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1. Kennedy Space Center Prepares for the Future

In June, FutureFlight Central modeled a planned, new air traffic control tower for the Kennedy Space Center Shuttle Landing Facility at Cape Canaveral, Florida.

FutureFlight developed the out-of-the-window view of the day and night scenes with the KSC skyline offering a vivid backdrop for multiple simulated flight operations.The day scene featured lush green vegetation lining the runways and swampy areas; the night scene dramatized the view with runway lights and high intensity xenon searchlights.

KSC’s purpose in conducting the simulation before begin expensive construction was to validate its selected tower location and to obtain the most usable tower interior design by employing human factors analysis.

KSC tower controllers, using the new tower location's view, evaluated three prospective interior tower cab configurations under varying visibilty and weather conditions while virtual aircraft took off and landed. Typical KSC aircraft included T-38s, G-2s, 747's, and helicopters as well as the shuttle orbiter. In addition, various tower heights and locations were tested to validate the best height and location for the proposed tower.

Ed Taff, NASA Shuttle Launch Facility Operations Manager, noted that "FutureFlight Central is a unique NASA capability. It will optimize the working environment for our people and offer future safety training opportunities. We are fortunate to have this facility available to us as we start our new tower."

Dr. Dawn Elliott, KSC Principal Investigator, added, "To conduct a true assessment, it is important to be able to closely replicate the workplace – here lies the strength of this simulator."

The Shuttle Landing Facility, first opened for flights in 1976, was specially designed for landing NASA Space Shuttle orbiters. Its paved runway is 15,000 feet long by 300 feet wide, exceeding the length of the longest, paved runways in the United States.

FutureFlight added the orbiter, the shuttle carrier, and unique ground support vehicles as new models for this simulation. The orbiter differs in at least one major aspect from conventional aircraft;it is unpowered during reentry and landing so its high-speed glide must be perfectly executed the first time -there is no go-around capability.

Looking into the future, Taff, concluded, "A FutureFlight Central simulation, while available for enhancing controller efficiency and safety training, perhaps offers its greatest benefit for future spaceport planning. KSC planners, using the KSC visual database model, can evaluate future technology impacts, requirements, and options well before decision time."

Figures 1 and 2 (from left to right): The shuttle orbiter as modeled in FutureFlight and a photograph of the orbiter landing at Kennedy

2. Virtual Exploration: FutureFlight Becomes a Mars Test Bed

Imagine exploration a hundred years ago in the Arctic or Antarctic; it was months or even years before data could be shared.

Today, we can send digital photographs from a remote location in minutes to a science team comfortably ensconced at their home base. And this is exactly what the Human Operated Robotic Science Evaluation (HORSE) Project did in a recently completed experiment that utilized the 360-degree panoramic viewing capabilities of FutureFlight Central.

At FutureFlight, a science team instructed the field team to explore three different sites under much faster communication times than those currently experienced in operating robotic rovers on Mars.

Brian Glass, NASA Ames Project Manager, explained why he chose FutureFlight as the facility to display the images: "FutureFlight Central will give the science team a total immersive experience so that the science team is, in effect, virtually present at the field site."

The research team, in preparation for eventual human Mars exploration, sought to understand the degree to which reducing the time delay in communications between controllers and robots can increase the scientific productivity of Mars surface exploration.

Future Mars exploration will be carried out by robots controlled from Earth for many years to come and, in this case, the minimum two-way communication delay will be many minutes. When human Mars exploration begins, crews will operate with much faster communication between themselves and their robotic rovers.

Geoffrey Briggs, Principal Investigator, continued, "The HORSE experiment will help us assess the optimum way to combine humans and robots for field exploration."

The Haughton meteorite impact crater, on Devon Island, in the Canadian High Arctic, is located 180 kilometers northeast of Resolute Bay, near Greenland. The crater is 20 kilometers in diameter and was formed 23 million years ago.

A Panoscan 12X camera, mounted on an all terrain vehicle, sent digital images to FutureFlight’s display screens via wireless satellite technology. At FutureFlight, scientists evaluated the content of the images and then specified new locations from which to take additional images including close-up views of rock samples.

The Haughton crater is an unusually good Mars analog - a well preserved impact crater in what is today a frigid, glaciated region with thick underlying permafrost. When the crater was formed, the meteorite punched through a stack of Paleozoic sediments and excavated material from a depth of over 1.7 kilometers, and thus exposed the basement crystalline rocks. Over the last four years researchers have been working to characterize the sparse biology of the crater to understand how life can re-colonize the devastated environment following an impact event.

More about the Haughton-Mars Science Project can be found at:

http://www.marsonearth.org/

Figure 3: Haughton Crater, a Mars analog site

3. FAA Study to Focus on Runway Crossing Procedures

The upcoming September Federal Aviation Administration (FAA) simulation at NASA FutureFlight Central will focus on investigating the impact of two National Transportation Safety Board (NTSB) recommendations for runway crossings

The first NTSB recommended change is to eliminate implied runway crossings per Federal Aviation Regulation (FAR), 91.129i. Currently this FAR states that a clearance given to an aircraft to "taxi to" the assigned takeoff runway is not a clearance to enter or cross that assigned takeoff runway. However, it is a clearance to cross other runways that intersect the taxi route to that assigned takeoff runway, and that any clearance to "taxi to" any point other than an assigned takeoff runway is clearance to cross all runways that intersect the taxi route to that point. By allowing for implicit runway crossings, this rule contradicts the basic principle of positive control in air traffic control and this practice has played a role in many runway incursions and collisions.

The second NTSB recommended change to be studied in FutureFlight Central is a procedure specifically allowed in the air traffic control rules handbook, 7110.65. A section allows controllers to clear aircraft to cross multiple runways in a single clearance. The NTSB wants controllers limited to single runway crossings in their clearances, and further wants aircraft to be clear of all previous runways before they are cleared to cross the next one. FFC will be testing the controller workload effect of requiring explicit runway crossing clearances from controllers and restricting them to single runway crossing clearances.

FFC will be simulating the DFW airport with some changes to their normal configurations. Four highly experienced controllers from DFW will participate in the experiment by directing traffic in the simulations. During the experiment, physiological measures will be recorded from the controllers and they will rate their workload at frequent intervals. Controller opinions and airport capacity under the different procedural conditions will also be measured. The FAA Office of Runway Safety is sponsoring this study.

Figure 4: The aerial photograph above shows a typical eastside DFW south flow arriving traffic route with runway crossings. (Only a portion of the eastside is depicted.)

4. Everywhere a Sound: FutureFlight Adds Noise Analysis Tool

Airport noise has long been the bane of existence for airport operators, airlines, and the communities living near airports. To help understand the impacts of airport noise, the FAA developed the Integrated Noise Model (INM) to assess airport noise impacts for:

- New or extended runways
- New fleet mix
- New traffic demand

FutureFlight has added the latest INM program release (6.0c) to its capabilities and is now testing the installation. Using this tool in the FutureFlight facility, airports or other organizations can try out new airport configurations.Then, using the noise contours overlaid onto a terrain or population map, they could determine what the effect would be on airport neighbor communities.

In order to calculate the noise intensity contours from a FutureFlight simulation, INM, as in the real world, utilizes flight track information, aircraft fleet mix, and aircraft profiles as inputs.

The FAA notes that the INM model estimates long-term average effects of noise using average annual input conditions. Their predicted measurements and actual measurements can differ since values can be affected by local acoustical variables such as the terrain, the humidity, buildings, barriers, etc.

For more information about INM, see http://www.aee.faa.gov/noise/inm/

5. FutureFlight Team Earns NASA Award

The FutureFlight Central Team received a 2002 NASA Honor Award for Group Achievement at the Ames July 10th ceremony. FutureFlight was recognized for its work with the Los Angeles Runway Incursion Studies; our citation reads: "For significant contributions to the safety of our Nation's air transportation system through pioneering a new simulation capability to enhance future terminal area surface operations."

Team members included representatives from Ames Research Center, Decision Systems, FAA (LAX Tower), Logicon, Los Angeles World Airports, Plato's Cave, QSS Group Inc., Raytheon ITSS, and United Airlines.

The NASA Honor Awards are "the most prestigious awards" granted by NASA to individuals and groups. The Administrator has approved each award, presented to a number of carefully selected individuals and groups, who have distinguished themselves by making outstanding contributions to the Agency's mission.

6. Upcoming Events and Trade Shows

NASA FutureFlight Central will be participating in the following events:

- American Society for Mechanical Engineers
  22nd Computers and Information in Engineering Conference
  September 29 – October 2, 2002 in Montreal, Canada.
  Nancy Dorighi, FutureFlight Manager, will be one of the speakers.

- ATCA 47th Annual International Technical Program & Exhibits
  "ATCA 2002: Aviation in Recovery – Meeting New Challenges,"
  November 3 – 7, 2002 in Washington, D.C. The conference web site is located at: http://www.atca.org/annual.htm

If you are attending any of these events and would like to a 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

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

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