar/calpub.htm>
- 74th Annual AAEE Conference and Exposition, May 19 - 22, 2002 at Dallas/Fort Worth, Texas.
- AIAA Modeling and Simulation Technologies Conference August 5-8, 2002 at Monterey, California.

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](mailto:ntucker@mail.arc.nasa.gov)

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

Contact **Nancy Dorigi**, FutureFlight Central Manager, [Nancy.S.Dorigi@nasa.gov](mailto:Nancy.S.Dorigi@nasa.gov) or phone **650.604.3258** for more information and to explore what we can do for your airport or airline needs.

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

Experience the Future of Your Airport!