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1. FutureFlight Central Goes to Mars!

A new Mars database using 3D images from the Mars Exploration Rovers (MER) mission will be installed in FutureFlight Central in the near future. Digital stereo images now being transmitted from the rover Spirit will be processed by VIZ, a software tool developed by NASA Ames, and displayed in FutureFlight's 360-degree projection environment. VIZ is the same visualization tool used at the Jet Propulsion Laboratory (JPL) to support the operational mission.

360-degree visualization of Mars in FutureFlight Central

FutureFlight will enable a unique 360-degree out-the-window visualization of Mars. The view will be based on the rover's perspective but viewers can adopt other perspective and thus effectively move through the scene. This ability to smoothly navigate through the scene provides a three dimensional sense and an immediate visceral understanding of the remote environment.

The new database will be of higher fidelity than previously available from the Mars Pathfinder landing site; the stereo color images from the rover, Spirit, are of higher resolution and these images will be combined in the new database with high-resolution images from the Mars Global Surveyor orbiter.

The panoramic presentation of images acquired by the rover can provide mission scientists an improved situational and positional awareness of the rover in its remote environment. This is in contrast to what is provided now: an elongated hard copy print, stereo images viewed through red/green spectacles or a series of TV monitor presentations.

NASA will be able to simulate not only the current position of the rover within the actual terrain, but also planned movements of the rover. Because communications

delays between the Earth and Mars are significant, optimizing rover commands offline can maximize the science return. Although the capability at FutureFlight Central is too new to have been incorporated into the MER mission operations now being carried out at JPL, it will be evaluated for use in future missions and can support the science community in its subsequent analysis of the returned data from MER.

Geoff Briggs, Scientific Director of the Center for Mars Exploration commented, "The MER landings have been eagerly awaited so this is a very exciting time for us. Our spacecraft and instrumentation have made major advances, as has the information technology to support operations and data analysis. This a great time to be a planetary scientist – one who has access to comprehensive libraries of data, to innovative software tools and to spectacular virtual environments of our neighboring worlds."

2. Aircraft Landing Lights Could Play a New Role in Runway Safety

A simulation study is underway at NASA Ames SimLabs to investigate the safety effects of standardizing the use of aircraft lighting during taxi operations. The Aircraft Landing Lights to Enhance Runway Traffic Safety (ALLERTS) project addresses a recommendation of the Runway Incursion Joint Safety Implementation Team to develop Standard Operating Procedures (SOP) for aircraft taxi operations specifically related to aircraft lighting.

The implementation of SOPs for aircraft taxi operations may be one of the most powerful near-term interventions, as well as a low-cost option, in mitigating the risk of runway incursions. In the U.S., a runway incursion is defined as "any occurrence in the airport runway environment involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in a loss of required separation with an aircraft taking off, intending to take off, landing, or intending to land."

Aircraft with illuminated tail and landing lights

The purpose of the ALLERTS project is to investigate the safety effects of using aircraft exterior lighting to convey messages in the airport environment. Two specific procedures are being explored: the use of landing lights to indicate that aircraft are cleared to depart and the use of all exterior lights to indicate that aircraft are crossing the active runway. The objective is to determine whether standardizing the use of aircraft exterior lighting will (1) reduce runway incursions and accidents, and (2)

increase pilot situational awareness.

The experiment is being run in the B747-400 flight simulation at SimLabs' Crew-Vehicle Systems Research Facility. In each run, pilots are instructed to taxi, depart, or land, and researchers gather subjective and performance data on the crew. In half of the scenarios, they encounter another aircraft that makes an error which could result in an incursion or accident if not detected by the subject crews.

The study principal investigator is from the FAA William J. Hughes Technical Center in Atlantic City, New Jersey. The ALLERTS project is sponsored by the FAA Office of Runway Safety.

3. New Voice Communication System Enhances Realism

A new state-of-the-art system to emulate tower radio and phone equipment will provide NASA SimLabs unparalleled realism for integrated design, procedural or human factors research of aircraft flight crews, highly complex airports and air traffic facilities. The system, manufactured by SimPhonics, Inc. of Tampa, Florida, will be installed in FutureFlight Central in February.

The new voice system was carefully designed after studying tower communications systems used by highly complex FAA facilities such as Dallas/ Fort Worth, Chicago O'Hare and San Francisco International Airports. It includes 36 separate, fully integrated stations. Programmable interphones allow coordination between controllers in any combination of positions - either directly connecting ("in the ear") or through ring lines. Controllers can select any combination of ten digital, programmable radio frequencies, and receive transmissions via headset or speaker.

Air traffic controller uses voice communication equipment in FutureFlight Central control tower

The system eliminates the slight transmission delay sometimes noticeable with older digital technology. A very faint side-tone, which mimics an important characteristic of VHF radio equipment, reduces the likelihood of blocked transmissions.

For simulations involving instructors and controllers in training, each position allows two user connections, with instructor override. FutureFlight can even simulate a crash phone.

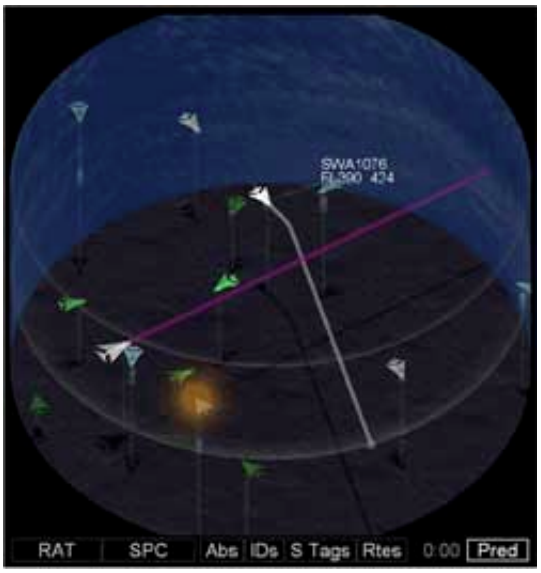
During a simulation run, FFC can digitally record all controller and pilot positions, frequencies and interphones for immediate playback or later study. Tower voice communication analysis provides important insight into task volume, pace, and overall controller workload.

The new SimPhonics system supports high level architecture (HLA) connectivity to transmit voice between multiple simulation facilities for simultaneous research involving aircraft cockpits and various types of air traffic facilities.

4. Enabling Technology for Distributed Air-Ground Research

NASA Ames SimLabs provides integrated simulation to support multi-player evaluation of new air transportation technologies such as those being developed under the Distributed Air-Ground (DAG) system. DAG researchers examine interactions between flight crew and air traffic controllers surrounding advanced technologies, such as the Cockpit Display of Traffic Information (CDTI) display. The CDTI consists of a display graphic and includes both self-separation and conflict detection logic.

In previous demonstrations, SimLabs integrated the CDTI into the flight deck of the Advanced Concepts Flight Simulator (ACFS). An interface to the Airspace Operations Lab (AOL) at Ames provided real-time simulated air traffic, and the Center and Terminal Radar Approach Control (TRACON) environments. A link to NASA Langley Research Center's CDTI lab provided an additional aircraft target and airborne spacing algorithms.



3-D Cockpit Display of Traffic Information

In November 2003, the DAG researchers integrated new versions of the CDTI and improvements in the flight management system to accommodate new datalink messages and to enhance the vertical and lateral navigation. CDTI airborne logic resolved traffic conflicts in the Center environment and NASA Langley Research Center's CDTI lab provided self-spacing speed algorithms for the approach phase of flight.

Flight crews flew the ACFS using the DAG tools. The ACFS's internal data collection system accumulated data on a continuous basis for total run situational information. In addition, the Crew Activity Tracking System (CATS) collected event

driven data, i.e. aircraft state when flight plan change was initiated on the Flight Management System.

A follow-on study is schedule in the summer of 2004 to continue development of the algorithms and to introduce weather phenomenon to further complicate spacing issues. The DAG system is supported under the Advanced Air Transport Technologies (AATT) Project.

5. Upcoming Events & Conferences

NASA SimLabs will be participating in these upcoming conferences:

- Airport Planning, Design & Construction Symposium, Feb. 18-20, 2004, Denver Marriott City Center Hotel, Denver, CO

  More information is available on the conference at: http://www.airportnet.org/depts/meetings/meeting_details.htm?Record_id=3

- 2004 FAA Worldwide Technology Transfer Conference, April 18-21, 2004, FAA Technical Center, Atlantic City, NJ. Paper presentation on DFW Airport Perimeter Taxi Demonstration

  More information is available on the conference at: http://www.airportnet.org/depts/meetings/meeting_details.htm?Record_id=19

6. Thinking of Doing Business with NASA SimLabs?

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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

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