



## High-tech sims enter real, of air traffic controller training

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Traditionally, air traffic controller training has been a dry-as-dust classroom learning process, with piles of documents to study, rules to absorb and procedures to learn, interspersed with occasional breaks to watch the professionals at work in ARTCCs, TRACONS and towers.

Now, advanced simulation technology has entered the controller training curriculum, and the scene has never looked better. Starting in the mid-nineties with pioneering work at NASA's Ames, CA, aerospace laboratory, simulation engineers have today brought an extraordinary level of reality into the classroom.

At NASA's multi-million dollar FutureFlight Central tower simulator, controllers sit at standard, fully equipped, consoles surrounded by large screens providing a simulated, full color, 360 degree view of the airport surface and its local airspace. Aircraft take off, land and taxi to and from gates while other aircraft are visible in the circuit, departing or on the approach. In a separate room, "pseudo pilots," many of them retired or off duty commercial pilots, "fly" the aircraft in response to controllers' instructions, using standard terminology back and forth. Daylight can be turned into night, and sunny VFR can be turned into heavy IFR, plus every permutation in between.

However, while NASA's simulator demonstrated what could be achieved in control tower simulation, it was not conceived as a training aid. Its prime purpose was to assess a given airport's traffic capacity, and to study the impacts of additional taxiways, high speed turnoffs, new construction projects and even new runways. Over the years, NASA has built up a "library" of domestic and overseas airports which can be displayed for these tasks.

Today, NASA's initiative has brought about the commercial development of airport tower simulators, which are being installed in increasing numbers both here and overseas, with the majority of them built by Adacel, Inc., of Montreal, Canada. Yet while these systems have been purchased by such customers as FAA's Technical Center, the FAA Academy, Nav Canada, the Universities of North Dakota and Alaska, Embry Riddle Aeronautical University, Norway's CAA and the United Arab Emirates Aviation College, the biggest buyer to date has been the US Air Force, which has taken delivery of around 30 Adacel MaxSim systems, with a further 60 to follow.

Over the next three years, the USAF plans to have a tower simulator at every one of its main domestic and overseas bases, including systems at its major ATC training establishment at Keesler AFB, Biloxi, MS. The Air Force was said to have estimated between 30% and 50% reduction in training time and costs with the MaxSim units. The Army has also purchased seven simulators, including one optimized for Special Operations.

And tower simulators no longer have multi million dollar price tags. Depending on individual customer needs and number of systems purchased, units start out at around \$300,000 each, with a very comprehensive system selling in the \$750,000 to \$900,000 range, according to the company.

Adacel's MaxSim was featured at the opening in December of the company's new facility in Orlando, FL, home to Flight Safety, CAE SimuFlite and PanAm/Simcom training centers. In fact, Orlando now calls itself the simulation capitol of the world where, according to Orlando Mayor Buddy Dyer, Adacel would become the region's 151st. simulator and training company, joining over 4,000 high technology firms already there.

### **No pilots required**

At Orlando, Adacel demonstrated MaxSim's capabilities, which incorporate many advances over NASA's system. One of these was an intriguing, company developed, voice recognition technique. Here, costly pseudo pilots are no longer required, and exchanges between controllers and pilots are governed by a very sophisticated software program where each controller voice message triggers an appropriate - yet distinctly human sounding - computer response from the pilot of the specific aircraft being called. Software vocabularies of pilot responses to controller messages have been developed to cover almost all situations, with separate versions in ICAO - and FAA-speak, plus a slightly shorter military vocabulary and one in Portuguese.

The simulation screens at the Orlando demonstration covered a 225-degree outside view, although this can be expanded or contracted to meet customer requirements. Most USAF systems will be 225-degree systems, to allow their installation in standard size training rooms. The detail and clarity of the simulated airport simulation was particularly impressive, as was the amount of activity, with aircraft continuously docking, pushing back, taxiing, landing and taking off. But it was nowhere near capacity: the system can accommodate 250 simultaneous aircraft and surface vehicle movements.

Controllers can also call up the view through a pilot's or vehicle driver's windshield for an instant appreciation of their view of any given situation. And even the traditional control tower binoculars are simulated. Slewing an outline box around an airline A-320 and zooming in on it as it turned off the runway made its registration easily readable. Similarly, zooming in on unidentifiable distant aircraft makes them quickly recognizable by type and, for the experts, by their airline color schemes.

Currently, Adacel has over 500 different aircraft in a constantly expanding library, each rendered in exacting detail to meet USAF requirements for precise replication of the real thing. And for most aircraft, the software can simulate different operating characteristics, such as engine out procedures, weight/altitude/ temperature variations and takeoff/climb techniques, including tight spiral climbs used in certain military operations. Crash/fire/rescue scenarios are also offered.

And, of course, specific airports and weather conditions can be called up. The Orlando demonstration simulated a sunny day at Milan's Malpensa airport, but within seconds, a change of location request brought up the windswept runways of Elmendorf AFB, AK, where, under a lowering ceiling and falling snow, a pair of F-15s roared into sight over the field (the sound effects were superb), broke over the runway and joined the downwind leg. Great stuff, but it looked damned cold, and we quickly switched back to Milan.

Time was when air traffic controllers would whistle in admiration on looking over pilot flight simulators. Now, it's the pilots' turn to whistle.