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Curbing terminal congestion – Automated vehicle technology is ready to roll at airports

Emerging technologies can provide airports with an affordable mobility alternative

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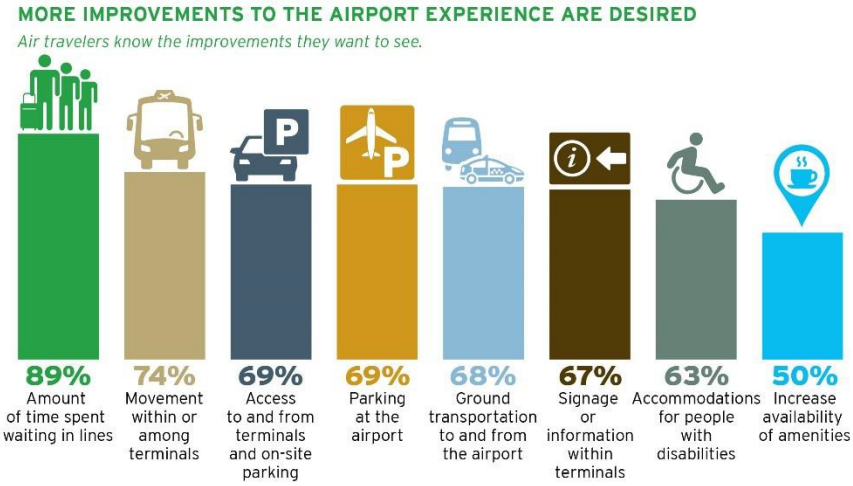
With the arrival of automated vehicle technology, airport owners now have another tool for alleviating bottlenecks around passenger terminals. An economical solution, automated vehicles can operate on existing infrastructure and carry large numbers of passengers. The best part? The technology can be implemented now.

In this white paper:

- The perfect controlled environment
- Pros and cons of adoption
- Forecasting market penetration

Losing curb appeal
Stand curbside at any major U.S. airport terminal, and you likely will see a chaotic environment of taxis, transit buses, airport shuttles, private vehicles and ride app drivers picking up or dropping off passengers. It is inefficient, often unsafe and an unpleasant experience for air travelers.

In a 2018 HNTB America THINKS survey, 69 percent of Americans said access to and from terminals and on-site parking needed improvement. And 63 percent of respondents said they view airport terminals as stressful.



Source: HNTB America THINKS survey

Fully aware of the problem, airport owners have built automated people movers (APMs) and relocated parking lots, garages and consolidated rental car facilities off-site. APMs offer numerous mobility and environmental benefits for airports, travelers and nearby residents, but they are not always right for every airport and are very expensive.

Depending on specific needs, available space, budgets and comfort level, connected and automated vehicles (CAVs) can present a viable, efficient alternative.

A new tool — perfect for the airport environment
With the arrival of automated vehicle technology, airport owners have another option for alleviating bottlenecks. Automated vehicles operate with an array of onboard sensors that detect and make independent decisions based on the environment around them. These self-driving vehicles can pick up and drop off passengers at remote parking lots or garages, remote ride app lots, or consolidated rental car facilities, or they can shuttle passengers between terminals.

Early adoption is best suited for fixed-routes with defined coverage areas or first-mile, last-mile deployments around a hub.

This makes the technology perfect for airport environments because:

- Airports can set their own rules and regulations, in certain situations, and adapt faster to new technologies.
- Airports offer a controlled environment, where automated vehicles can be separated from non- automated vehicles, and in many cases from pedestrians as well.
- The technology has evolved to a level of sophistication sufficient for reliable use at airports.

Pros, cons and considerations
There is no right or wrong choice. Whether an airport chooses an automated vehicle system or an automated people mover hinges on which asset best meets the airport's individual needs, budget, layout and comfort with new technology.

APMs generally serve airports shuttling large numbers of passengers on a limited circular or linear route that never deviates from its station sequence. An airport with a wider network of stops may see automated vehicles a solution. Self-driving vehicles have the flexibility to go where they are needed.

The 51 airports worldwide with automated people mover systems — Los Angeles International Airport soon to be No. 52 — aren't excluded from the benefits of this emerging technology. Self-driving vehicles could be dispatched to areas the APMs do not serve, further reducing congestion at the terminal curb.

Below are other considerations:

- **Capital cost.** The price of an automated vehicle system will vary dramatically based on the airport's needs and environment; however, the system likely will cost far less than an APM. For example, HNTB's study for the Greenville-Spartanburg Airport District estimated a new half-mile light rail system would cost $258 million while a connected and automated vehicle system would cost $86 million and could be constructed in the half the time.

- **Flexibility.** The APM is a dedicated, permanent fixture on the airport campus. Automated vehicle routes can be moved to accommodate construction or as demand shifts from one terminal or airline to another.

- **Infrastructure requirements.** All of the initial and ongoing expenses associated with APMs — a maintenance facility, rail system, signal system, fixed track and electrical power — are eliminated with automated vehicles. Stations, necessary with either mode, are simpler and more economical for automated vehicles. The need only consists of a raised curb and canopy, at minimum, or they can be as elegant and elaborate as the terminal they serve.

  And, for the near future, until they are fully autonomous, automated vehicles, too, will require dedicated lanes. However, because of their precision driving capabilities, they should be able to navigate in a narrower lane than conventional vehicles and can travel closely spaced, much like and APM. For airports with space-constrained terminal areas, a section of elevated guideway may be necessary to accommodate automated vehicles.

  When the technology matures and self-driving vehicles become mainstream — still another 20 years away — the vehicles will no longer need their own lanes. Once that happens, any roadways built exclusively for the automated vehicles could be designated for universal use.

- **Capacity.** An APM can have as many as four cars on one train, with each car carrying up to 100 standing passengers. As passenger demand increases, airports can add cars or trains.

  Automated vehicles, because of their precise maneuverability, can platoon into train-like configurations to handle crowds at big airports. Passengers per automated vehicle shuttle range from 45 for the larger vehicles and 14 for smaller cars. Plus, automated vehicles require less headway and can make more frequent stops — say every 60 seconds versus an APM, which might arrive every 3 minutes. CAV vehicles can also be configured like an APM/light rail seating arrangement, including standing passengers.

- **Lifecycle costs.** Both APMs and automated vehicles will require upkeep, but an automated vehicle system has fewer components to maintain, operate and replace. As the automated vehicle technology evolves and updates are required, owners can upgrade the software in their fleet without replacing the vehicles themselves. And, because most automated vehicles are powered by electricity, owners will have the expense of replacing batteries and installing chargers. Prices of those items, once extremely high, continue to fall as the technology takes root. And, CAVs have no track infrastructure that requires extensive maintenance.

- **System conversion.** Realizing automated vehicle technology is implementable today, airport owners may want to know if they should update their existing APMs — some now close to 30 or more years old — or repurpose those systems to accommodate the more economical option of automated vehicles.

  It depends. Every airport faces different needs, budgets and future forecasts, and automated vehicles may not make sense in some situations. Considering them, however does make sense — as a replacement, complement or stand-alone system — when developing curbside congestion solutions.

Encouraging use, discouraging congestion

Understanding existing curbside congestion is due to passengers choosing to ride in cars, airports may want to know how they could ensure more people would use APMs or an automated vehicle system. The answer could be tolling.

Some airports are exploring the possibility of charging vehicles that enter the terminal area. Others are considering tolling those that cut through an airport roadway as part of their commute without even accessing the terminal. Although congestion pricing may be years away, it could cut down on congestion while providing a valuable nonaeronautical revenue stream.

Market penetration

Theories differ on how soon automated vehicles will penetrate the automotive market. Some experts predict automated vehicles could represent 10 percent of the U.S. fleet as early as 2023. More conservative projections say 2030, with sales of the vehicles skyrocketing to 33 million by 2040. These timelines are based on current data and could be affected by unforeseen regulatory constraints, safety incidents, business investment, new technologies and user adoption.

No U.S. airport has implemented an automated vehicle program yet, but Seattle-Tacoma International Airport and the Greenville-Spartanburg Airport District have added automated vehicles to their long-range master plans. The Greenville-Spartanburg Airport District's automated vehicle system will transport passengers one-half mile from the economy parking lot to the terminal.

Airports outside the U.S. have been more receptive to the new technology. Since 2011, London's Heathrow Airport has operated a 21-vehicle Ultra Personal Rapid Transit system. More recently, Mercedes demonstrated its larger autonomous bus on a 20-kilometer bus rapid transit route at Amsterdam Airport Schiphol. And, in Paris, an automated vehicle pilot was deployed in April 2018

to connect Charles de Gaulle International Airport with an office complex in the city. The shuttle transports up to 15 passengers and operates daily. Connected automated vehicles also have been deployed on the tarmacs of airports at Amsterdam, Hong Kong and Frankfurt, Germany, to shuttle passengers from aircraft to the terminal from remote hardstands.

Ready to roll

As airport owners evaluate how to address congestion at their terminal curbsides, automated vehicles are another tool that can be considered now to reduce the number of vehicles picking up and dropping off passengers.

Resources

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Additional resources

Airports Council International – North America
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ITS America
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