

STUDY OBJECTIVES

The Commission of the Port of Seattle (the Port) requested that the staff of Seattle-Tacoma International Airport (the Airport) prepare a comprehensive review of commercial ground transportation (GT) operations at the Airport. To assist in preparing this review, the Port retained LeighFisher to research commercial ground transportation operations at peer airports and to document the relevant best practices. This review describes how other airports manage and operate the ground transportation system at their airport. This review also addresses how other airports are accommodating the rapid change in the ground transportation industry resulting from the introduction of transportation network (TNC) services (e.g., Lyft, Sidecar, and Uber) and peer-to-peer rental car services (e.g., Flightcar and RelayRides).

The information presented in this report is intended to assist Airport staff develop and evaluate options to manage and operate ground transportation considering the Port's key objectives for ground transportation operations and services at the Airport including:

- Provide the travelling public with superior service and a menu of transportation options
- Assure the 24 hours/7 days-a week availability of adequate ground transportation capacity to meet expected passenger demands
- Provide service in a manner that allows it to be efficiently and effectively managed by Port staff
- Establish business arrangements with the providers of ground transportation services that, at a minimum, allow the Port to recover its costs and potentially increase revenue
- Promote opportunities for small businesses
- Expand economic opportunity for the region
- Support regional environmental and sustainability goals

In addition to these key objectives of the Port, Airport staff wish to implement programs that:

- Are consistent with best industry practices including those used at peer airports
- Conform to the legal and operational constraints within which the Port must operate
- Consider a 5 to 10 year time horizon (which is prior to any major renovations to Sea-Tac's roadway system associated with the Sustainable Airport Master Plan (SAMP), currently in development)

The initial sections of this report define the terminology used in this report and list the peer airports (and how they were selected). Subsequent sections compare these peer airports with Seattle-Tacoma International Airport in terms of the:

1. Commercial ground transportation services offered to the travelling public
2. Business structures (or operational models) employed and the fees charged
3. Responsibilities of and resources available to the landside/parking departments
4. Operating budgets of these departments and the revenues they collect or manage
5. Facilities used by commercial vehicles dropping off and picking up airline passengers
6. Regulation of TNCs and peer-to-peer rental car businesses

The final sections of this report, prepared by Port staff, describe (1) the current commercial ground transportation providers at the Airport and their specific business models, and (2) the key constraints on commercial ground transportation operations at the Airport.

DEFINITIONS

The following paragraphs define technical terms used in subsequent sections of this report:

- **Commercial ground transportation** – Rubber-tired publicly and privately operated transportation service transporting customers to/from airports including taxicabs, limousines, transportation network companies (TNCs), shared-ride vans, courtesy vehicles, chartered buses and vans, but excluding rail service and parking shuttles, rental car shuttles, or other buses operated by or on behalf of the Airport.
- **Cost-recovery fee** – A fee charged to commercial vehicle operators doing business on an airport (i.e., picking up passengers) which allows the airport owner to recover the costs of providing, operating, and maintaining the roadways, curbsides, hold areas, and other facilities used directly by the commercial ground transportation operators.
- **Courtesy vehicle or courtesy shuttle** – Door-to-door, shared-ride transportation provided by the operators of hotels/motels, rental car companies, parking lots, and other businesses solely for their customers, and with the cost of such service considered to be incidental to the primary service offered the customer.
- **Deadhead trip** – A non-revenue trip which occurs prior to picking up a customer or after dropping off a passenger.
- **Dwell time** – The total time a vehicle spends at the terminal curbside while waiting for a passenger to arrive or to actively load or unload.
- **Exclusive Provider** – A contract (frequently referred to as a **concession contract**) between an airport operator and a commercial ground transportation business under which the airport provides the company certain rights or privileges (e.g., the exclusive right to offer a specific transportation service or use designated areas of the airport) and in turn the **exclusive provider** or **concessionaire** agrees to pay the airport a fee which frequently involves a minimum annual guarantee (MAG) amount and/or an amount that reflects the volume of airport-related business conducted by the company (e.g., a percent of gross revenues).
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- **Hold area** – An area designated for use by commercial vehicles such as taxicabs, limousines, shared-ride vans, and buses/vans to wait in (or stage) until they are called to the curbside. Also referred to as staging area, hold lot, or holding area.
- **Improper solicitation** – Improperly or illegally offering transportation services to airline passengers such as licensed and unlicensed limousine drivers (or their representatives) soliciting business from passengers who have not made prior arrangements for such service from the driver or company.
- **Licensed enforcement officer (LEO)** – A police officer monitoring Airport curbside facilities who is capable of issuing tickets for moving violations and arresting offenders.
- **Limousine** – Transportation service offered in town cars or luxury vehicles, most frequently on a pre-arranged basis, where the provider is compensated based upon the length of time the vehicle is hired regardless of the number of passengers transported or distance travelled. At some airports on-demand limousine service is available.

- **Minimum annual guarantee (MAG)** – The minimum fee or amount that a business, concessionaire, or exclusive provider agrees to pay on an annual basis regardless of the revenues collected or business volume conducted. A similar fee may instead be assessed on a monthly basis as a minimum monthly guarantee (MMG).
- **On-demand service** – Transportation service (e.g., taxicab service) that is provided in direct response to a customer’s request via telephone, street hail, or other form of communication as opposed to pre-arranged transportation service. At an airport, on-demand services are available on a walk-up basis at the curbside without prior arrangement or interaction between the customer and the provider.
- **Owner/operator** – An individual who both owns and operates a vehicle (e.g., a taxicab driver who owns a taxicab and drives the vehicle). Frequently owner/operators may operate a vehicle as a franchisee or as part of a fleet owned/controlled by others.
- **Peer-to-peer** – Services that are shared among users rather than owned by a company
- **Pre-arranged service** – Transportation service (e.g., limousine, transportation network company, or bus/van service) that is provided in response to a prior request from a customer via telephone, company provided smartphone application, or other method as opposed to on-demand service that is available on a walk-up basis. Often the transportation service is required to have an electronic receipt or waybill showing the customer’s name, pick-up point, party size, destination, and arrival time, or other details depending on the type of transportation service. The precise definition of prearranged varies from community to community.
- **Privilege fee** – As used in this report, a fee charged commercial vehicle operators that reflects the overall business benefits the commercial ground transportation operators receive and privileges they enjoy as a result of the presence of the entire airport and from the operators’ access to the traveling public. Typically such fees are calculated based on the volume of airport-related business conducted by the operator.
- **Scheduled service** – Fixed route transportation operated at set headways or departure times
- **Shared-ride service** – A service providing door-to-door transportation for multiple customers or parties to or from an airport whereby each passenger pays a pre-determined fare regardless of the number of passengers transported or distance travelled. The service, most commonly provided in 8 to 12 passenger vans, may make multiple enroute stops and may be available on a walk-up or pre-reserved basis.
- **Taxicab** – A vehicle – typically a sedan or van – providing non-stop, door-to-door transportation for a single party (one or more passengers) between locations of the passenger’s choice with the fare established based upon a taximeter or zone system regardless of the number of passengers transported. The precise definitions for taxicabs, taxicab companies, and taxicab drivers vary from community to community. Taxicab service at airports can be classified as **on-demand taxicabs** available to walk-up customers, or **pre-arranged/belled-in taxicabs** that are serving customers who have made prior reservations. Pre-arranged (e.g., personals) or belled-in taxicabs may be licensed by a jurisdiction or regulatory authority other than one regulating on-demand taxicabs at the airport.

- **Third-party management contractor**—A qualified business, retained by an airport operator to provide and oversee, at the airport’s direction, specific services (e.g., management of parking facilities) and which is reimbursed for labor hours they furnish and other authorized expenses they incur.
- **Traffic control officer (TCO)** – An enforcement officer capable of issuing tickets for non-moving violations but not arresting an offender
- **Transportation network company (TNC)** –A business that connects its affiliated drivers who, using their personal vehicles, transport customers desiring door-to-door transportation and who have requested this service using the businesses’ proprietary smartphone application. The fare is typically established based upon time and distance traveled. Service may be non-stop or shared with another party depending on the type of service selected.

SELECTED PEER AIRPORTS

In cooperation with Airport staff, fifteen airports were selected for comparison with Seattle-Tacoma International Airport. These airports, which are listed in Table 1, were selected to include airports which:

- Serve a similar volume of originating and terminating airline passengers. The volume of originating and terminating passengers, which excludes passengers connecting between flights, reflects the potential users of commercial ground transportation services. As shown below, Seattle-Tacoma International served about 25.9 million originating and terminating passengers in 2013, the most recent year for which originating-terminating airline passenger data are available from the Federal Aviation Administration
- Serve a passenger mix similar to that served by Seattle-Tacoma in terms of trip purpose (business vs. leisure passengers) and place of residence (local resident versus non-resident passengers)
- Are operated by either a port or airport authority, as is Seattle-Tacoma International, or by a city or county
- Employ a range of commercial ground transportation business structures or operating models including those considered to have best of industry practices.

Table 1
Selected Peer Airports

2013 O&D passenger rank	IATA Code	Airport Name	2013 O&D passengers (millions)	Governance structure
3	SFO	San Francisco International	33.6	City
8	DEN	Denver International	28.0	City
9	BOS	General Edward Lawrence Logan International	27.8	Authority
10	SEA	Seattle-Tacoma International	25.9	Authority
14	MIA	Miami International	21.9	County
15	PHX	Phoenix Sky Harbor International	21.2	City
16	FLL	Fort Lauderdale/Hollywood International	20.9	County
17	MSP	Minneapolis-St Paul International/Wold-Chamberlain	18.1	Authority
19	DTW	Detroit Metropolitan Wayne County	16.6	Authority
20	IAH	George Bush Intercontinental/Houston	16.0	City
21	BWI	Baltimore/Washington International Thurgood Marshall	15.9	State
22	TPA	Tampa International	15.7	Authority
24	PHL	Philadelphia International	15.2	City
26	PDX	Portland International	12.6	Authority
28	IAD	Washington Dulles International	12.0	Authority
NA	YVR	Vancouver International	19.2 (a)	Authority

Source: LeighFisher, July 2015 based upon airline passenger volumes obtained from FAA data base

(a) Passenger volume is total enplaned plus deplaned passengers.

The airport staff responsible for the day-to-day management of ground transportation at each of the above airports were contacted and invited to participate in a detailed telephone survey. Surveys were completed with fourteen airports; representatives from Detroit Metropolitan Wayne County Airport (DTW) did not respond to requests to participate in the survey.

The resulting survey data were supplemented with data LeighFisher gathered during the conduct of the forthcoming Airport Cooperative Research Program Report 146 (*Commercial Ground Transportation at Airports: Best Practices*) and other data contained in LeighFisher’s files.

COMPARISON OF OVERARCHING GROUND TRANSPORTATION STRATEGIES

Airports have a variety of overarching strategies that guide their decision-making processes. As shown in Figure 1, the primary strategies the peer airports consider when making decisions regarding ground transportation operations were customer service (11 of 15 peer airports) and revenue generation or cost recovery (8 of 15 peer airports). Other important considerations cited include maintaining efficient operations by minimizing traffic congestion, ensuring safety and security for customers, and maintaining high levels of accessibility to the airport.

Figure 1
Overarching Strategies Influencing Ground Transportation Decisions

	Customer Service	Revenue/Cost Recovery	Efficient Operations	Safety/security	Accessibility	Other
<u>SEA</u>	Green	Green	Grey	Grey	Grey	
<u>BOS</u>	Green	Grey	Green	Grey	Grey	Encourage HOV modes
<u>BWI</u>	Green	Grey	Grey	Grey	Green	Be a low-cost airport
<u>DEN</u>	Grey	Green	Grey	Grey	Green	
<u>DTW</u>	Green	Grey	Grey	Grey	Grey	
<u>FLL</u>	Green	Grey	Grey	Green	Grey	
<u>IAD</u>	Green	Green	Green	Grey	Grey	
<u>IAH</u>	Grey	Green	Grey	Grey	Grey	Provide variety of service
<u>MIA</u>	Grey	Grey	Grey	Grey	Grey	Enhance technology
<u>MSP</u>	Green	Grey	Grey	Grey	Grey	
<u>PDX</u>	Green	Green	Grey	Grey	Grey	
<u>PHL</u>	Green	Grey	Grey	Grey	Grey	
<u>PHX</u>	Green	Green	Green	Green	Grey	
<u>SFO</u>	Green	Green	Green	Grey	Grey	
<u>TPA</u>	Green	Green	Grey	Grey	Grey	
<u>YVR</u>	Green	Green	Grey	Grey	Grey	Sustainability

Source: LeighFisher, based on data from Airport staff, July 2015



Figure 2 summarizes the extent to which environmental and customer service initiatives are incorporated into ground transportation agreements or rules and regulations. Three of the peer airports (PHX, SFO, and YVR) place a high importance on environmental initiatives or sustainability. PHX and SFO both require 100% alternative fuel vehicles for at least two modes of commercial ground transportation. YVR previously provided discounted permit fees for alternative fuel vehicles, but ended this incentive program in 2014 with a taxi fleet that is more than 75% alternative fuel. YVR also places a strong focus on sustainability overall. PDX considered encouraging alternative fuel vehicles; however, without any incentive program the fleet mix is already more than 80% green. BOS, DEN, and IAD offer a discounted permit fee to vehicles using alternative fuels, with IAD’s applying only to hotel/motel courtesy vehicles.

Customer service is an important component of ground transportation agreements, rules, and regulations at seven of the airports. Common customer service initiatives include requiring all drivers to complete a customer service training program, implementing higher vehicle and driver standards than required by the local regulator, requiring that ground transportation operators accept credit cards and process them in a secure manner, and limiting the age or mileage of vehicles that can be used to provide service at the airport. MSP and PDX each have a specific customer service program outside of these common customer service initiatives. At MSP, the airport overall sets Widely Important Goals (WIGS). Specifically, the MSP ground transportation staff have a goal to create a memorable moment every day (e.g., by approaching a lost passenger and asking if he or she needs help finding their ground transportation).

Figure 2
Environmental and Customer Service Initiatives

	Environmental Initiatives						Customer Service					
	Extent of impact on ground transportation	Alternative fuel required	Discounted fees	Front-of-line privileges	Deadhead trip reduction	Other	Extent of impact on ground transportation	Training required	Higher standards than local regulator	Secure credit card processing	Customer service program	Vehicle age/mileage limits
SEA	High	(a)					High					7 years
BOS	Moderate		(b)				Moderate					No
BWI	None						High					6 years
DEN	Moderate		(c)				Moderate					No
DTW	Unknown											
FLL	None						High					7 years
IAD	Low		(d)				Moderate					5 years
IAH	None						Low					No
MIA	None						Moderate					5 years
MSP	None						High					6 years
PDX	Moderate	(e)					High					10 years
PHL	Low						Low					7 years or 250,000 miles
PHX	High	(f)					High					New at start of contract
SFO	High	(g)				(h)	Moderate					
TPA	None						High					5 years at start of contract
YVR	High		(i)				High					6 model years

- (a) 100% green fleets for major on-demand services
- (b) 50% discount on access fees
- (c) 10% discount on access fees
- (d) 50% discount for hotel/motel courtesy vehicles only
- (e) No policies needed: 80% alternative fuel already
- (f) 100% for taxi and shared-ride fleets
- (g) 100% for shared-ride and courtesy vehicles
- (h) Only alternative fuel limo companies listed on airport website
- (i) Ended in 2014 at over 70% alternative fuel taxi fleet

 Airport initiative
 Local regulator initiative

Source: LeighFisher, based on data from Airport staff, July 2015

At PDX, the ground transportation operators participate in the airport's "PDXpectations" initiative and are educated on the five guiding principles (be knowledgeable, be friendly, speak with body language, be respectful, be proactive). Prizes are given out in the hold lot several times per year to encourage drivers to approach a booth where customer service handouts outlining the PDXpectations are distributed at that time. Airport staff meet with all managers/owners of companies to discuss the PDXpectations. There is also a reward program that allows a driver recognized by a customer for good service to be eligible to receive a plaque, be recognized by airport management, earn a free lunch, and be entered into a drawing to attend an annual dinner.

COMPARISON OF AVAILABLE COMMERCIAL GROUND TRANSPORTATION SERVICES

The types of ground transportation services offered at each of the peer airports are summarized in Figure 3. All airports provide on-demand taxicab service and pre-arranged limousine services, and all but YVR offer shared-ride service. Most airports allow non-local or non-contracted taxicabs (i.e., belled-in taxicabs) to pick up pre-arranged customers at the airport if the driver obtains a permit and pays the required fees, whether an annual permit or occasional use/day pass. At most airports these taxicabs are considered to be pre-arranged services like limousines and regulated as such, rather than being allowed to use the same boarding areas or pay the same fees as taxicabs. Some airports such as FLL, MIA, and MSP do not allow outside taxicabs to pick up at the airport on either an on-demand or pre-arranged basis.

Four of the peer airports have established permits for transportation network companies. At IAH there is only one operator (Uber), at DEN and PDX there are two operators (Lyft and Uber), and at SFO there are four TNCs (Lyft, Sidecar, Uber, and Wingz). Five airports have agreements in place with peer-to-peer rental car companies such as FlightCar or RelayRides. All five airports classify these operators as off-airport rental car companies. Four other airports do not yet have agreements in place with any peer-to-peer rental car companies, but have either had discussions with company representatives about operations beginning or are aware that the companies are currently operating without an agreement in place.

Figure 3
Ground Transportation Services Permitted to Pick Up Passengers

	On-demand taxicabs	Pre-arranged taxicabs	On-demand shared-ride	On-demand limousines	Pre-arranged limousines	Transportation network companies	Peer-to-peer rental car companies
<u>SEA</u>							1
<u>BOS</u>							
<u>BWI</u>							1
<u>DEN</u>						2	1
<u>DTW</u>							
<u>FLL</u>							
<u>IAD</u>							
<u>IAH</u>						1	
<u>MIA</u>							
<u>MSP</u>							
<u>PDX</u>						2	1
<u>PHL</u>							
<u>PHX</u>							1
<u>SFO</u>						4	2
<u>TPA</u>							
<u>YVR</u>							

Source: LeighFisher, based on data received from Airport staff, July 2015

COMPARISON OF BUSINESS STRUCTURES AND BASIS OF FEES

General pros and cons of business structures

There are three basic types of business arrangements (or models) that airports use with commercial ground transportation companies. These are: open access, restricted or exclusive access, or a hybrid blend of these two. Airports typically use an open access model for their business relationships with all courtesy vehicles, prearranged limousines, scheduled vans/buses, and charter vans/buses. Airports may use either an open or an exclusive (or semi-exclusive) model for their business relationships with taxicabs, shared-ride vans, and on-demand limousines.

Each model has its advantages and disadvantages. The key differences are (a) the airport’s ability to control the customer experience and operations, including vehicle and driver standards, (b) the amount of staff effort required to implement and oversee operations, and (c) the amount of competition among companies.

Open Access. With an open access system any vehicle having a valid permit issued by the local regulatory agency may serve the airport. This allows for greater competition among operators. This competition is the key benefit of an open system—all licensed companies have the opportunity to serve the airport. However, an open system frequently leads to an oversupply of taxicabs or shared-ride vans. An oversupply of taxicabs frequently leads to reduced taxicab driver income, reduced motivation for the drivers to properly maintain their vehicles, and reduced customer service. As a result, an open system requires increased effort by airport staff to ensure that drivers and their vehicles comply with the airport’s minimum standards and its rules and regulations. Enforcement requires greater staff effort because (a) penalties are limited to

monetary fines or service suspensions, and (b) staff, particularly those at large airports, must oversee the operation and compliance of hundreds of drivers and their vehicles. Airport staff may also need to implement measures to balance the supply of taxicabs with customer demand for service. These measures include rotation systems or closing the hold lot at times.

Exclusive Access. With an exclusive (or semi-exclusive system) an airport awards a contract to one or several companies and only this company may pick up customers at the airport. These contracts are awarded through a competitive bid or proposal process. The selected concessionaire(s) is typically responsible for day-to-day operations including vehicle dispatching from the hold area, curbside operations, and staging area management; furnishing the communication and other equipment needed to dispatch vehicles and oversee vehicle queues; ensuring the appropriate balance between customer demands and the number of waiting vehicles; providing an adequate number of waiting vehicles at all times including during inclement weather or irregular operations; and, ensuring that service is provided using vehicles and drivers that meet or exceed the standards set forth in their proposal. Compared to an open access contract, enforcement requires significantly less effort from airport staff because (a) the airport has a contractual business relationship with the ground transportation provider, rather than a regulatory one, and (b) the airport is interacting with a single ground transportation provider (or typically fewer than three ground transportation providers) rather than hundreds of individual drivers. Customer service is enhanced because companies competing for the concession contract are incentivized to propose levels of service that exceed the airport's minimum standards.

The major disadvantage of an exclusive or semi-exclusive access model is that some properly licensed companies will not be selected and these companies will be precluded from conducting on-demand business at the airport, and thus denied a business opportunity. A second disadvantage is that if one company is awarded the contract, when there is a re-compete for the contract the incumbent will have a perceived advantage over its competitors, assuming the incumbent has been performing satisfactorily.

Typically companies that are awarded semi-exclusive concession contracts allocate the customers using a predetermined method (e.g., based upon the number of authorized taxicabs). However, at some airports individual taxicab contracts are awarded by terminal building or terminal curbside (e.g. TPA), and individual shared-ride van services may be awarded by geographic area.

Another practice to allow greater opportunities for small or disadvantaged businesses is to award contracts to a driver collective or consortium (such as the contract previously awarded to SITA at SEA and now in place at Sacramento International Airport), where multiple smaller independent owner/operators agree to work collaboratively together as one group, creating a fleet large enough to serve the airport.

On-demand taxicabs

Best practice is typically to have a closed on-demand taxicab system. This is due to the benefits described previously including a better experience for customers, higher incomes for the drivers, and a system that is easier to manage for airport staff. Figure 4 summarizes the taxicab systems at the peer airports. Of the peer airports, eight have an open taxicab system. This includes PDX where all taxicabs are allowed to operate at the airport but only every other day (a rotation system). Of the six peer airports with a closed system, BWI has a single concessionaire, TPA has two concessionaires, and both IAD and PHX have three concessionaires. YVR is unique in that the airport decides on the number of taxicab permits needed, then releases a mini-RFP for the number of new permits needed to reach that limit. In total there are currently sixteen companies who have contracted with YVR in this way. DEN is also unique, as there are only five taxicab companies licensed by the local authority, thus each company is allocated a percent of the available permits based on the proportion of their business in the city as a whole. It is then up to the companies to decide which drivers may use those permits and pick up passengers at the airport on a given day.

When asked what they would change about ground transportation operations at their airports if anything were possible, two of the eight peer airports with open taxicab systems said they would prefer to operate a closed on-demand taxicab system with only one or a few companies if there was support from management. Implementing a closed taxicab system can be a difficult task for airports that must seek approval from a City Council or local commission, as airport management will likely face political opposition from some taxicab drivers and companies.

Figure 4
On-Demand Taxicab Operating Agreements

	Open	Restricted	Limit on number of permits	Number of permits	Permits per thousand O&D passengers
<u>SEA</u>		One operator	Airport asks for set number and taxis can petition to increase	231 permits	8.9
<u>BOS</u>	Open			Unknown	Unknown
<u>BWI</u>		One operator		324 permits	20.4
<u>DEN</u>		Allotment to each company in city	Yes, increased for special events (e.g., 10 extra cabs per company)	281 permits	10.0
<u>DTW</u>				Unknown	Unknown
<u>FLL</u>	Open		County has cap but not airport	Unknown	Unknown
<u>IAD</u>		Three operators	Limit 240 vehicles/company	720 vehicles	59.9
<u>IAH</u>	Open			2,200 drivers	137.6
<u>MIA</u>	Hold lot closed when full			Unknown	Unknown
<u>MSP</u>	Open			32 companies; 767 vehicles	42.3
<u>PDX</u>	Two-day rotation system			Unknown	Unknown
<u>PHL</u>	Open			900 permits; 1,100 drivers	59.1
<u>PHX</u>		Three operators	Based on seasonal demand	186 to 254	8.8
<u>SFO</u>	Open			2,199 permits	65.4
<u>TPA</u>		Two operators		15 companies; 75 permits	4.8
<u>YVR</u>		Limited permits	Mini RFPs for new licenses	16 companies; 525 vehicles	27.3

Source: LeighFisher, based on data received from Airport staff, July 2015

Figure 5 summarizes the fees paid by, annual revenues received from, and length of the agreements with on-demand taxicabs at the peer airports. The chart also describes how the fees were originally determined, when known by airport staff. At some airports, trip or permit fees have been in place without being updated for many years, particularly at the open access airports. The majority (nine) of the peer airports determine their fees using a cost recovery analysis – determining the fees that would be necessary to fully recover the costs associated with managing the taxicab service, including providing and maintaining the curbsides, dispatching and other equipment, staging areas, and the roadways and other facilities used by the taxicab operators. At airports with a closed system, the companies awarded the concession contract are typically required to pay a MAG, a per-trip fee, or a percent of gross revenues when they submit their bid for the concession contract. Other airports negotiate with the contracted taxicab concessionaire(s) to determine a fee amount that is acceptable to both the provider(s) and the airport.

Many airports will at times have insufficient taxicabs waiting at the airport to pick up on-demand passengers, particularly when there are irregular flight operations, severe weather that impacts the condition of the roadways such as ice or heavy storms, or when there are unusually high demands for taxicabs elsewhere in the community. Figure 6 shows the methods used by the peer airports to manage customer wait times and ensure the availability of taxicabs during these times. At airports with a closed system and a formal agreement with the taxicab operator(s), the taxicab companies (the concessionaires) have a contractual obligation to pick up waiting passengers within a prescribed amount of time, ranging from three minutes at TPA to twenty minutes during off-peak times at BWI. PHX has a customer wait time limit of 5 minutes. If a customer must wait longer and the company does not have at least 85% of its taxicab fleet in operation, then it is assessed a fine of \$295 per occurrence. At DEN there is no prescribed time limit for customers waiting to be picked up, but if there are long lines and any of the five companies are consistently found to not be providing sufficient taxicabs, then the airport may reallocate some of their permits to another company. The airports reporting that a lack of taxicabs is not an issue (e.g., IAD and IAH) also report having excessive numbers of waiting taxicabs during most hours.

At most of the other airports not previously mentioned, if there are insufficient taxicabs then the airport taxicab dispatcher will contact the companies and alert them that additional taxicabs are needed. BOS uses a unique system where the airport taxicab dispatcher updates a Twitter account to alert licensed taxicab drivers to how many taxicabs are currently in the airport taxi pool, whether additional taxicabs are needed, and what time the last flight is scheduled to arrive if there have been delays. This provides the drivers with up-to-date information that they can check from any location, allowing them to make an informed decision about whether to serve the airport at that time.

Figure 5
Taxicab Fees

	Permit	Trip Fee	Trip fee for drop off?	Concession Fee	MAG	Other	How fee determined	Recent annual amount received	Length/term of agreement
SEA				13%	\$3.6M		Bid. Airport set 10% minimum	\$3.6M	5 years
BOS		\$2.25				Min. 10 trips/mo.	Cost recovery	\$5.1M	N/A
BWI		\$2.50			\$2,423,892		Unknown	\$2,423,892	5 years
DEN		\$4.57					Cost recovery	Unknown	N/A
DTW							Unknown	Unknown	
FLL	Yes + \$350/vehicle deposit	\$3.00					Cost recovery, workshops, peer airports	Unknown	N/A
IAD	\$1,800/\$3,000/vehicle + \$250 per driver	\$2.55	Yes				Bid	\$4.9M	3 years + 2 one-year options
IAH		\$2.75					Cost recovery	Unknown	N/A
MIA		\$2.00					Originally cost recovery	\$2,990,278	N/A
MSP	\$3,300/ vehicle						Cost recovery	\$2,487,101	N/A
PDX	\$200/company for 5 years + \$100/veh/year	\$2.50					Cost recovery	\$954,900	N/A
PHL		\$1.50					Cost recovery	\$1,685,499	N/A
PHX	\$15,500 - \$16,300/ vehicle	\$1.00					Bid amount + \$1.00/trip	\$3.5M	5 years + 1 five-year option
SFO	\$55/vehicle for inspection	\$5.00					Cost recovery	Unknown	N/A
TPA				\$0.043/pax.	\$166,000		Negotiation	\$365,158	5 years + 5 year extension + amendment
YVR	(a)						Negotiation	Unknown	N/A

(a) YVR permit fees based on average monthly trips: \$4,104 if > 90 trips; \$3,120 if < 90 trips

Source: LeighFisher, based on data from airport staff, July 2015

Figure 6
Methods to Enforce On-Demand Taxicab Customer Service Wait Times

	Contract requirement	Penalty	Contact taxi companies	Other	Non-issue
<u>SEA</u>	5 minutes	\$50/person or \$500/day			
<u>BOS</u>			Twitter		
<u>BWI</u>	10/20 minutes peak/off-peak	\$250/occurrence			
<u>DEN</u>		Reduce company permits			
<u>DTW</u>					
<u>FLL</u>					
<u>IAD</u>					
<u>IAH</u>					
<u>MIA</u>					
<u>MSP</u>					
<u>PDX</u>				Open to all cabs	
<u>PHL</u>					
<u>PHX</u>	5 minutes	\$295/occurrence			
<u>SFO</u>					
<u>TPA</u>	3 minutes				
<u>YVR</u>					

Source: LeighFisher, based on data received from Airport staff, July 2015

On-demand limousines

Only four of the peer airports (BWI, FLL, PDX, and YVR) have on-demand limousine contracts. PDX is contracted with three companies; however, they are currently reviewing their contract and are unsure whether it will be renewed. Those three companies currently pay the airport a trip fee of \$3.00 per pick-up. The single contracts at BWI and FLL are operated by the same companies that hold the shared-ride contracts at the airports. At BWI the operator pays the greater of 9% of gross revenues or a minimum annual guarantee (MAG) of \$100,000. At FLL the contract is combined with the shared-ride agreement, with a fee of \$0.461 per deplaned passenger with a MAG of \$500,000 from both the on-demand limousine and shared-ride operations. YVR was unable to share the details of their on-demand limousine contract.

Until recently PHX had an on-demand limousine contract; however, when the contract expired airport staff determined that it was not viable to renew the contract because (1) the contracted company was struggling to make their required payments, (2) the amount of curbside space allocated to the service did not seem to be warranted, (3) conflicts between the on-demand limousine drivers and taxicab drivers, and (4) the service no longer seemed to be needed due to the recent improvements in the quality of taxicab service. The previous concessionaire is now operating on a pre-arranged basis instead, and the airport provided the company with advertising on the airport website and in the terminal to assist them during the transition period.

With the advent of TNCs and their related services such as UberBlack (provided in both personal cars and licensed limousines), there is less need for an airport to offer on-demand limousine service to passengers. This is because (1) customers can now select from traditional on-demand taxicabs, pre-arranged limousines including UberBlack, and TNCs, (2) it is questionable as to what advantages airports can offer a prospective on-demand limousine provider other than the ability to have a waiting vehicle parked at the curb, and (3) the value of the concession contract appears to have been diminished, and in the view of some, is no longer financially attractive.

On-demand shared-ride service

Best practice for shared-ride service is to have a closed system where the airport has a contractual (concession) agreement with one or a few companies (an exclusive or semi-exclusive concession). Of the peer airports, seven have an exclusive agreement with one shared-ride provider and one has an agreement with two providers. YVR does not have shared-ride service. The other five airports that responded to the survey have an open access system. A summary of the type of agreements and customer service standards for shared-ride operators at each airport is provided in Figure 7.

With a closed system, it is easier to implement and enforce customer service standards such as maximum customer wait times, secure credit card processing, vehicle age limits, and driver training. Eight of the airports have maximum customer wait times, typically between 20 and 30 minutes. Many of the airports require that the shared-ride providers accept credit card, but only IAD, MSP, and PHX specify the method of credit card processing in their contracts to ensure transactions are conducted securely. At other airports such as MIA, the company requires drivers to use secure credit card processing without any requirement from the airport.

Six of the airports have an age requirement for shared-ride vehicles. IAD and SFO have a maximum age of four model years, and MIA and MSP have a maximum age of five years. BWI and PHX both limit the vehicle age at the start of the contract, but do not have a maximum age limit. At PHX 75% of the fleet must be new at the start of the contract, with the other vehicles no more than 2 years. The PHX contract is for five years, with one five-year option. BWI requires that all vehicles be no more than 5 years at the start of the four-year contract.

Only three of the peer airports have measures in place to encourage or require shared-ride operators to use alternative fuel vehicles. PHX and SFO both require that 100% of the shared-ride fleet use alternative fuels, with PHX using propane and SFO using CNG. DEN offers a reduced trip fee incentive for operators choosing to use alternative fuel vehicles.

Other customer service initiatives referenced by the airports interviewed include training programs (BWI and MIA), providing a way for customers to give feedback through comment cards or another method (MIA, MSP, PHX), driver and vehicle appearance standards (IAD, PHL), and the ability for the customer to make reservations and payments for the shared-ride service online (PHX).

Figure 8 summarizes the basis and amounts of the shared-ride fees and, when available, a recent annual amount received. Six of the peer airports (BOS, DEN, MSP, PDX, PHL, and SFO) determine their fees based on a cost-recovery analysis, and four of the airports' shared-ride fees are based on bids received by the operators (BWI, MIA, PHX, and TPA). At the four airports with bids, both MIA and TPA originally set a minimum bid amount.

When asked what they would improve about the ground transportation systems at their airports, two airports indicated that the shared-ride system would be an area for improvement. Both were airports with open shared-ride systems who would prefer to have a closed system with fewer operators, and in one case,

have a company with better brand recognition for customers. In both instances local regulations and politics were the limiting factor on those airports being able to do so.

Figure 7
Shared-ride Operating Agreements

	Open	Restricted	Customer wait time/ number of destinations	Secure credit card processing	Vehicle age/mileage limits	Alternative fuel/hybrid vehicles	Other customer service provisions
SEA	Two area operators					100% propane	
BOS	Open						
BWI		One operator	30 minutes		5 years at start of contract		Driver training program
DEN	Open					Trip fee reduction	
DTW							
FLL		One operator	30 minutes				
IAD		Two operators	Yes	Yes	4 years		Dress, vehicle standards
IAH		One operator	Unknown	Unknown	Unknown	Unknown	Unknown
MIA		One operator	20 minutes		5 years		Training for all employees; complaints sent to Airport
MSP		One operator	3 stops. Max. wait time	Yes	5 years		Customer feedback ability
PDX	Open						
PHL	Open						Cleanliness/maintenance
PHX		One operator	15/20 minutes load/leave time. Max. 3 stops	Yes	75% new at start of contract	100% propane	Comment cards, ability to pay online
SFO	Open		20 minutes		4 years; 400,000 miles	100% CNG	
TPA		One operator	25 minutes				

Source: LeighFisher, based on data from airport staff, July 2015

Figure 8
Shared-ride Fees

	Permit	Trip Fee	Trip fee for drop-off?	Concession fee	MAG	Dwell fee	Other	How fee determined	Recent annual amount received	Length/term of agreement
SEA		\$3.42						Cost-recovery	\$253,000	Month-to-month
BOS		\$3.75					Min. 10 trips/mo.	Cost recovery	Unknown	N/A
BWI				17.5%	\$405,000			Bid	\$926,600	4 years
DEN		(a)						Cost recovery	Unknown	N/A
DTW										
FLL				\$0.461/pax	\$500,000			Per deplaned passenger	Unknown	Unknown
IAD		\$7.00			\$330,000; \$265,000			3X taxi fee	\$360,000 + \$263,000	3 year + 2 one-year options
IAH				10%	\$8,333/month			Unknown	Unknown	Unknown
MIA				6.4%	\$792,535			Bid. Airport set minimum bid	\$792,535	5 years + 1 three-year option
MSP		\$3.03						\$0.50/trip over cost recovery	\$96,381	3 years + 2 two-year extensions
PDX	\$200/company for 5 years + \$100/veh/year	\$2.50						Cost recovery	Unknown	N/A
PHL		(b)						Cost recovery	Unknown	N/A
PHX	\$575,000	\$3.00						Bid	~\$1.2M	5 year + 1 five-year option
SFO		\$3.00						Cost recovery	Unknown	N/A
TPA				(c)	(c)			Bid. Airport set minimum bid	\$531,288	5 years

(a) DEN trip fees based on vehicle size, \$2.37, \$4.68, and \$7.10 for 0 to 15, 16 to 31, and over 31 passengers, respectively

(b) PHL trip fees based on vehicle size: 1-5 passengers \$1.50; 6-12 \$3.00; 13-24 \$8.00; 25+ \$22.00/trip

(c) After MAG (\$100,000/\$43,648/\$380,000 based on service area), fee per deplaned passenger of \$0.0121/\$0.0055/\$0.0412

Source: LeighFisher, based on data from airport staff, July 2015

NEW INDUSTRY PROVIDERS

Recent changes in the industry due to the rise of the sharing economy have resulted in two new types of companies entering the ground transportation/rental car business at airports. These new services include transportation network companies (TNCs) where a passenger uses a smartphone application to connect to a driver using their personal vehicle, and peer-to-peer rental car companies, where a customer rents an owner's personal vehicle while it is not in use. The most well-known of these companies are UberX and Lyft for TNCs and FlightCar and RelayRides for peer-to-peer rental car companies.

Transportation Network Companies

Airport staff at all of the peer airports except YVR reported that TNCs are operating in their area, although most are doing so without the airports' approval. Only four of the airports (DEN, IAH, PDX, and SFO) have a permit in place for TNCs. PHX is currently in discussions with the TNCs to develop a TNC permit, but some TNC drivers have obtained a pre-arranged operator permit to operate at the airport. IAD has developed a draft permit which is being reviewed by their board.

The process for a TNC to begin operations at each of the four airports with permits is similar. The company must first obtain an operating permit from the local regulatory authority, then complete an application for an airport permit, agreeing to pay fees and comply with the airport's rules and regulations, including displaying the company's trade dress. At SFO there was a one-time activation fee to cover the unpaid fees the companies incurred prior to agreeing to sign the airport's permit. IAH is unique in that in addition to the company signing an airport permit, each driver must also be licensed by the City of Houston and receive an airport permit by showing proof of their City registration.

Table 2 summarizes the fees charged to TNCs at the four airports with TNC permits. At all four airports, the trip fee was originally determined based on the existing trip fee for other operators. At DEN and PDX, however, a trip fee is charged for both drop off and pick up, even though other operators are only charged for pick up. At PDX this is because taxicabs and limousines must pay an annual vehicle permit fee in addition to the company permit, which TNCs are not required to pay. At SFO limousines also pay for trips on a pick up and drop off basis.

At all four airports, TNC drivers are required to stage outside of the main terminal area. Table 3 shows the location where TNC drivers must wait for, pick up, and drop off customers. At all of the airports, the TNCs wait in a location separate from the taxicab holding area. The drivers at DEN wait in one of two remote parking facilities infrequently used by customers except during peak travel weeks. At IAH, PDX, and SFO there are designated holding areas for commercial vehicles or TNCs only with minimal amenities.

The TNCs at each of the four airports currently self-report their trips and associated fees. SFO is able to verify the trips using software airport IT staff developed. The software also enables airport enforcement staff to see the TNC vehicles currently at the airport in real-time, the company they are operating for (as some drivers work for more than one TNC), and information about the vehicle's trip history including how long they have been on airport property and whether the driver dropped off a passenger. PDX is currently developing their own version of this enforcement software. In the meantime, PDX has audited the companies and found them to have complied with their reporting requirements.

Table 2
Transportation Network Company Fees

	Trip Fees	Trip fee for drop off?	Other Fees	Fee Determination	Estimated annual revenue
DEN	\$2.15	Yes	None	Same fee all operators were charged when permit developed	Unable to share
IAH	\$2.75	No	None	Keep similar to taxis	Unknown
PDX	\$2.00	Yes	\$200 company permit	Same trip fee as other operators but drop off too since no vehicle permit	~\$600,000
SFO	\$3.85	Yes	Activation fee (a)	Same as limos when permit developed	~\$7M

(a) Total of unpaid trip fees since April 2015 or \$100,000

Source: LeighFisher, based on data provided by airport staff, July 2015

Both DEN, IAH, and SFO reported that the main challenge in managing the TNCs has been in educating the drivers on how to operate properly while on the airport (i.e., how the airport “works”) and ensuring they comply with the rules and regulations, particularly given the high driver turnover rate and use of non-professional drivers. SFO also cited concerns about the large number of TNC vehicles operating at the airport and congestion on the roadways. PDX did not have any complaints about their TNC operations.

The other peer airports where the TNCs are operating without a permit in place were also asked what challenges they have faced with regard to the TNCs and how this new service has impacted other commercial ground transportation operations. At these airports the main challenge is in enforcing the airport’s current regulations against the companies who are operating there illegally. In Miami, the airport and city combined have issued over \$2 million in fines. PHX has also been issuing citations to unpermitted drivers and had Uber implement a geofence to limit the areas where vehicles can wait for a customer. IAD also had issues with TNC drivers dwelling in prohibited areas.

Table 3
Transportation Network Company Operations

	Drop-off location	Other drop-off location users	Pick-up location	Other pick-up location users	Staging area	Size	Amenities
DEN	Level 6	Private vehicles	Level 4	Private vehicles	Remote airport parking lots	N/A	None
IAH	Departures curbsides	Private and commercial vehicles	Designated commercial curb space	Commercial vehicles	Separate holding area	~75-100 vehicles	Garbage cans, porta pottys
PDX	Upper outer roadway	Commercial vehicles	Ground transportation curbside	Commercial vehicles	Separate holding area	~120 parking stalls	Garbage cans, porta pottys
SFO	Departures curbside	Private and commercial vehicles	Departures curbside	Private vehicles	Designated spaces in commercial lot	Unknown	Garbage cans, porta pottys

Source: LeighFisher, based on data provided by airport staff, July 2015

The peer airports found mixed impacts of the TNCs on airport taxicab operations. PDX found that taxicab trips increased year-over-year but at a slower rate than in previous years (2-3% compared with 11% in 2014). DEN and IAH did not report any impacts to the taxicab providers, and at PHX taxi trips were up 10% over the previous years. At IAD there was a decrease in both the inbound (6%) and outbound (3%) taxicab trips, however. SFO also found that inbound taxi trips were affected more than outbound trips, which increased year-over-year.

There were also mixed results for the impact on other commercial ground transportation operators. At DEN there has been an impact on both shared-ride providers and limousine operators, many of whom are now using application based software similar to the TNCs. At FLL the shared-ride/on-demand limousine operator has reported a decrease in passengers, although the company is not required to report trip data to the airport. Similarly, the shared-ride operator at MIA has also reported a decrease in business, but the airport has not seen much of an impact on either the shared-ride or limousine operators. At PDX the number of limousine and shared-ride trips have remained about the same as in previous years despite passenger growth at the airport. Similarly, shared-ride passenger numbers were flat year-over-year at PHX.

Peer-to-Peer Rental Car Companies

The two main peer-to-peer rental car companies (FlightCar and RelayRides) typically have very different business models at airports. FlightCar typically operates off of the airport property, often at a nearby off-airport parking or hotel/motel site. Customers can use the parking or hotel operator's courtesy shuttle to travel to and from the airport terminal or consolidated rental car facility. Owners leave their vehicles at FlightCar's lot and receive free parking while their vehicle is available to be rented by customers. Their competitor, RelayRides, more often leaves the vehicle owner to arrange for pick up or drop off of the vehicle with the customer directly. Many of the vehicles advertised as available at an airport on their website are in fact located at the owner's home or other location in the area surrounding the airport. In these instances, the airport does not have an agreement with RelayRides. Some drivers will meet or drop off passengers at the airport or arrange to have their vehicle dropped off in an airport parking facility however.

At SFO both FlightCar and RelayRides operate using the typical FlightCar business model. The airport considers these companies off-airport rental car providers and has an agreement in place accordingly. Similarly, the other four airports that have agreements in place with a peer-to-peer rental car company (all currently with FlightCar) also consider the company to operate as an off-airport rental car company. At all four of these airports (BWI, DEN, PDX, and PHX) the airport's business relationships with these peer-to-peer rental car companies are managed by the same airport staff responsible for management of the traditional rental car companies rather than the ground transportation staff responsible for oversight of commercial ground transportation services.

OVERVIEW OF AIRPORTS' GROUND TRANSPORTATION ORGANIZATION AND RESOURCES

Table 4 summarizes the staff resources available to the airport sections or departments responsible for oversight and management of commercial ground transportation operations. As shown, the number of full time equivalent (FTE) staff varies from two or fewer (BWI, FLL, IAD, and YVR) to over 100 (IAH and MIA). Several of the airports, particularly those with open taxicab systems and limited staff resources, employ third-party management contractors to assist with the oversight and management of commercial vehicles and curbside operations. Airports employing third-party contractors to assist with commercial vehicle and curbside operations include DEN, FLL, IAD, PDX, PHL, PHX, and SFO.

Figure 9 shows the responsibilities of the airport staff responsible for oversight and management of commercial vehicle operations. The key differences are which group is responsible for taxicab dispatching, vehicle inspections, driver permitting, control of the staging areas, and management of the roadways used by private vehicles.

**Table 4
Airport Ground Transportation Staff Organization and Resources**

	Group overseeing CGT reports to:	# FTE Staff overseeing CGT	# peak shift TCOs/curb enforcement employed by airport	# police assigned to curbsides during peak	# third-party management contractors	# concessionaires
SEA	Director of Airport Operations	14-16	N/A	5 (e)	0	1 taxi + 1 limo
BOS	General Manager	50-60	0	3	0	0
BWI	Chief Operating Officer	1.5	2	0	0	1 taxi + 1 shared-ride/limo
DEN	Chief Revenue Officer	45	0	0	1 dispatch	0
DTW	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
FLL	Director of Operations	2	0	1 contract	1 curb management	1 shared-ride/limo
IAD	Airport Manager	2	Unknown	0	1 dispatch	3 taxi + 1 shared-ride
IAH	General Manager	150	14 (a)	0	0	1 shared-ride
MIA	Assistant Director of Operations	112	0 (b)	0	0	1 shared-ride
MSP	Director of MSP Operations	28.5	3	0	0	1 shared-ride
PDX	Airport's Operations Manager	2.5	0	0	1 dispatch/curb management	1 PSA
PHL	Deputy Director Operations & Facilities	30	0	30	15	None
PHX	Director of Operations	72		0	1 dispatch + 1 secret shopper	4
SFO	Deputy Director of Operations	12	16	9	1 curb management	0
TPA	Director of Operations	4.5	15 (d)	0	0	2 taxi + 1 shared-ride
YVR	Senior VP Finance/CFO	2	Unknown	Unknown	1 curb management	16 taxi + 1 limo

- (a) TCOs are included in the total 150 count of staff overseeing CGT
- (b) All MIA landside staff are cross-trained as TCOs
- (c) 80 PSAs for whole airport. Usually 1 per curb, 2 during peak shifts
- (d) 60 employed. 15 during peak shifts
- (e) For entire airport. Curbsides are low priority

Source: LeighFisher, based on data from airport staff, July 2015

Figure 9
Airport Ground Transportation Staff Responsibilities

	SEA	BOS	BWI	DEN	DTW	FLL	IAD	IAH	MIA	MSP	PDX	PHL	PHX	SFO	TPA	YVR
Developing CGT rules/regulations	GT	GT	GT	GT		GT	GT + Legal	GT	GT	GT	GT	GT	GT	GT	GT	GT
Establishing CGT fees	GT + F	GT	GT	GT		GT	GT + Revenue	GT	GT	GT	GT	GT	L	GT	GT	GT
Permitting of CGT companies/vehicles	GT	GT	GT	GT		T	GT	GT	GT	GT	GT	T	GT	GT	GT	T
Vehicle inspections	GT	L	GT	L		T	GT + MWAA inspectors	L and GT	L	L	GT	T	GT	GT	N/A	T
Driver licensing/ permitting	L	N/A	N/A	N/A		N/A	T + GT	GT	L	GT	L	T	GT	GT	N/A	T
Fee collection	GT	GT	GT	GT		GT	GT	F + GT	T + GT	GT	GT	T	GT	GT	GT	F
Control of AVI system	GT	GT	N/A	GT		GT	GT	N/A	GT	GT	N/A	T	GT	GT	N/A	N/A
Enforcement of CGT passenger drop-off areas	GT	GT + PD	GT	GT		T + PD + GT	GT	GT	GT	GT	T + PD	PD	GT	PD + T	AP	T
Enforcement of CGT passenger pick-off areas	GT	GT + PD	GT	GT		T + PD + GT	GT	GT	GT	GT	T + PD	PD	GT	PD + T	GT	T
Enforcement of illegal solicitation	GT	GT + PD	GT	GT		T + PD + GT + L	AP	GT	GT	GT + AP	T + GT + PD	PD + T	GT + PD + T	PD	GT	T + GT
Enforcement/ control of staging areas	GT	GT	CS	GT		T + PD + GT	T	GT	GT	GT	GT + T	T	T + GT + PD	PD + T	GT	T
Taxicab dispatching	CS	GT	CS	T		T + GT	T	GT	GT	GT	T	T	T	T	T	T
Shared-ride van dispatching	CS	N/A	CS	N/A		CS	CS	CS	CS	CS	N/A	T	CS	T	T	N/A
Oversight of peer-to-peer rental cars	Business development	N/A	Commercial management	Properties		N/A	N/A	N/A	N/A	GT	Concessions	Properties	N/A	RAC manager + GT	GT	N/A
Roadway management/enforcement for all vehicles	PD	GT + PD	PD	PD + T		PD + GT	AP	GT	GT	AP	GT	PD	GT + PD	PD + T	AP	PD + T

GT = Airport ground transportation staff
 F = Airport finance staff
 L = Local regulator/regulations
 PD = Local police
 AP = Airport police
 T = Third-party contractor
 CS = Concessionaire

Source: LeighFisher, based on data provided by airport staff, July 2015

FACILITIES USED BY COMMERCIAL VEHICLES TO DROP OFF AND PICK UP PASSENGERS

This section summarizes the curbside and other facilities used by commercial vehicles when dropping off and picking up airline passengers. Key features considered when contrasting the drop-off and pick-up facilities of the peer airports are:

1. Is access to the boarding areas gate controlled?
2. Does the airport have more than one terminal?
3. Are for-hire vehicles, particularly, on-demand taxicabs and shared-ride vans, visible from the baggage claim exit doors?
4. How is the available curb space allocated among users?
5. What amenities are available to customers waiting for commercial vehicles?

This section also addresses holding lots or staging areas and the amenities provided to commercial vehicle drivers in these lots.

Gate-controlled access to commercial vehicle boarding areas

Airports place control gates (often AVI-activated gates) at the entry to the commercial vehicle boarding areas in order to prevent unauthorized vehicles from entering. Gates can also be placed at the exits to monitor vehicle dwell times and support the implementation of fines or dwell time fees to discourage excessive dwell times. Thus the use of gates simplifies vehicle management and enforcement. However, the ability to have gate controlled roadways depends on the terminal area roadway layout (e.g., having a dedicated commercial vehicle roadway and space for vehicle queues which may form at the entry gate). The peer airports with gate controlled access to the commercial vehicle boarding area include DEN, MSP, and TPA. Access for some but not all commercial vehicles is gate controlled at PHL (for-hire vehicles only) and PDX (taxicabs only).

Number of terminals

Airports with multiple terminals typically have a greater amount of curb length. However, oversight and management of multiple curbs requires more enforcement personnel, more taxicab or shared-ride dispatchers, and allocation of space for each vehicle class at each terminal. Of the peer airports, those with multiple terminals (and the number of physically separated terminals) are: BOS (4), DTW (2), FLL (4), IAH (5), MSP (2), and PHX (3).

Visibility of for-hire vehicles from baggage claim exits

Passengers exiting baggage claim expect to be able to easily find waiting taxicabs and the boarding areas assigned to for-hire and other commercial vehicles. These expectations are a result of airline passengers, including those travelling in commercial vehicles, traditionally being dropped off adjacent to the check-in area and being picked up adjacent to the baggage claim area. Since most large airports have multi-level terminal buildings with check-in lobbies on the upper level and baggage claim areas on the lower level airline passengers are typically dropped off on the upper level and picked up on the lower level. This

layout—an upper level drop-off curbside and a lower level pick-up curbside for all vehicles--represents the most common or conventional airport curbside layout.

Examples of airports having conventional two-level curbside layouts-- Ten of the selected peer airports have two-level curbside including BWI, BOS, DTW, FLL, IAH, MIA, PDX, SFO, and YVR. At these airports, with the exception of BOS and SFO, passengers exiting baggage claim areas can easily see waiting taxicabs, shared-ride vans, courtesy vehicles, and scheduled buses.

- At BOS, three of the four unit terminals (Terminals A, B, and C) have two level curbsides, but the fourth (Terminal E) has a single level curbside. At Terminals A and C passengers exiting the baggage claim area can see the boarding areas for all commercial vehicles. However at Terminal B, due to a lack of curbside capacity, the taxicab and limousine boarding areas were recently moved from the lower level curbside to the Terminal B garage located on the opposite side of the curbside roadway. Passengers seeking taxicabs must exit the baggage area and walk across the curbside roadway to the Terminal B garage. Taxicab and limousine boarding positions, which occupy an entire level of the garage, are configured in two rows of angled, pull-through spaces. This space layout (1) improves customer throughput/reduces customer wait times as multiple taxicabs or limousines can be boarded simultaneously, (2) provides for covered/weather protected boarding positions, (3) allows for efficient oversight and control by Airport staff, and (4) minimizes conflicts between vehicles and pedestrians.
- At SFO shared-ride vans, transportation network company vehicles, and courtesy vehicles (except those serving off-airport rental cars which are required to use the consolidated rental car center) are required to both drop off and pick up passengers on the upper level due to a lack of curb space capacity.
- At IAH passenger drop-off and pick-up areas are located on two levels at Terminals A, B, C, and E. Terminal D only has a drop-off curbside as it only serves departing international passengers. At Terminals A, B, and C the pick-up curbsides are adjacent to the baggage claim area, but at each terminal there are three separate pick-up curbsides – one each on the south, north, and west facades of the terminal building. Each curbside serves a different ground transportation service (e.g., private vehicles on the north curb, rental cars and taxicabs on the west, and courtesy vehicles on the south). However, because of the roadway design, some vehicles stop with the driver’s side adjacent to the curb (considered “wrong way” loading as passengers must board the vehicle while standing in an active traffic lane). Because IAH has 15 individual curbside areas, each physically separated, more staff are required to control traffic and enforce these curbsides than a conventional curbside.

Airports having curbside layouts with three or more levels—DEN, IAD, and MCO. A few U.S. airports have more than two curbside levels include DEN, IAD, and Orlando International (MCO). At these airports all vehicles are required to drop-off passengers on the upper level (adjacent to ticketing). Commercial vehicles are required to pick-up passengers on one of the two remaining levels --the middle level at DEN, and the ground levels at IAD and MCO. At MCO—which was not one of the selected peer airports because of the large proportion of non-resident airline passengers—the three-level curbside configuration is replicated on

both sides of the terminal building, and supplemented by a fourth boarding area beneath the terminal building restricted for use by pre-arranged limousines that have been inspected by security staff.

TPA has curbsides on two sides of the terminal building (the red and blue sides) each having separate passenger drop-off and pick-up areas. At TPA the drop-off curbside used by all vehicles and the pick-up curbside used by private vehicles and limousines are traditional linear curbsides. These linear curbsides are supplemented by four surface parking lots which are reserved for use by taxicabs, shared-ride vans, and courtesy vehicles. The surface parking lots—referred to as Quad Lots as they are located in each quadrant of the building—are immediately adjacent to each end of the baggage claim areas.

Airports having non-traditional curbsides—PHL, PHX, MSP, and DTW. PHL and PHX have non-traditional curbsides, but their layout permits passengers exiting the baggage claim areas to easily see waiting taxicabs, shared-ride vans, courtesy vehicles, and scheduled buses.

At PHL the check-in lobby and baggage claim areas are located in two separate buildings for each of the five terminals. These buildings are separated by a railroad track with elevated walkways connecting the aircraft gates/departure terminals and the baggage claim building. All vehicles drop-off passengers on the departures road adjacent to the check-in lobbies. There are two arrivals curbsides, one on either side of the baggage claim building, with the south side used by private vehicles and courtesy vehicles, and the north side used by for-hire vehicles.

At PHX there are curbside roadways on both sides of Terminals 3 and 4. Terminal 3 has a single level curbside. Boarding areas for taxicab and rental car shuttles are provided on both the north and south curbs while the boarding areas for all other commercial vehicles are located only on the south curb. Terminal 4 has a two-level curbside with upper levels on both sides used for drop-off by all vehicles, and a lower level on both sides used for pick-up by all vehicles. At the lower level there is an inner and outer curbside with private vehicles using the inner curbside and taxicabs, rental car shuttles, and courtesy vehicles using the outer curbside.

As described below the commercial vehicle boarding area is not adjacent to or visible from the exits from the baggage claim areas at MSP and at DTW's McNamara Terminal.

- At MSP passengers board taxicabs, limousines, shared-ride vans, scheduled vans, and courtesy vehicles from a Ground Transportation Atrium located within a parking structure opposite the terminal. Access between the terminal and the Ground Transportation Atrium is provided via an underground walkway that passes airline check-in desks located in the ground transportation center.
- At DTW both terminals have Ground Transportation Centers, where passengers board taxicabs, for-hire vehicles, and courtesy vehicles. The Ground Transportation Center is located in a parking structure at the McNamara Terminal.

Allocation of available curbside space

The peer airports consider multiple factors when allocating the available curb space on the inner or outer roadways or along the length of the curbsides among the commercial vehicles. The factors include:

- **Passenger and vehicular safety.** Provide adequate curb space for maneuvering vehicles (especially large buses and coaches), minimize the volume of passengers crossing roadways, separate private and commercial vehicles, and enforce dwell times
- **Customer expectations.** Locate services that customers expect to find at the curbside (e.g., on-demand taxicabs) in visible locations
- **Use of public transportation.** Provide convenient boarding areas for scheduled buses/vans and public transit services. Some airport operators (e.g., BOS and SFO) assign these services to the curbside areas immediately adjacent to the terminal unless prevented from doing so by vertical clearance, structural loads, or roadway widths. At MIA, shuttles must use the outer roadway due the lack of bypass lanes on the inner roadways. Conversely, at PHX these vehicles use the outer curbsides, in part to enhance traffic operations.
- **Non-airline revenues.** Allocate the more visible and convenient curbside spaces to services that generate significant revenues (e.g., on-airport parking and rental car shuttles)
- **Competition among ground transportation operators.** Separate competing operators (e.g., on-demand taxicabs, shared-ride vans, and limousines) while attempting to provide them with equivalent access to deplaning airline passengers. Airports also attempt to distinguish between on- and off-airport parking courtesy vehicles.
- **Separation of private and commercial vehicles.** Improve ability to control and enforce pick-up areas by separating private and commercial vehicles, and if space is available, providing separate boarding areas for each type of commercial ground transportation service

Examples of curbside space allocations:

- Due to the City of San Francisco's "Transit First" policy, priority is given to curb space for HOVs at SFO
- Due to curbside capacity constraints the upper level curbside is used for both drop-off and pick-up by most hotel/motel courtesy vehicles at MIA and by all courtesy vehicles, TNCS, and shared-ride vans at SFO
- At MIA and SFO's International Terminal, courtyards are reserved for the use of charter buses (e.g., cruise ship buses)

Amenities provided waiting passengers

Most of the peer airports provide bus shelters and benches for passengers waiting for commercial vehicle. However several airports provide additional amenities:

- At MSP the Ground Transportation Atrium contains a heated/air conditioned seating area, having padded chairs, floor-to-ceiling windows to allow waiting passengers to see arriving vehicles, and counter space for the regional shuttles
- At TPA there are enclosed, air conditioned waiting areas adjacent to the Quad Lots

- There are counter areas for the commercial ground transportation providers available for lease at DEN, PHL and PHX. Several of the airports with exclusive shared ride van concession contracts (e.g., BWI, FLL, IAD, and IAH) provide or lease counter space to the concessionaire.
- At PDX a glass canopy covers all the curbside areas

SUPPORTING TECHNOLOGIES

Ten of the peer airports have AVI systems. Those that do not are BWI, IAH (which formerly had one and is evaluating re-installing a system), TPA, and YVR. PDX recently acquired an AVI system which is scheduled to be operative by September 1, 2015.

Airports having handheld devices used by curbside staff for enforcement or dispatching purposes and to supplement their AVI systems include FLL, IAD, MSP, PHX, and SFO, although IAD report that they never use the devices. PHX and IAH IT staff developed their own device while the other airports acquired the device through their AVI system vendor.

Most of the airports rely upon radios or mobile phones to dispatch taxicabs and other vehicles from the staging lot to the curbside boarding positions. MSP staff developed a unique software program which among other features monitors the position of each waiting taxicab and automatically dispatches the vehicle to the boarding area. SFO is in the midst of acquiring a system to monitor both taxicabs and shared-ride vans. IAD has an automated taxicab dispatching system developed by an outside vendor. At those airports having a contracted taxicab or shared-ride system the contractor is responsible for acquiring and maintaining the dispatch system.

None of the airports surveyed have airport provided mobile phone applications (apps) for arranging for-hire vehicle trips.

COMMERCIAL VEHICLE STAGING AREAS/HOLDING LOTS

Table 5 summarizes the capacity and use of the commercial vehicle staging areas. Most of the peer airports have one staging lot, but FLL, MIA, MSP, PHL, PHX, and SFO have multiple areas. At IAD and PHL there is a remote main holding area and a small stack or lot closer to the terminal. At MIA and SFO there is one area for taxicabs and one for all other commercial vehicles. At PHX one area is used primarily by black cars and the other area by all other operators.

Table 5
Summary of Commercial Vehicle Staging (Holding) Areas at Peer Airports

Airport	Approximate Capacity (a) (spaces)	Vehicle orientation (a)	Peak period travel time to terminal (a) (minutes)	Do CGT vehicles stage off airport?	Is this a concern to local community?
SEA	200	Nose-to-tail	8 to 10	Limos at nearby gas station and church	City expressed concern but not those businesses
BOS	Unknown	Nose-to-tail	Unknown	No	N/A
BWI	300	Nose-to-tail	1	No	N/A
DEN	300	Nose-to-tail	5 to 7	No	N/A
DTW	Unknown	Unknown	Unknown	Unknown	Unknown
FLL	150	Nose-to-tail	10	No	N/A
IAD	>1000	Parking spaces	5 to 10	No	N/A
IAH	>500	Nose-to-tail	2	Limos at nearby gas stations	No, they like the business
MIA	450	Nose-to-tail	1	Taxis when staging area closes	Police respond
MSP	570	Parking spaces	4	Limos	No
PDX	Unknown	Nose-to-tail	Unknown	No	N/A
PHL	200-300	Nose-to-tail	5	Rarely	No
PHX	150	Parking spaces	2 to 7 (b)	No	N/A
SFO	Unknown	Nose-to-tail	3	Sometimes limos on edge of roadway	No
TPA	100	Nose-to-tail	8	No	N/A
YVR	250	Nose-to-tail	3	No	N/A

(a) If airport has multiple holding areas, information is for area(s) where taxicabs stage

(b) Around 7 minutes from west hold lot to south curb and 2 minutes from east hold lot to Terminal 4

Source: LeighFisher, based on information from airport staff, July 2015

The reported sizes include all the available staging lots as well as supplemental stacking areas located near the terminal. The lot sizes vary from about 150 spaces (PHX) to over 1000 spaces (IAD). The number of spaces provided reflect the volume of taxicab business, the number of waiting taxicabs, the average length of time the drivers spend in the hold lot (which varies from under 2 hours in BOS to nearly 4 hours at IAH), and the availability of convenient sites on the airport. Other information gathered from the peer airports includes:

- The travel time from the staging areas ranged from 1 to 10 minutes. Airports with 10 minute travel times (e.g., FLL and IAD) were more likely to have supplemental stacking areas.
- Generally the staging areas serve taxicabs, shared-ride vans, limousines, and charter buses, with the areas for taxicabs separated from the other services by fences or barriers. However staging area at MIA and SFO are reserved exclusively for taxicabs. Waiting taxicabs park in nose-to-tail queues at all the airports except IAD, MSP, and PHX. Each of these three airports have reader boards that indicate each driver’s position in the waiting queue, allowing drivers to park their cars in

conventional spaces and avoid the need to move up when preceding taxicabs are dispatched to the terminal.

- Staff of the peer airports reported that commercial vehicles never or rarely park in adjacent communities, and that when they do it is typically not a concern of the local communities.

Figure 10 presents information about the driver lounges. BOS and SFO reported not having a lounge, and FLL's consists of a tent and wood deck. Generally the lounges contain TVs (sometimes provided by the drivers rather than the airport), microwaves, and most offer Wi-Fi access. The lounge at MSP is in the rear of a convenience store/service station, allowing access to food, beverages, and gas/oil for their vehicles. IAD provides a virtual hold lot, allowing drivers to exit the hold lot and monitor their position remotely without losing their place in the queue.

Five of the airports provide facilities for meditation, reflection or religious practices. At some this implies a quiet area, while others have provided special fixtures (e.g., foot washes).

Six of the peer airports reported that one to two staff were present in the holding area at all times and provided some form of office space for these staff. DEN has eight staff (including two from their management contractor).

AIRPORT DESIRED IMPROVEMENTS AND EXAMPLES

Twelve of the fourteen airports provided examples of airports whose ground transportation systems as a whole or a specific aspect of an airport's ground transportation system they found desirable. The twelve responses included 28 references to 14 airports. The airport that received the most references was MCO, which was highlighted in four responses. SEA and SFO were each mentioned by three others and five airports were mentioned by two others. PDX and TPA also self-identified as having desirable systems, PDX specifically for its busing and TPA overall. Another airport called out PDX's taxicab rotation system.

Of those airports that received multiple references, the references were mostly for different aspects of the system. For example, references to MCO highlighted the Mears buses, curbside layout, shuttles, and rental car facility (which was outside the scope of the study). Only MSP (taxi system) and DFW (tolling system) received multiple references for the same reason. Specifically, other airport staff liked the taxi dispatch system and pull-through curb spaces at MSP. PHX was called out for its handheld devices and like-colored taxicabs, and ATL's commercial vehicle loading areas with stall parking and covered walkways was also referenced. SEA received references for its rental car facility, taxicab system, covered commercial vehicle area, and amount of curb space (from PDX staff). Several of the staff interviewed listed additional curbside capacity as a desired improvement for their own airports.

Figure 10
Drivers Lounge Amenities

	Approx. size (sq. ft.)	Amenities provided drivers							Airport office/staff	
		Permanent restroom	FID monitor	Food truck	Permanent cafe/restaurant	Vending machines	Area for reflection or religious practices	Call board/displays	Office	Staff
SEA	~2500-3000	Yes	No	No	Kitchenette	Yes	No	Monitor shows GT plaza	Yes	0
BOS	None	No	No	No	No	No	No	No	Yes	2
BWI	~1000	Yes	No	Yes	No	Yes	Yes	No	Yes	1
DEN	>2000	Yes	Yes	Yes	No	Yes	No	No	Yes	8
DTW	Unknown									
FLL	N/A (tent and wood deck)	No	No	Yes	No	No	No	No	No	0
IAD	~1000	Yes	Yes	No	No	Yes	Quiet room and footwash	Yes	Yes	0
IAH	>2000	Yes	No	Yes	No	No	No	No	Yes	2
MIA	Open air	Yes	Yes	No	Yes	Yes	No	No	Yes	2
MSP	160 people + a store	Yes	Yes	No	Yes	Yes	No	Yes	No	0
PDX	Unknown	Yes	Yes	No	No	Yes	Yes	No	Yes	1
PHL	Unknown	Yes	No	Yes	No	No	No	No	No	0
PHX	~4000 (incl. outdoor space)	Yes	Yes	Yes	No	Yes	No	Large board outside, monitors inside	No	0
SFO	None	Yes	No	Yes	No	No	Footwash	No	No	1
TPA	~1000	Yes	Yes	Yes	No	No	Yes	No	No	0
YVR	Unknown	Yes	Yes	No	No	No	"Quiet Area"	For special requests & number needed	No	0

CURRENT COMMERCIAL GROUND TRANSPORTATION PROVIDERS AT THE AIRPORT AND THEIR SPECIFIC BUSINESS MODELS

To be completed by Port staff

KEY CONSTRAINTS ON COMMERCIAL GROUND TRANSPORTATION OPERATIONS AT THE AIRPORT

To be completed by Port staff