

## Airport Cities

**Energy conservation, sustainability and performance-based design are key issues for M/E/P designers on airport projects—and yes, airport security as well.**

*By Barbara Horwitz-Bennett, Contributing Editor -- Consulting-Specifying Engineer, 3/1/2007 1:00:00 AM*

Domestic airline travel is on the rise, but that doesn't always translate into airport renovations and expansion. "The demand for air travel is fairly strong, but the problem is financing," explains Dave Kipp, P.E., chief operating officer and senior vice president of technology and aviation, Ross & Baruzzini, St. Louis.

One problem is that reauthorization of the Federal Aviation Administration's Airport Improvement Program has been tied up in Congress for the past couple of years, so federal funding has been slow in coming, and the lack of domestic financial support has contributed to an interest in a new business model—with some alternative forms of revenue.

One new concept is the "airport city," with retail and restaurant franchises, hotels, offices and

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apartments re-creating the airport as a destination, according to Randy Tucker, P.E., executive vice president and chief strategy officer, RJA Group, Houston. Airports also are focusing via décor on building local themes into these new facilities.

And now, some airports have tapped into parking, rental cars and leasing of unused property to contribute to bottom lines. In fact, Houston's George Bush Intercontinental Airport harvests hay from its surrounding fields and sells it to farmers.

But airport authorities don't just cater to air travelers. They also must accommodate the evolving business plans of the airlines.

Common use terminal equipment (CUTE), which allows carriers to share data transmission and delivery systems, fits into the equation. "Common use is very popular and continues to increase, although it's harder to implement at major hubs as large carriers want to maintain control of their terminals," Kipp explains.

At the same time, Tucker says, airport authorities may push airlines to share gates. He points to Miami International Airport, where CUTE is being pushed because the facility is landlocked and unable to expand.

According to Ashok Raiji, P.E., principal, Arup, New York, the application of common use systems is critical to optimizing the efficiency of terminals that multiple carriers use. "Typically, common use systems will increase capacity by 25%, resulting in the ability to process more passengers with fewer facilities. As the typical cost of building a gate ranges between \$10 million and \$25 million, and the cost of installing CUTE systems is less than \$100,000 per gate, the economic advantages are clear," he says.

Another efficiency tool in use is the self check-in station. "The popularity of self check-in has grown rapidly in North America and Europe," Raiji says. "Common use self-service (CUSS) kiosks present airports with the opportunity to segregate passengers based upon travel needs, as opposed to the conventional approach of segregation based upon airline."

Already in airports such as Las Vegas' McCarran International, such devices have been well received by passengers. However, even though CUSS has been popular, Raiji points out that airport design hasn't quite caught up with demand. "Often self check-in kiosks are incorporated into check-in desks and departure halls in ways that make them appear to be an afterthought," he says.

Instead, Raiji suggests locating CUSS kiosks for passengers without bags to check near security to simplify passenger flow. And for passengers with bags to check, Raiji recommends installing a bag drop by kiosks.



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## The design challenges

Each of these projects presents its own set of challenges—a long list of stakeholders, phased construction to maintain daily operations, large buildings teams and the need for significant flexibility.

Not only is the list of stakeholders long, but the building team itself is quite large. In fact, aviation projects require more team members—possibly worldwide—than any other project type, claims Pat Askew, AIA, aviation group director, HOK, St. Louis.

Consequently, project websites have become commonplace. “We can exchange drawings and information in real-time, and superimpose our work onto other drawings, even in 3-D,” Askew notes.

And don't forget the fact that an average terminal project easily can take seven to eight years, during which time airline and airport needs, not to mention technologies, are bound to change—flexibility is a must.

Raiji points out yet another difficulty: Building codes generally take a prescriptive-based approach to life safety and don't recognize the unique nature of airport terminal buildings.

“For example, codes require compartmentation of spaces in order to prevent the spread of fire and smoke, and they also stipulate the maximum travel distance for egress. For airports, such prescriptive requirements result in significant compromises in functionality, aesthetics and cost,” Raiji suggests. One option is to use performance-based design, when possible.

## Top security

As always, security is a top issue—along with concerns of passenger time and convenience in the security process—with lots of money poured into R&D. Askew says baggage scanning systems are more sophisticated, fast and accurate. “Travelers hate losing time in the airport on trips,” Tucker concurs.

Consequently, there is a growing demand for registered traveler programs, fingerprinting and retinal scans to streamline the travel process for frequent travelers. Also, designers predict, security equipment will migrate to a more behind-the-scenes post within airports.

But for now, most airport resources must go into security measures, especially with requirements for explosion detection systems still being an un-funded mandate for airports. “The stubborn political reality of aviation is that security trumps everything,” Kipp says.

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intrusion. Fortunately, a number of new products on the market, such as sophisticated radar detection, are making the job somewhat easier, Kipp says.

## Saving energy

Airports are one of the biggest energy users in a city, making energy conservation a significant issue for the engineering designers of these facilities. Sustainable design has become a serious consideration, such as at Boston's Logan International Airport, with the nation's first operational U.S. Green Building Council LEED-certified terminal.

The Indianapolis Airport Authority's new terminal, scheduled to open in late 2008, is expected to achieve a LEED Silver rating once it is completed. (For more, see "A Green Building for the Wild Blue Yonder" on pg. 34.)

"Sustainability is exploding," concurs Loy Warren, III, P.E., associate principal, national aviation manager, Carter & Burgess, Ft. Worth, Texas. "Most big cities, especially on the coasts, have dictated sustainability designs for new and renovated facilities."

In a similar vein, Mehta relates, "All states are mandating sustainable design and although many airports are not required to comply with the local codes, we have found that the owner [usually] insists that our design meets the code requirement."

In a nutshell, airports, with their hazardous materials, noises and pollution, are more actively looking for ways to mitigate their environmental footprint by exploring sustainable options such as capturing rainwater, gray water recycling, natural lighting and more efficient building envelopes.

## Big plans

Ambitious plans, however, need adequate funding. Aviation facilities are trying to keep up with passenger, security and energy conservation demands, but until the necessary funding comes in, it's going to be a challenge to do as much as they can with what they have.

"Because passenger growth has been tremendous the past two years and will likely continue before major expansions can be realized at airports, a quick-fix frenzy is starting," Warren says. "Most big airports have plans they have been unable to initiate, but will now at least jump-start interim improvements to add gates, passenger processing improvements and parking."

### **A Life-Cycle Approach to Aircraft Cooling**

Airlines have a keen interest in any and all methods of energy conservation. One possibility for energy savings lies in how aircraft are

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cooled while parked at the gate. Large commercial aircraft are capable of self-generating cooling while parked at the gate through an internal auxiliary preconditioned air (PCA) unit at each gate. PCA units are either direct-expansion or fed from a central plant with a glycol-water mix.

There lies a life-cycle cost decision when choosing between the two types. In order to help owners with this key decision, Orlando, Fla.-based TLC Engineering for Architecture has developed a nationally recognized computer modeling program that evaluates aircraft schedules, weather data, plant equipment efficiencies, utility rates, and maintenance and construction costs.

The software calculates ramp cooling load for a 24-hour design day in 10-min. increments. By modeling worst-case scenarios, the TLC designer works with the client to develop a full understanding of what will happen to the system operation under various operating circumstances.

This computer modeling also provides data to develop complete plans and specifications for a new PCA system and designs for current needs and anticipated future expansion. Another big advantage is that it simulates various design alternatives and provides payback periods, providing answers before construction dollars are committed.

— By Kevin Keither, P.E., LEED AP, Principal, TLC Engineering For Architecture, Tampa

## **Airport as Environmental Steward**

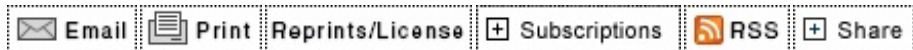
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One trend that is rapidly emerging is the design of airports and terminals in an environmentally responsible way, especially since the aviation industry creates a significant environmental footprint. In fact, air travel is estimated to contribute to about 3.5% of climate change linked to human activities, according to a U.N. panel. And over the last decade or so, greenhouse gas emissions from air travel has increased globally by 70%. The industry has recognized this and is under pressure to decrease their impact on global warming and climate change. As a result, there is a positive move to design terminals in a

sustainable manner.

From the standpoint of energy use, there is significant bang for the buck, since airport terminals are often very large buildings operating 24/7. Consequently, designers have gravitated from conventional HVAC systems to others such as fully-stratified and semi-mixed systems. There is also a greater focus on improving indoor air quality through the use of special filtration systems, placement of air intakes or both. Furthermore, newer airports have been designed with daylighting systems where natural light is introduced in a controlled manner so that artificial lighting can be turned off or reduced in intensity.

— By Ashok Rajji, P.E., Principal, Arup, New York



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