University Transportation Research Center

The Airport of the Future

A Sustainable & Equitable Ground Transportation Management Paradigm

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1 Executive Summary

This report endeavors to identify and convey best and accepted practices for managing commercial ground transportation at airports during construction and redevelopment projects, including when the construction phase is complete and the project is finished, with specific attention to the redevelopment of John F. Kennedy International Airport ("JFK Airport") in New York City. This report focuses on commercial ground transportation access points, traffic management processes and controls, curbside boarding areas, and landside modal prioritization at airports during redevelopment construction and in the finished state.

While the focus of this research explores these issues at JFK Airport, it also provides general advice relevant to any primary airport, but especially medium-hub and large-hub airports that are undertaking redevelopment or restructuring programs. The goal of this report is to design best management practices, guiding policies, and operational principles that can be used by airport operators and other stakeholders to ensure commercial ground transportation services at airports are easy-to-use and efficient.

For the purposes of this report, commercial ground transportation services includes taxicabs, limousines, ridesourcing, and shared-ride vans, all of which are common to airports. Jurisdictions have different terminology for these services, and how they are regulated will depend on the jurisdiction in which the airport is located. In this report, the term "limousine" means a licensed sedan, town car, executive sedan, SUV, or luxury vehicle that provides door-to-door, prearranged transportation service; the service is also known as livery and black car service. For ease of understanding and clarity, this report uses the term "ridesourcing" to refer to app-based, on-demand transportation of the type provided by Uber and Lyft.[1] This report does not address programs to manage courtesy vehicles, flight crew vehicles, rental cars, public transit, or airport-operated shuttles.

This report reviews the existing challenges airport operators frequently face with respect to managing and controlling commercial passenger ground transportation generally, and when undertaking redevelopment projects. The report also reviews the potential solutions (best and/or recommended practices) to those challenges both during redevelopment construction, and when the project is complete. These best and accepted practices will subsequently form the basis of advocacy to officials, regulators, and industry stakeholders on the topic.

Managing commercial ground transportation and controlling airport curbsides and roadways at the airport is a challenge for most airports, regardless of the airport's size or location.

[1] Ridesourcing is commonly known as ride-hail, rideshare, and app-based ride services, and the platform providers are often referred to by regulators as Transportation Network Companies or "TNCs."

The popularity of ridesourcing services has decreased the number of people who drive themselves to the airport, and increased curbside congestion where ridesourcing services conduct pick-ups and drop-offs at the curb. To reach the terminal, passengers who drive to JFK Airport may park in either the nearby parking garage and walk, or park in the Long-Term Lot and take the AirTrain – as neither option adds to congestion at the curbside. Passengers now arriving in an Uber or Lyft are dropped off and sometimes picked up at the terminal curb, adding to the curbside congestion.

This issue is not new. For years, airports have been attempting to deal with managing traffic while balancing the needs and expectations of airport customers (riders), ground transportation service providers, commercial vehicle drivers, local elected officials, and other stakeholders. In some cases, this has led airport operators to contract with a private company to provide ground transportation management.

Ground transportation is a reflection of the environment in which the providers operate, and the goals for each airport are unique. As the saying in the airport community goes, "if you've seen one airport, you've seen one airport." What works at one airport may be unrealistic, undesirable, or unnecessary at another airport. For example, an airport in a large city that is easily accessible by a one-seat ride on a train may have lower demand for parking and ridesourcing services than an airport like JFK Airport. With that in mind, the following are the best and/or recommended practices and general policy/operational principles for managing commercial ground transportation at airports during redevelopment construction, and in the finished "modernized" state:

- **"Fair Modal Curbside Pick-Up and Drop-Off ("PUDO") Separation":** If an airport has the physical space, competing ground transportation operators and sub-modes (*e.g.*, taxis, ridesourcing, and limousines) should be separated curbside for PUDO. This can be accomplished by clearly designating separate boarding areas for differing classes of commercial ground transportation services, while attempting to provide said services with equivalent access to deplaning airline passengers.

- **Accessible Curbside PUDO for Passengers with Disabilities:** When considering allocating separate boarding areas for the different classes of commercial ground transportation services, there should also be an accessible location that would be available for use by all approved/authorized commercial ground transportation providers to pick-up/drop-off passengers with mobility needs or restrictions. Airports should ensure there is adequate wayfinding throughout the passenger's journey from the gate area through the baggage claim area.

- **Visibility & Walkability:** Address customer expectations by locating ground transportation services that customers normally expect to find at an airport curbside in a visible location adjacent to or a walkable distance from the terminal.

- **Mode-Neutral Ground Transportation Centers:** Inter-modal facilities (ground transportation centers) that can accommodate multiple commercial ground transportation modes—taxis, ridesourcing, private vehicles, shuttles—away from terminal curbs should be mode-neutral, so that no particular mode is given preferential treatment at the expense of another. These facilities should also be modular (as opposed to purpose-built) so that the physical structure can be altered to accommodate changes in the transportation landscape.

- **Premium Airport Space PUDO ("First Class Curbside Service"):** When space constraints require, consider making curbside PUDO service a premium option - for a fee - to increase airport revenue, while also encouraging passengers to use separate PUDO locations away from the curbside facilities.

- **Airport Access Fees for All PMVs:** Consider charging a fee for all vehicles to access the airport curbside for pick-ups and drop-offs, including private PMVs, with a no-fee option for PUDO at a remote location, with free transportation to and from the terminal via a shuttle, people mover, air train, or mass transportation. Another option is to consider relocating all PMV PUDO areas to a remote location – with no curbside access - with free transportation to and from the terminal via a shuttle, people mover, air train, or mass transportation.

- **Passenger Friendly Non-Curbside PUDO Facilities:** Remote PUDO locations that are away from the terminal curbside should be well lit, clearly marked, and grade separated, if possible. The waiting area should also be covered to shield passengers from the elements.

- **Re-Matching Ground Transportation:** Rematch should be used, where practical given the airport roadway layout, to allow ridesourcing and taxi drivers to make a pick-up at the airport immediately after a drop-off without going to the designated holding lot or pick-up area.

- **Due Diligence Review of Existing Rules, Permits & Contracts:** Consult any existing contracts that the airport has with ground transportation providers, especially ridesourcing and limousine companies, to ensure actions are in line with the contract terms. Also, consult applicable rules or ordinances as well as any permits or permitting rules/processes to ensure compliance with same.

The above general principles can and should guide airport management when making temporary changes to commercial ground transportation during airport redevelopment projects. However, major construction presents unique challenges that must be addressed. It is understood

that service levels will be impacted during construction, and such impacts should be addressed collectively as an airport.

Additional guiding principles and best and/or recommended practices during redevelopment construction, include the following:

- While construction continues, impacts to the day-to-day operation and the traveling public must be minimized as much as possible; and
- Maintain clear and frequent communication with all stakeholders—operators, drivers, passengers, airport personnel, and airlines—regarding impacts on operations and changes to pick-up/drop-off locations, processes, and/or procedures.

There are no perfect airports. However, as this report explains, there are guiding principles, strategies, and practical tools for adapting airport landside access programs to evolving ground transportation modes. This report is a resource to help airport operators establish the commercial ground transportation practices that are best suited to their particular airport during redevelopment projects, and in the finished state.

We believe that congestion will be mitigated by deploying the principles and strategies identified in this report. However, the scope of this report does not include a detailed carbon footprint analysis, since public data necessary to perform the modeling required for such analysis is unavailable. We plan to work with airport operators and the industry to collect data in the future to not only quantify or estimate the congestion mitigation from the various recommended practices, but to quantify or assess access fee equity among the various stakeholders, with revenue estimates and recommended fee structures for airports. The goal is to use this report to work with airports and stakeholders to obtain data from them and to advise on revenue capture, fee equity, and carbon footprint reduction/congestion mitigation estimates.

2 About the Author & the UTRC

Matthew W. Daus, Esq. currently serves as Transportation Technology Chair at the University Transportation Research Center of The City College of New York, CUNY where he conducts research, and continues to be extensively published as an expert on ground transportation regulation and technology. As a CUNY Distinguished Lecturer from 2010 to 2018, he taught courses on transportation history, policy, sustainability, for-hire regulation and technology. Mr. Daus also continues to serve since 2009 as President of the International Association of Transportation Regulators (IATR), a non-profit educational and advocacy peer group of government transportation regulators from around the world promoting best regulatory and innovative practice. Commissioner Daus is the longest serving Commissioner/Chair & CEO of the New York City Taxi and Limousine Commission (TLC), serving for 8½ years. Prior to his tenure as Chair/Commissioner, Mr. Daus served in executive and other positions in NYC government for almost 20 years at several agencies including as General Counsel to the TLC and the NYC Community Development Agency, as Special Counsel to the TLC and NYC Trade Waste Commission, as a NYC Human Rights Prosecutor, and as Commissioner of the NYC Civil Service Commission. Mr. Daus is a partner and currently chairs the Transportation Practice Group at Windels Marx Lane & Mittendorf, LLP. He is also the chair of the Transportation Committee of the New York City Bar Association.

The **University Transportation Research Center** ("UTRC") at The City College of New York was established to support research, education, and the transfer of technology in the field of transportation. UTRC conducts research in critical areas related to transit, intermodalism, infrastructure and regional funding and pricing.

The UTRC is one of ten original University Transportation Centers ("UTCs") established by Congress in 1987 with the recognition that transportation plays a key role in the nation's economy and the quality of life of its citizens. UTCs advance transportation expertise and technology in the varied disciplines that comprise the field of transportation through education, research, and technology transfer activities. UTRC was recently selected by the U.S. Department of Transportation to be a Regional (Region 2) UTC, and UTRC will lead a consortium of universities focused on improving the mobility of people and goods.

The Region 2 UTC Center for Social and Economic Mobility for People and Communities through Transportation consortia members include CUNY Bronx Community College, New Jersey Institute of Technology, New York University, Princeton University, Rensselaer Polytechnic Institute, Rutgers University, SUNY University at Albany, SUNY Polytechnic Institute, SUNY Stony Brook University, and University of Puerto Rico Mayaguez.

3 Acknowledgments

The author would like to thank UTRC Director Dr. Camille Kamga, whose ongoing support for this report and so many other projects and activities in the region has and continues to make available academic resources and research indispensable to the development of sound transportation policymaking.

The author and the UTRC would also like to thank the hardworking group of volunteers and staff from Windels Marx Lane & Mittendorf, LLP who assisted with the research, drafting, and many other tasks related to the production of this report, especially Bre Injeski, who took lead on the project, as well as Pasqualino Russo, Salma Mallah, Ben Fink, and Patricio Vicuna.

We would like to express our sincere gratitude to the peer reviewers who provided valuable feedback and suggestions on our report:

- **Patty Clark**: CEO, Project Gestalt, Inc. (current); Principal, PCAA, a business unit of Project Gestalt, Inc. (current); Aviation Strategy Officer, The Port Authority of New York & New Jersey (prior)
- **Patricia L. Gatling**: Commissioner and Chair, New York City Human Rights Commission (2002–2015)
- **Dr. Camille Kamga**: Director, UTRC; Associate Professor of Civil Engineering, The City College of New York
- **Ray A. Mundy, Ph.D.**: Executive Director, Airport Ground Transportation Association
- **Carlton Thomas**: Board Chair, International Association of Transportation Regulators (current); Airport Landside Access Manager, City of Austin Aviation Department (prior)
- **Brian Sadek**: Counsel, Dentons (current); Principal, Sadek Legal PLLC (current); Vice President of Legal and Authority Affairs, Wayne County Airport Authority (prior)
- **Vincent Vesce**: Principal and CEO, V Squared Strategies, LLC (current); Senior Manager – Airport Access Programs, The Port Authority of New York and New Jersey (prior)
- **Christopher O. Ward**: Executive Vice President of Business Development, BRAVO (current); Executive Director, Port Authority of New York and New Jersey (2008–2011); Commissioner, New York City Department of Environmental Protection (2002–2005)

Their expertise and insights helped us improve the quality and clarity of our work. We appreciate their time and effort in reviewing our report and sharing their constructive comments. We have addressed their concerns and incorporated their recommendations in the revised version of our report. We hope that our report will contribute to the advancement of knowledge and

practice in this field. The biographies of the peer reviewers are included in Appendix A. The peer reviewers of this report submitted significant comments and revisions. The peer reviewers may not agree with every single recommendation in this report, but each peer reviewer has indicated support for the goals, mission and overall recommendations and mission of the report.

4 Methodology

The research conducted for this report was directed towards building an understanding of landside commercial ground transportation operations at medium-hub and large-hub airports in the U.S. and Canada, and the proposed redevelopment at JFK Airport. To determine best and/or recommended practices for managing ground transportation access at airports, the research team identified airports that have implemented commercial ground transportation programs, procedures, and facilities considered to be examples of best and/or recommended practices.

Secondary research for this report focused on ascertaining current practices, operational models/methods, facility configurations, rules and regulations, fees, and mechanisms that airport operators use to provide, monitor, control, regulate, and enforce commercial ground transportation services at airports. This report identifies globally-relevant regulatory principles and the best and/or recommended practices, citing to relevant research, evidence, and expert opinion.

The report was peer reviewed and supported by a wide range of recognized experts in airport commercial ground transportation services and management. (See Appendix A.) The peer reviewers of this report submitted significant comments and revisions. The peer reviewers may not agree with every single recommendation in this report, but each peer reviewer has indicated support for the goals, mission and overall recommendations and mission of the report.

5 Problem Statement & Background

Historically, curbside PUDO service at the airport terminal has been synonymous with air travel since the golden age of commercial aviation, beginning in the 1950s.[2] PMVs and commercial operators, such as taxicabs, limousines, and rental car companies are all competing for the same curb space at the airport terminal because passengers desire seamless, convenient access to the terminal.[3] In particular, New York City airports have been grappling with the fight for the curbside—that is, determining where people are dropped-off and picked-up depending on their mode of transportation to or from the airport. The advent of ridesourcing and the boom of transportation network companies made curbside management an unavoidable issue.[4]

Major airports struggled to adapt to the new normal of increased motor vehicle traffic in unsuccessful ways, so that the fight for the curbside really never went away. For example, in the early phase of construction during the LaGuardia Airport Redevelopment Program, a parking garage and surface lot were closed, plus the airport authority decided to close, re-route, and narrow several roadways. On a few occasions, during the morning and evening travel times, the traffic volumes at the terminal reached "Level of Service F" conditions, during which the amount of traffic approaching a point exceeds the amount that can be served. In a few extreme circumstances, some taxicab passengers fearful of missing their flight, exited vehicles amidst the gridlock of the roadway, opting to walk to the terminal.[5]

In response to safety concerns at LaGuardia Airport during redevelopment, the Port Authority of New York and New Jersey ("Port Authority") implemented a comprehensive traffic mitigation program operated out of the Traffic Management Center that was launched in 2016. Actions included removing the traffic lights throughout most of the roadway, which enabled traffic to flow more quickly. To encourage the use of mass transportation, the airport managers provided a free Metropolitan Transportation Authority Q70 La Guardia Link bus. The airport managers also shifted pick-up locations for taxis and ridesourcing vehicles away from the terminals, requiring a walk or sometimes a shuttle bus to access taxis.[6]

When the work was beginning for LaGuardia Airport, the author of this report was brought in as a consultant to assist with managing stakeholder input on the resulting disruption when terminal curbside pick-up ended for taxis, limousines, and ridesourcing vehicles. The author helped identify issues and potential solutions in advance of implementation. The scope of the

[2] https://portfolio.panynj.gov/2015/05/26/vintage-laguardia-airport/#jp-carousel-389
[3] https://www.nytimes.com/2018/11/12/business/car-rentals-airport.html
[4] https://www.nytimes.com/2019/08/19/business/airports-traffic-uber-lyft.html
[5] https://qns.com/2017/02/heres-avoid-getting-stuck-massive-traffic-laguardia-airport-weekend/
[6] https://thepointsguy.com/news/your-guide-to-taxis-ubers-and-lyfts-during-laguardias-construction/

author's work also included facilitating direction on best practices for operating the limousine and ridesourcing pick-up area, such as providing recommendations regarding the layout for efficiency and personnel at the terminal frontage.

Additionally, the construction at LaGuardia Airport led to regular changes to the road patterns, holding lot locations, and the pathways for passengers to hail a cab or greet their chauffeurs. Through the active engagement of LaGuardia Airport managers, the construction team, and industry stakeholders, the Port Authority was able to address the interim steps to allocate better access for travelers going in and out of LaGuardia Airport. In addition, the Traffic Management Center coordinated roadway closures, traffic incidents, and other events with Waze (a free crowdsourced traffic and navigation application). The Port Authority feeds pertinent traffic information to the Waze platform, so that drivers using Waze had real time notice of road closures and detours.[7]

The final plan sought to balance LaGuardia Airport's interest in expediting the construction, while ensuring close curbside access for all for-hire modes, and de-prioritizing private motor vehicle use at LaGuardia Airport. While physical limitations make the fight for the airport curb intense, and, while no system is perfect, many of the lessons learned from LaGuardia Airport's redevelopment can be useful for the JFK Redevelopment–both for the interim construction, and final plans for passenger PUDOs.

It is clear that the fight for the curb will persist even despite efforts to move or relocate drop-off and/or pick-up zones away from the terminal. As it was with LaGuardia Airport, the only possible relief to the traffic issue was a temporary infrastructure fix that helped facilitate the flow of traffic, but not stop it from reaching the terminal curbside.[8] While not part of the original plan, the Port Authority decided that, to relieve congestion on the roads inside the airport during construction, it would build a temporary ramp between the Delta terminal and the Grand Central Parkway. The temporary ramp required closure of a lane of the Grand Central Parkway, and it was, therefore, open only when necessary.

[7] www.panynj.gov/port-authority/en/press-room/press-release-archives/2017_press_releases/laguardia_airporttraveladvisory-accesstolgasterminalband94thstre.html
[8] https://www.nytimes.com/2017/03/16/nyregion/la-guardia-traffic-ramp.html

6 The New York JFK Airport Redevelopment Project

The Port Authority operates JFK Airport, which is among the nation's busiest airports for international passengers serving the largest and densest population in the country.[9] By 2030, the Port Authority expects the number of passengers at JFK to grow by one-third to over 75 million passengers annually. To accommodate the expected growth, in 2017, the New York Governor's Airport Advisory Panel ("Airport Advisory Panel") developed a "Vision Plan" to transform JFK into a leading global airport.[10]

The Vision Plan provides a strategic framework for the Port Authority and its partners to completely redevelop, modify, and expand existing terminal facilities and associated infrastructure at JFK. This includes increasing the number and size of gates, improving parking availability, providing an array of airside taxiway improvements to decrease runway occupancy times, and upgrading the AirTrain JFK system to increase capacity. The Airport Advisory Panel, in consultation with the New York State Department of Transportation, also recommended enhancing roadways on and off the airport, particularly the Van Wyck Expressway and the Grand Central Parkway, and including the Kew Gardens Interchange.

The master plan and the project, referred to as the JFK Redevelopment Program, provide for multi-staged redevelopment. The Program calls for an overhaul of the airport's eight disparate terminal sites into an interconnected JFK Airport—albeit with distinct terminals—by demolishing old terminals, using vacant space, and modernizing on-airport infrastructure, while incorporating the latest in passenger amenities and technological innovations.

As a part of the JFK Redevelopment Program, to benefit the local communities around JFK Airport, the Port Authority is working with terminal developers to engage minority and women-owned businesses and other local small businesses in all aspects of the redevelopment.[11] Local small businesses and communities around JFK include taxi, limousine, and Uber/Lyft drivers, many of whom are self-employed independent contractors and minorities.

According to the New York City Taxi and Limousine Commission ("TLC"), approximately 96% of yellow and green taxicab drivers and 91% of drivers of other for-hire vehicles (Uber, Lyft, livery, black car, and luxury limousine) were born in countries other than the

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[9] U.S. Department of Transportation Office of the Assistant Secretary for Aviation and International Affairs, International Aviation Developments Series, June 2021 (released January 2022), https://www.transportation.gov/sites/dot.gov/files/2022-01/US%20International%20Air%20Passenger%20and%20Freight%20Statistics%20for%20June%202021.pdf

[10] Airport Advisory Panel, Vision Plan for John F. Kennedy Airport: Recommendations for a 21st Century Airport for the State of New York, January 2017, https://www.anewjfk.com/wp-content/uploads/pdf/JFK-Vision-Plan.pdf.

[11] https://www.anewjfk.com/work-with-us/work-with-panynj/

United States.[12] More than half of these drivers are from countries in Asia, Africa, and the Caribbean that have high percentages of populations that would be considered minority populations in the U.S.[13] These drivers are significant stakeholders in the JFK Redevelopment. As such, adverse impacts on their business should be considered when planning for reconstruction and the final state.

6.1 Existing Commercial Ground Transportation Access

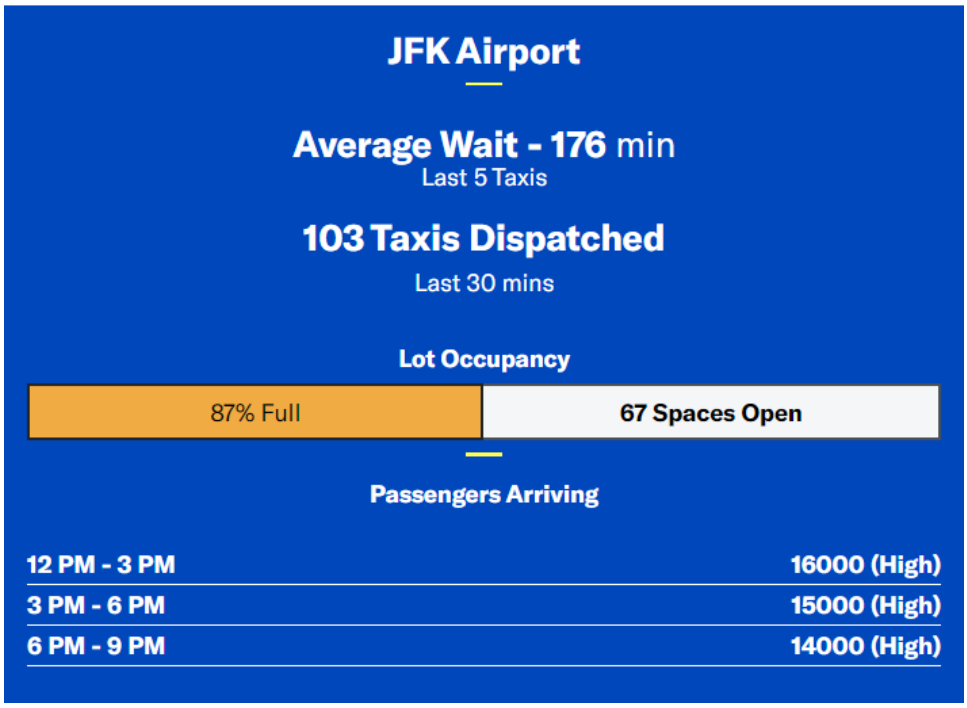
Currently, Uber and Lyft pick-ups are located on the curbside outside of the arrivals level at each Terminal.[14] At Terminal 4, the taxi stand line is located inside the terminal; at the other terminals, the lines for the taxi stands are directly outside the terminal.

JFK taxi line. Inage Credit: Lécuyer-couqueberg, via wiki commons.wikimedia.org

Uber and Lyft, as well as taxis and limousines, must use designated waiting areas (staging lots) within JFK Airport, where they must stage and wait with their vehicles until they are allowed to proceed to their respective designated loading area to pick-up a passenger. Staging areas remove vehicles from the terminal frontages, and other airport roadways and local roads, thereby reducing

[12] New York City TLC. 2020 Fact Book. https://www1.nyc.gov/assets/tlc/downloads/pdf/2020-tlc-factbook.pdf.
[13] *Id.*
[14] https://www.jfkairport.com/at-airport/airport-maps

congestion and improving efficiency.[15] For taxi drivers, the Port Authority has a dashboard that shows real-time information on average wait time and lot capacity.[16]



Port Authority NY & NJ Taxi Driver Information Dashboard captured February 16, 2023. Source: Port Authority NY & NJ (www.panynj.gov)

The limit on the number of Uber and Lyft vehicles allowed in the JFK Airport waiting queue has been lifted since the pandemic, while limits on the amount of time a driver may remain in the staging lots remain in place. Once in the staging lots, these drivers receive ride requests via a virtual first-in, first-out (FIFO) queue.[17]

6.2 Challenges with Existing Ground Transportation Access

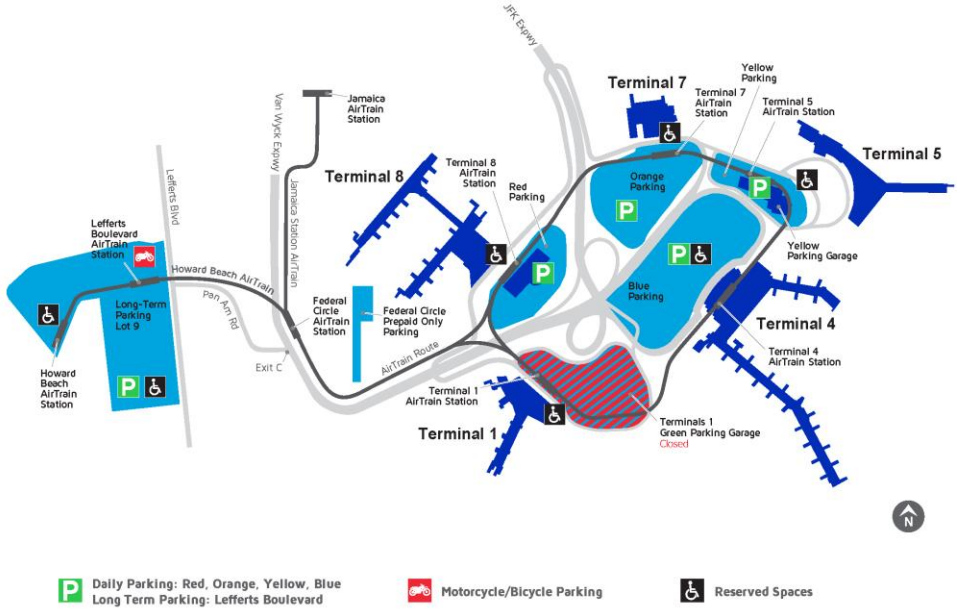
The challenges that the JFK Redevelopment Program seeks to address fall into five broad areas: 1) terminal configurations; 2) airport roadway networks; 3) passenger operations and delays; 4) cargo operations; and 5) increasingly crowded, congested, and unreliable transportation access to the airport.[18] The roadway network and access to the airport are the two aspects of the Program

[15] www.panynj.gov/port-authority/en/press-room/press-release-archives/2004_press_releases/jfk_internationalcutsribbonforlimoandbusstagingarea.html
[16] https://www.panynj.gov/airports/en/operator-resources/taxi-driver-information.html
[17] *Id.*
[18] Airport Advisory Panel, Vision Plan for John F. Kennedy Airport: Recommendations for a 21st Century Airport for the State of New York, January 2017, https://www.anewjfk.com/wp-content/uploads/pdf/JFK-Vision-Plan.pdf.

that impact ground access for taxis, limousines, and ridesourcing, as well as landside modal prioritization to maximize efficiencies.

6.2.1 Roadway Network

Currently, the roadway network within JFK's central terminal area is divided into five areas for motorists to access the different terminals, parking garages, and expressways connecting to the Airport. The Van Wyck Expressway and JFK Expressway loop into the Airport's central terminal area in a "clover-leaf" pattern, creating multiple flows of inbound and outbound traffic that are difficult for drivers to understand. In front of each terminal, the existing passenger PUDO areas are insufficient, with major bottlenecks, particularly at Terminals 4 and 5.[19]

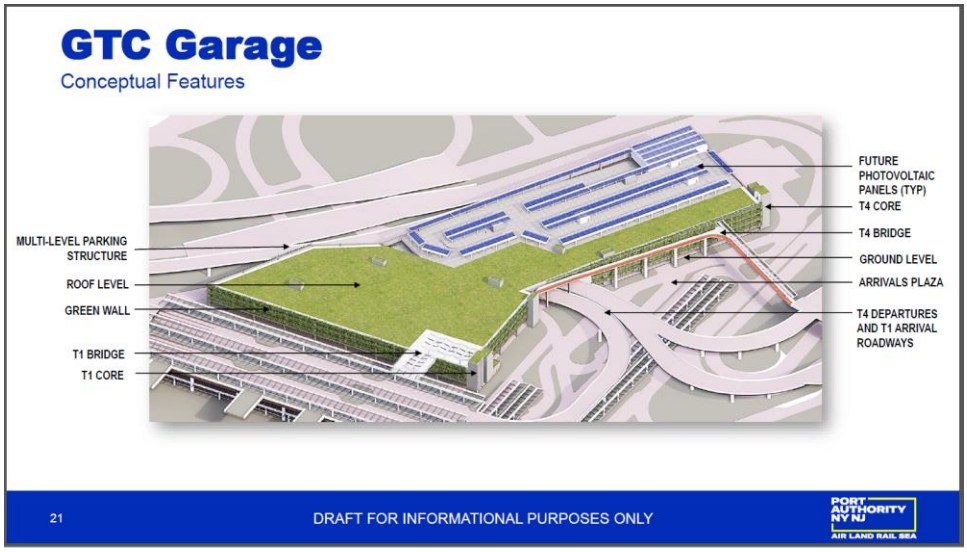


Inner Roadways at JFK Airport. Source: Port Authority of NY & NJ (https://www.jfkairport.com/at-airport/airport-maps)

The Airport Advisory Panel found that the roadways on the Airport are often congested and confusing for drivers to navigate. Terminal PUDO locations are bottlenecks and congested. As passenger volume continues to grow, on-airport congestion will steadily increase.

To remedy the roadway network issues, the Panel recommended redesigning the on-airport roadway network to evolve over time into a ring-road configuration and provide expanded parking capabilities within the airport's central terminal area or underground, as well as improved way-finding, to create a more efficient, simple airport roadway network, and appropriately-sized and centrally-located parking facilities.

[19] *Id.*



JFK Redevelopment Ground Transportation Center Garage. Image Credit: Port Authority NY & NJ

6.2.2 Access to the Airport

The Airport Advisory Panel found that, with respect to ground transportation to and from JFK, the existing options lag compared to other world-class international airports, and the roadways and curbsides at many times of the day are unable to accommodate demand.[20] These shortcomings frustrate passengers and result in vehicle congestion spilling into the surrounding Queens community.

Under current traffic conditions, travel time to JFK by car is unpredictable. Using mass transit, passengers have the option to take the subway or commuter rail to get to a difficult-to-navigate and dated station at Jamaica, Queens in order to transfer to the JFK AirTrain for service to and from the airport, which can require lengthy waits for service to Brooklyn's Atlantic Terminal.

As the Airport continues to grow, accessing JFK will become more difficult unless the Port Authority follows best and/or recommended practices like those contained in this report. This overall growth will make roadway congestion, as well as transit access, to and from JFK even more challenging.

6.3 Proposed Solution: Centralized Ground Transportation Center Garage

To remedy the existing issues with the roadway network and access to the airport, the Port Authority is planning a centrally located four-level parking structure called the Ground

[20] Airport Advisory Panel, Vision Plan for John F. Kennedy Airport: Recommendations for a 21st Century Airport for the State of New York, January 2017, https://www.anewjfk.com/wp-content/uploads/pdf/JFK-Vision-Plan.pdf.

Transportation Center ("GTC"). It also would include an AirTrain station and have a sustainable roof level plaza.

The Port Authority's estimated total construction cost range for the JFK Central Terminal Area Roadways, Utilities, and Ground Transportation Center is approximately $700 million - $800 million.[21] To effectuate the JFK Redevelopment Program, the Port Authority included $2.9 billion in its 2017-2026 capital plan for airport capital investment to: 1) support private passenger terminal development expenditures; and 2) improve the backbone infrastructure of the airport.

The GTC below will feature a flexible design that improves the passenger experience by providing a seamless flow of traffic, and it will also provide a clear and safe pedestrian access.[22] The GTC will be a multi-level parking garage to accommodate over 3,000 private vehicles. Its ground level will serve as the new Terminal 1 and Terminal 4 arrivals plaza, staging area for taxis, for-hire-vehicles, private vehicles, and buses. The GTC Roof Level Plaza will reside at the topmost level. The consolidated structure is expected to serve the entire Airport community.

On January 11, 2022, the Port Authority issued a Request for Qualifications ("RFQ") seeking bona fide Statements of Qualification ("SOQs") from qualified firms interested in the design and construction of the central terminal area, roadways, utilities, and ground transportation center at JFK.[23] The Port Authority's issuance of the RFQ began a two-step process whereby the Port Authority first reviewed submitted SOQs and then shortlisted four firms to the next phase of the procurement process, which will be the Port Authority's issuance of a Request for Proposals ("RFP") to the respondents. The Port Authority selected (shortlisted) the following firms to proceed to the next phase of the procurement process: Skanska-Halmar JFK, JV, Tully Construction Co. Inc., Tutor Perini Corporation, and Yonkers – Picone, JV.[24] As of the date of publication, the procurement is still open.

Currently, there are few details of the plan for handling curbside PUDO areas and modal prioritization. The RFQ industry briefing provided the images below, which do not identify where exactly limousines, taxis, and ridesourcing vehicles will go:

[21] Request for Expressions of Interest, The Roof Level Plaza Part of the New Ground Transportation Center John F. Kennedy International Airport, 6000000820.
[22] Request for Expressions of Interest, The Roof Level Plaza Part of the New Ground Transportation Center John F. Kennedy International Airport, 6000000820.
[23] https://panynj.bonfirehub.com/opportunities/57786
[24] https://www.panynj.gov/content/dam/port-authority/pdfs/altlernative-project-delivery-pdfs/industry-briefing-6000000775-RFQ-Shortlist.pdf

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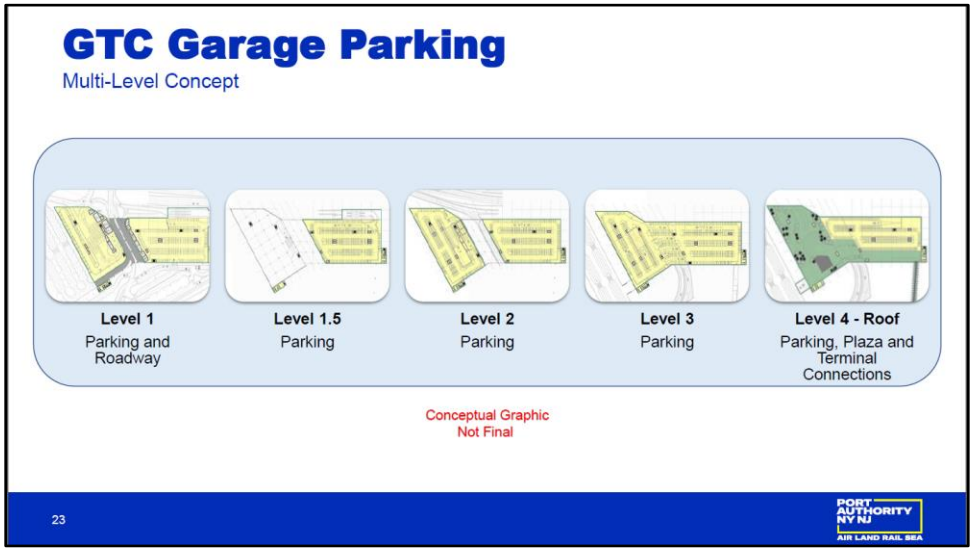
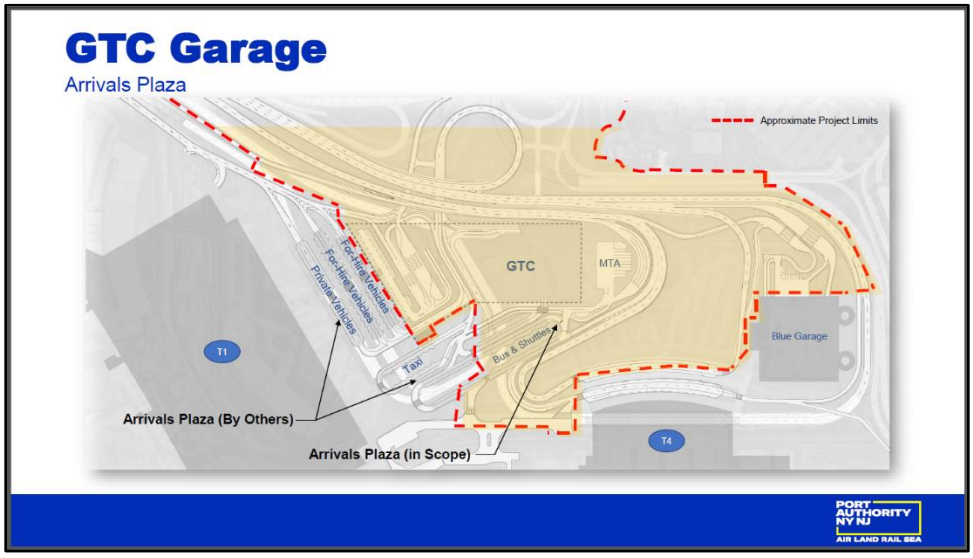
JFK Redevelopment Ground Transportation Center Roof. Image Credit: Port Authority NY & NJ.



JFK Redevelopment Ground Transportation Center Garage Parking. Image Credit: Port Authority NY & NJ.



JFK Redevelopment Ground Transportation Center Garage. Image Credit: Port Authority NY & NJ

6.4 Possible Alternatives

For arrivals, there is a possibility that the JFK Redevelopment Program will locate private vehicle pick-ups near the arrivals plaza, and alternatively relocate pick-ups for taxi and ridesourcing vehicles to a remote non-terminal location accessible only by some mode of transportation (*e.g.*, bus, AirTrain). This would be inconvenient for arriving passengers to have to walk or take a shuttle to reach their pick-up location, especially for families and those travelling with children and customers with multiple items of luggage. Banning terminal curbside pick-ups can be confusing for passengers,[25] and change can anger them as well.[26]

An off-site pick-up and drop-off location can also tack-on unwanted travel time. According to a report on LAX-it (discussed in Section 5.2 below), in its opening month, passengers waited up to 50 minutes to get a ridesourcing vehicle once they reached the pick-up location.[27] In addition, if the estimated time to get to the pick-up location is too long, it may "encourage more passengers to drive their personal vehicle to/from the airport or use rental cars."[28] This could lead to increased traffic congestion at and around the airport from those who find the time, aggravation, confusion, and uncertainty of using taxis and ridesourcing services to not be worth it.

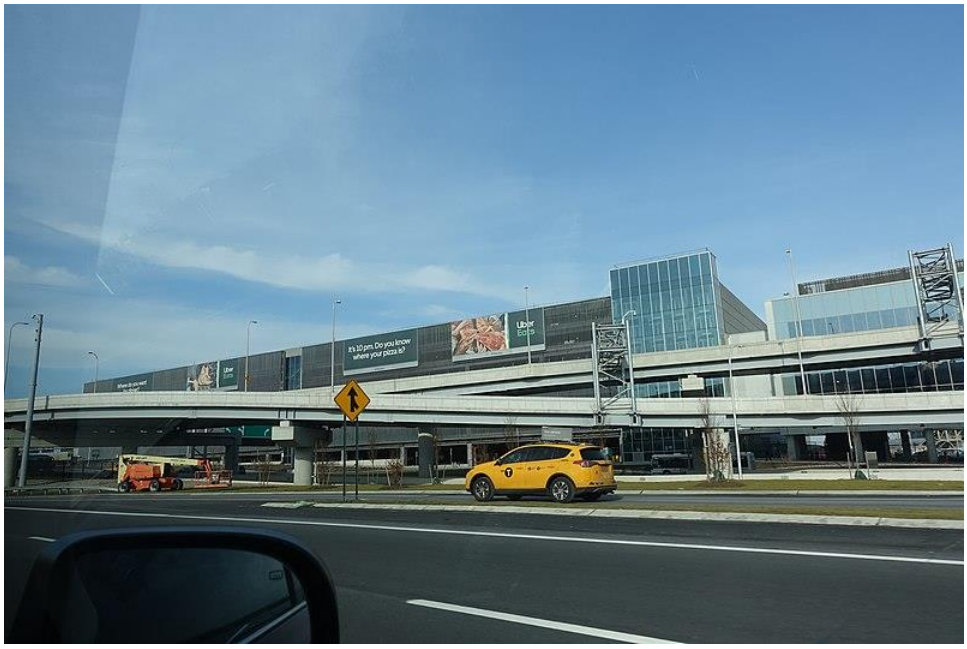
[25] https://thepointsguy.com/news/your-guide-to-taxis-ubers-and-lyfts-during-laguardias-construction/
[26] Harry Campbell and Blair Schlecter, "Congestion at the Curb: An Analysis of Ride-Hailing at LAX and Recommendations to Optimize the TNC System at Airports" (January 2020), https://comotionnews.com/wp-content/uploads/2020/01/Congestion-at-the-curb.pdf
[27] *Id.*
[28] *Id.*

7 Recent & Relevant Airport Redevelopment Projects

7.1 LaGuardia Airport, New York City

In 2015, a comprehensive plan to construct a completely new LaGuardia Airport (LGA) was unveiled with the goal of creating a world-class, 21st century passenger experience featuring modern customer amenities, state-of-the-art architecture, more spacious gate areas, and a unified terminal system.[29] The $8 billion project, two-thirds of which was funded through private financing and existing passenger fees, broke ground in 2016 and is expected to be completed by 2026.[30] LaGuardia Airport is substantially complete now, and it has been transformed into a unified airport with new terminals, better transportation access, additional airside taxiways, and best-in-class passenger amenities.[31]

The redevelopment of Terminal B includes a 3,000-car parking garage with covered, convenient pick-up facilities for both taxis and ridesharing vehicles. The seven-story adjoining parking garage opened in February 2018, and the second floor is dedicated to ridesourcing vehicles.



New Terminal B Parking Garage. Image Credit: Tdorante10, via wiki commons.wikimedia.org

[29] https://www.panynj.gov/port-authority/en/press-room/press-release-archives/2022-press-releases/GOVERNOR-HOCHUL-PORT-AUTHORITY-AND-LAGUARDIA-GATEWAY-PARTNERS-ANNOUNCE-COMPLETION-OF-TERMINAL-AT-LAGUARDIA.html

[30] https://www.anewlga.com/ (accessed Nov. 2, 2022).

[31] https://www.afar.com/magazine/laguardia-airports-new-terminal-named-the-worlds-best

The Terminal B expansion and renovation project also included demolition of a multi-level parking garage located in front of the existing terminal to make room for the construction of the new main departures and arrivals hall (known as the headhouse).

The year 2018 was the peak year for construction on the project. At the height of infrastructure and terminal renovations, LaGuardia Airport suffered from extreme traffic volumes. In an attempt to ease traffic congestion at the terminals during redevelopment construction, LaGuardia Airport offered a free bus link to encourage the use of mass transportation, and shifted pick-up locations for taxis and ridesourcing away from the terminals, requiring a walk or sometimes a shuttle bus to access taxis.[32]

The construction required regular changes to the road patterns, holding lot locations, and the pathways to the taxi, ridesourcing, and limousine pick-up locations. Airport managers and the construction team engaged industry stakeholders to address interim steps to minimize impacts on the day-to-day operation and the traveling public while advancing the Airport's goal of expediting construction. In the context of speaking about changes to traffic and taxi stand locations during the JFK construction, Port Authority Executive Director Rick Cotton commented, "We don't expect things to get that bad, what we expect is that we've learned our lesson at LaGuardia."

While the construction phase was less than ideal, the end result of LaGuardia Airport's redevelopment is a best practice from a commercial ground transportation perspective. Taxi, ridesourcing, and limousine service is available at all LaGuardia Airport terminal buildings. The services each have designated spaces that are easy for passengers to locate. From inside the airport, passengers can follow the "Taxi Stand" signs to the queue or the "Car Services" signs to the pick-up area, and to contact their car service or ridesourcing service when they reach the pick-up area.[33]

7.2 Los Angeles International Airport, California

In 2019, to avoid traffic in the central terminal area, Los Angeles International Airport ("LAX") introduced LAX-it (pronounced "LA exit"), a specific area for travelers to pick-up a taxi or connect with a ridesourcing service.[34] Those arriving at the airport via a ridesourcing service or taxi continue to be dropped-off curbside on the departures (upper) level. Limousine services are still allowed to make pick-ups at the terminals.[35] LAX-it will remain in service until the automated people mover opens, which is currently planned for 2024.[36]

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[32] https://www.laguardiaairport.com/to-from-airport/car-service-and-shared-rides
[33] https://www.laguardiaairport.com/to-from-airport/car-service-and-shared-rides
[34] https://www.lawa.org/news-releases/2019/news-release-110; https://www.flylax.com/lax-it
[35] https://comotionnews.com/wp-content/uploads/2020/01/Congestion-at-the-curb.pdf
[36] https://www.flylax.com/lax-it

LAX-it is located just east of Terminal 1, and it is accessible by either walking 3 to 20 minutes (depending on the terminal) or via dedicated shuttles that run every 3 to 5 minutes during peak hours.[37] The LAX-it shuttles operate in a dedicated lane on the arrivals (lower) level, and they do not compete with other airport traffic.

LAX-it offers basic amenities such as restrooms, benches, umbrellas for sun and rain protection, cellphone charging stations, public Wi-Fi, and local food trucks. Dedicated staff at LAX-it are supposed to provide passenger assistance and lane management onsite. However, reports from operators are that this is not always the case.

Implementation of LAX-it did not go smoothly.[38] Some of the problems included confusion among passengers trying to understand the new system, traffic gridlock, non-arriving or crowded shuttle buses, ridesourcing driver shortages, and inflated fares.[39] While LAX-it shuttles are supposed to run frequently and in dedicated lanes, observational reports of the arrivals level at LAX paint a different picture, with LAX-it shuttles sandwiched in between private vehicles and hotel/rental car courtesy shuttles, and ridesourcing customers look for alternative and more easily accessible pick-up spots. Once passengers stepped off the packed buses into the LAX-it waiting lot (which Uber had publicly warned was too small before launch), waits were often more than one hour.[40] Driver shortages also led to surge pricing.

7.3 Tampa International Airport, Florida

In 2021, Tampa International Airport (TPA) began revamping its curbside operations to address heavy traffic during peak travel times by adding more curbsides adjacent to the terminals.[41] The first-in-the-nation "Express Curbsides" allow departing passengers who do not need to check luggage to bypass the ticketing lobby and proceed directly from the curb to TSA checkpoints and airline gates. This doubles the curbside capacity while reducing curbside traffic by about half. The goal is to ease congestion at the curbside and in the departures lobby to accommodate expected passenger growth into the 2030s without building new infrastructure.[42]

TPA also works with ridesourcing services to develop innovative solutions to increase adoption of the Express Curbsides. Just one example is adding the Express Curbside drop-off option to the app's airport selection screen for travelers with carry-on luggage only.

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[37] https://www.flylax.com/lax-it
[38] https://comotionnews.com/wp-content/uploads/2020/01/Congestion-at-the-curb.pdf
[39] Martin, Brittany, "LAX's New Pick-Up Policy Got Off to a Turbulent Start," Los Angeles Magazine, October 30, 2019, https://www.lamag.com/article/lax-uber-lot-chaos/
[40] https://www.latimes.com/california/story/2019-10-14/uber-letter-lax-lyft-pickup-system-changes
[41] https://airportimprovement.com/article/express-curbsides-tampa-int-l-will-allow-millions-passengers-bypass-ticketingbaggage-lobby
[42] *Id.*

Currently, TPA has 16 lanes of curbside traffic loops: eight on the "blue" (north) side of the main terminal, and eight on the "red" (south) side. Each side has four lanes stacked on a double-decker roadway. Passengers arriving at the Express Curbsides enter "vertical circulation buildings," where they take escalators or elevators up to a skywalk that leads to the terminal and a monorail that links to the airport's four satellite terminals.[43] The system works in reverse for arriving passengers who do not need to claim luggage. Pick-up areas for taxis and ridesourcing are located outside the baggage claim areas.[44]

According to *Airport Improvement* magazine, to ensure that traffic keeps flowing during redevelopment construction, TPA used "innovative phasing plans to keep access open to the existing roadways, curbs and the terminals all through construction."[45] To minimize disruptions, the Airport implemented a public outreach campaign to inform passengers and stakeholders on each stage of construction.[46] Some work, "such as splicing and merging new roadways into existing roadways and building elevated roadway bridges over active roadways, will occur at night to minimize the impact on passengers."[47] In addition, temporary barrier walls separate construction areas from landside operations, while maintaining full access for passengers throughout the project. Extensive wayfinding aids and signage on the airport roadways warn drivers, including clear, unambiguous directions through possible construction activity.

[43] *Id.*
[44] https://www.tampaairport.com/ground-transportation
[45] *Id.*
[46] *Id.*
[47] *Id.*

8 Emerging Guiding Principles & Best and/or Recommended Practices for Airport Ground Traffic Management

Curb space allocation is critical to managing landside ground transportation traffic at airports. Depending on the size and location of the particular airport, various modes of transportation such as buses, public transit, taxis, limousines, ridesourcing, and private vehicles may all be competing for the same limited space in front of the terminals. Airport operators designate the level (departure or arrival) and the assigned area where vehicles may make PUDOs.[48]

The demand for curbside space increasingly exceeds the space available. As market shares change, airports have no choice but to prioritize the location and amount of space allocated to the different modes clamoring for access to the curb. Consequently, airport operators have relocated ridesourcing passenger PUDO operations to alternative curbs, levels, or locations—nearby garages, surface lots, or intermodal ground transportation centers—to make effective use of available landside capacity.[49]

An airport's goals and size will generally dictate curb space allocation. An airport operator should identify and prioritize various goals – such as safety, passenger experience, ground transportation provider experience, throughput and efficiency, and revenue–and use these goals, and their relative importance, to dictate an allocation of curb space that best serves these goals and the airport operator.

According to a 2015 report from the Airport Cooperative Research Program ("ACRP") of the National Academy of Sciences, "ACRP Report 146: Commercial Ground Transportation at Airports: Best and/or Recommended Practices (2015)," airport operators considered some of the following goals when allocating curb space:[50]

- Provide a safe environment for pedestrians and motorists.
- Address customer expectations by locating ground transportation services that customers normally expect to find at an airport curbside in a visible location.

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[48] National Academies of Sciences, Engineering, and Medicine 2020. Transportation Network Companies (TNCs): Impacts to Airport Revenues and Operations Reference Guide. Washington, DC: The National Academies Press. https://doi.org/10.17226/25759.
[49] *Id.*
[50] National Academies of Sciences, Engineering, and Medicine 2015. Commercial Ground Transportation at Airports: Best and/or recommended practices. Washington, DC: The National Academies Press. https://doi.org/10.17226/21905.

- Consider revenues received from each class of service by allocating the more visible and convenient curbside spaces to those transportation services that generate significant airport revenue.
- Recognize competition among ground transportation providers by separating competing operators (*e.g.*, taxis and ridesourcing) while attempting to provide them with equivalent access to deplaning airline passengers.
- Facilitate the ability to control and enforce by separating PMVs from commercial ground transportation vehicles, and, if space is available, by clearly designating separate boarding areas for different classes of commercial ground transportation services.[51]

In 2020, ACRP released the report "ACRP Research Report 215: Transportation Network Companies (TNCs)—Impacts to Airport Revenues and Operations" as a reference guide for airport operators to identify strategies and practical tools for adapting airport landside access programs to evolving ground transportation modes.[52] Some of the practices identified in the ACRP Research Report 215 for curb management to reduce airport access road and curb congestion and to make best use of available landside capacity include the following:

- PUDO should be in designated areas only.
- Flex between departure and arrival levels to reallocate ridesourcing activities to less congested locations.
- Consider using (or establishing) intermodal ground transportation centers for all commercial ground transportation operations.
- Consider the role of non-terminal locations (nearby garages and surface lots) for pick-up and drop-off.
- Analyze proposed changes with a microsimulation model, such as VISSIM.
- Monitor mode market share every six months and adjust curb assignments (linear feet, location) commensurate with demand.

Best and/or recommended practices for airport curbside PUDO will vary depending on the airport's goals, as well as the size and volume of passengers. Smaller hubs or non-hub airports may not have the capacity issues associated with larger hubs like JFK Airport, where roadways invariably become congested because of the greater volume of passengers. In addition, depending

[51] National Academies of Sciences, Engineering, and Medicine 2015. Commercial Ground Transportation at Airports: Best and/or recommended practices. Washington, DC: The National Academies Press. P. 32–33.
[52] National Academies of Sciences, Engineering, and Medicine 2020. Transportation Network Companies (TNCs): Impacts to Airport Revenues and Operations Reference Guide. Washington, DC: The National Academies Press. https://doi.org/10.17226/25759.

on an airport's location, it might be more appropriate to do year-over-year market share comparisons for each period to account for the seasonal flux of passengers.

Regardless of size, the following are best and/or recommended practices for managing commercial ground transportation at airports during redevelopment construction and the finished project – all of which are discussed in detail in the following sections:

- **"Fair Modal Curbside PUDO Separation":** If an airport has the physical space, competing ground transportation operators and sub-modes (*e.g.*, taxis, ridesourcing, and limousines) should be separated curbside for PUDO. This can be accomplished by clearly designating separate boarding areas for differing classes of commercial ground transportation services, while attempting to provide said services with equivalent access to deplaning airline passengers.

- **Accessible Curbside PUDO for Passengers with Disabilities:** When considering allocating separate boarding areas for the different classes of commercial ground transportation services, there should also be an accessible location that would be available for use by all approved/authorized commercial ground transportation providers to pick-up/drop-off passengers with mobility needs or restrictions. Airports should ensure there is adequate wayfinding throughout the passenger's journey from the gate area through the baggage claim area.

- **Visibility & Walkability:** Address customer expectations by locating ground transportation services that customers normally expect to find at an airport curbside in a visible location adjacent to or a walkable distance from the terminal.

- **Mode-Neutral Ground Transportation Centers:** Inter-modal facilities (ground transportation centers) that can accommodate multiple commercial ground transportation modes—taxis, ridesourcing, private vehicles, shuttles—away from terminal curbs should be mode-neutral, so that no particular mode is given preferential treatment at the expense of another. These facilities should also be modular (as opposed to purpose-built) so that the physical structure can be altered to accommodate changes in the transportation landscape.

- **Premium Airport Space PUDO ("First Class Curbside Service"):** When space constraints require, consider making curbside PUDO service a premium option - for a fee - to increase airport revenue, while also encouraging passengers to use separate PUDO locations away from the curbside facilities.

- **Airport Access Fees for All PMVs:** Consider charging a fee for all vehicles to access the airport curbside for pick-ups and drop-offs, including private PMVs, with a no-fee option for PUDO at a remote location, with free transportation to and from the terminal via a shuttle, people mover, air train, or mass transportation. Another option is to consider relocating all PMV PUDO areas to a remote location – with no curbside access - with free transportation to and from the terminal via a shuttle, people mover, air train, or mass transportation.

- **Passenger Friendly Non-Curbside PUDO Facilities:** Remote PUDO locations that are away from the terminal curbside should be well lit, clearly marked, and grade separated, if possible. The waiting area should also be covered to shield passengers from the elements.

- **Re-Matching Ground Transportation:** Rematch should be used, where practical given the airport roadway layout, to allow ridesourcing and taxi drivers to make a pick-up at the airport immediately after a drop-off without going to the designated holding lot or pick-up area.

- **Due Diligence Review of Existing Rules, Permits & Contracts:** Consult any existing contracts that the airport has with ground transportation providers, especially ridesourcing and limousine companies, to ensure actions are in line with the contract terms. Also, consult applicable rules or ordinances as well as any permits or permitting rules/processes to ensure compliance with same.

When implementing any of the above general principles, airport operators must consider, and make accommodations as necessary for, people requiring assistance or for people with disabilities. This is especially important with respect to location discussions. It is advisable to identify disability advocacy groups and other stakeholders in the local disability community, and to incorporate their input into planning. These key players may also potentially serve as an ally in the future with respect to messaging, communication, and responding to criticism.

Executing a large infrastructure redevelopment project, while also minimizing disruption to passengers, will involve complex planning and maneuvering. Additional guiding principles, as well as best and/or recommended practices during construction, include the following:

- While construction continues, impacts to the day-to-day operation and the traveling public must be minimized as much as possible. Consider performing work that is disruptive to passengers and airport operations during overnight or low traffic times.
- Maintain clear and frequent communication with all for-hire passenger ground transportation stakeholders—operators, drivers, passengers, airport personnel, and airlines—regarding impacts on operations, and changes to PUDO locations, processes, and/or procedures. Changes in pick-up locations and/or procedures should be

communicated to drivers and passengers before they arrive at the airport, and wayfinding signage should be updated as needed.

The above principles are discussed in more detail below.

8.1 Location of Ground Transportation Services

8.1.1 Adjacent to or a Walkable Distance from the Terminal

Improving the passenger experience for those entering and exiting the airport is a goal for many airport operators.[53] At most airports, loading areas for arriving passengers using commercial ground transportation are on the curbside roadway located adjacent to the arrivals level and baggage claim area.[54] The curbside area may be located just outside the terminal building or along a raised island separating an inner and outer roadway.

Curbside loading areas should be designed in such a way that they minimize or even eliminate the need for travelers to cross large roadways. A goal and best or recommended practice for many airport managers is to address customer expectations by locating ground transportation services that customers normally expect to find at an airport curbside (*e.g.*, taxis, ridesourcing, and limousines) in a visible location adjacent to, or a walkable distance from, the terminal.

Passenger pick-up zones should be clearly delineated to spread out the curbside for drivers, and streamline the pick-up process.[55] When possible, airports should use both the departures and arrivals levels interchangeably for pick-ups and for drop-offs to reduce wait times and traffic congestion at the curb and improve physical distancing between vehicles.

At O'Hare International Airport (ORD) in Chicago, Illinois, there are taxi stands at the curb outside of arrivals/baggage claim at each terminal.[56] Limousines, including Uber Black, may pick-up passengers outside of the arrivals/baggage claim area in the center lane in designated areas. Depending on airport traffic, it can take between 5 and 20 minutes for the vehicle to get to the designated pick-up location from the limousine holding lot. Loading zones for ridesourcing services are on the arrivals (lower) level of Terminal 5, and on the departures (upper) level of Terminals 1, 2, and 3. Loading zones are color coded, and passengers wait in the specific colored zones until their driver arrives to the same colored zone before proceeding to the designated pick-up location. An inside waiting area is available.

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[53] Harry Campbell and Blair Schlecter, "Congestion at the Curb: An Analysis of Ride-Hailing at LAX and Recommendations to Optimize the TNC System at Airports" (January 2020), https://comotionnews.com/wp-content/uploads/2020/01/Congestion-at-the-curb.pdf

[54] National Academies of Sciences, Engineering, and Medicine 2015. Commercial Ground Transportation at Airports: Best and/or recommended practices. Washington, DC: The National Academies Press. https://doi.org/10.17226/21905

[55] https://www.gensler.com/blog/TNCs-Ride app-app-rides-changing-airport-curbside.

[56] www.flychicago.com/ohare/tofrom/taxi/pages/default.aspx

At Boston Logan International Airport (BOS), there are designated pick-up lots and limousine stands located at Terminals A, B, C, and E, where ridesourcing and limousine passengers meet their drivers for pick-up.[57] Walking distance estimations from the terminals to each pick-up area range from 1 to 3.5 minutes.[58] The designated limousine stands in each terminal are located either across from the curb on the arrivals (lower) level of the terminal, or on the ground level of the Central Parking Garage. Ridesourcing services PUDO areas are located in the Central Parking Garage for terminals A, C, and E. Between 4 a.m. and 10 a.m., ridesourcing drop-off at Terminals A and E is on the arrivals (lower) level curbs. Taxis are available at each terminal on the arrivals level except Terminal C, where taxis are located on the ground level of the Central Parking Garage.

Washington Dulles International Airport (IAD) sacrificed approximately 100 spaces in its terminal parking lot to create a new designated curb space for ridesourcing pick-up, located outside of baggage claim just beyond the curb for commercial vehicles.[59] The 500-foot ridesourcing-designated curb is divided into several zones with alphanumeric labels to help customers find their drivers quickly. A steel canopy protects passengers from the elements. The new curb redistributed vehicle volume, and alleviated traffic congestion at the curb and through the parking lot.

Memphis International Airport (MEM) moved ridesourcing services to the terminal's upper, ticketing level, separating those vehicles from taxicabs, shuttles, and private passenger pickups on the lower, baggage level. There are ridesourcing PUDO locations outside each terminal (A, B and C), with a covered waiting area outside Terminal B ticketing to provide shelter during bad weather. The previous setup caused bottlenecks for incoming commercial and private passenger vehicles on the airport's baggage level.[60]

Many airports relocated ridesourcing loading areas and limited their curbside access in an effort to reduce congestion. This has the downside of increased wait times and travel time for passengers who use those services. Decreased wait times benefit both the driver and the passenger. Ridesourcing services have the ability to guide users to convenient pick-up locations that would decrease wait times and increase overall efficiency. This is done in-app and allows riders to be guided to nearby pick-up points that are easier to service and help optimize overall routing. These

[57] www.massport.com/logan-airport/to-from-logan/transportation-options/ground-transportation/
[58] *See* Final Report of the Commonwealth of Massachusetts Ride For Hire Task Force (February 2018), www.mass.gov/doc/final-ride-for-hire-task-force-report/download.
[59] https://airportimprovement.com/article/dulles-int-l-adds-separate-pickup-area-tnc-traffic
[60] https://www.commercialappeal.com/story/money/industries/logistics/2018/02/15/uber-lyft-pickup-and-dropoff-locations-moving-march-1-memphis-international/341083002/)

pick-up points can be set to designated curbside pick-up locations on both the arrivals and departures level to decrease congestion.[61]

8.1.2 Balanced Allocation of Available Curb Space

Airport managers should recognize competition among ground transportation providers by separating competing operators (*e.g.*, taxis, ridesourcing, and limousines), while attempting to provide them with equivalent access to deplaning airline passengers.[62] All comparable modes of commercial ground transportation services—such as taxis and ridesourcing—should be in the same general location relative to the terminals.

Space should be allotted proportionally to the volume of service provided by the respective mode. Ridesourcing services now represent 70 percent or more of the market from the airport, so they should have the dominant and closest curb area to the baggage claim. When modes are substitutes for each other in terms of cost and service provided, passengers will tend to choose the mode that is more convenient. If one mode is located at the curbside and another is in a remote facility that requires a shuttle or lengthy walk to reach, then demand for the convenient curbside service will increase, while demand for the remote option will decrease. Importantly, any traffic reduction benefits that the airport anticipated would be lost in such a scenario.

Airports should consider requiring all commercial ground transportation services to pick-up from locations that are equidistance from the terminal—be it the curb, a parking garage/lot, or a remote facility. This will ensure that allocation of space does not disadvantage any particular mode of transportation due to proximity to the terminal. It will also ensure that demand for the harder-to-reach mode does not shift to conveniently located curbside modes, thereby negating any anticipated traffic congestion reduction effects.

Safety factors, including crosswalk traffic, must be considered so that curb space assignments do not create a less safe airport roadway. For example, with 70 percent of the passenger traffic, ridesourcing pick-ups should be located in the inner curb closest to the terminal building to reduce crosswalk traffic as passengers walk across other lanes of traffic to reach their ride. In addition to safety, limiting the number of people crossing lanes of traffic is better for vehicle traffic flow.

8.1.3 Intermodal Ground Transportation Centers

Ground transportation centers ("GTCs") are intermodal facilities that can accommodate multiple commercial ground transportation modes—taxis, ridesourcing services, rental cars, hotel

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[61] https://www.itf-oecd.org/sites/default/files/docs/shared-use-city-managing-curb_3.pdf

[62] National Academies of Sciences, Engineering, and Medicine 2020. Transportation Network Companies (TNCs): Impacts to Airport Revenues and Operations Reference Guide. Washington, DC: The National Academies Press. https://doi.org/10.17226/25759.

shuttles, local buses—away from terminal curbs. GTCs can provide a mode-neutral way of managing demand, so that no particular mode is prioritized over another, which could lead to decreased demand for a particular mode if it is seen as more inconvenient.[63]

Several airports have opened GTCs. For example, Austin-Bergstrom International Airport (AUS) in Austin, Texas, opened a new parking lot and GTC where ridesourcing and taxis stage pick-ups.[64] Another example is Long Island MacArthur Airport (ISP) in Islip, NY. In spring 2022, ISP, opened a new 12,000 square-foot GTC that includes facilities for rental car agencies and space for rental cars, taxis, buses, and hotel courtesy shuttles.[65] Relocating rental car operations from the terminal area to the ground transportation center at ISP changed traffic flows and decreased congestion on the terminal frontage road.[66] It also freed up space in the terminal that will be used to house upgraded mechanical, electrical, and plumbing systems at ISP.[67] More recently, in May/June 2022, Cincinnati/Northern Kentucky International Airport (CVG) completed an overhaul of its ground transportation facilities. This included transforming an existing facility to accommodate ridesourcing vehicles, limousines, taxis, shared-ride vans, public transit buses, charter buses and CVG employee shuttles.[68]

Airports that have banned curbside pick-ups for commercial vehicles usually have relocated pick-ups to one or more sites that are within the airport terminal area.[69] To be the most appealing to passengers, the GTC should be at a walkable distance from the terminal and not require a shuttle or other mode of transportation to access. In addition, they should be mode-neutral and require all commercial ground transportation services to pick-up from the facility in parity. This will ensure that allocation of space does not disadvantage any particular mode of transportation due to proximity to the terminal. It will also ensure that customers do not forgo the ground transportation center in favor of curbside options, thereby negating congestion reduction effects of the ground transportation center.

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[63] National Academies of Sciences, Engineering, and Medicine 2020. Transportation Network Companies (TNCs): Impacts to Airport Revenues and Operations Reference Guide. Washington, DC: The National Academies Press. https://doi.org/10.17226/25759.

[64] https://www.austintexas.gov/department/ground-transportation-barbara-jordan-terminal

[65] https://www.macarthurairport.com/images/files/gtc032422.pdf

[66] https://airportimprovement.com/article/consolidated-ground-transportation-center-long-island-macarthur-facilitates-cascade-other-improvements

[67] https://airportimprovement.com/article/consolidated-ground-transportation-center-long-island-macarthur-facilitates-cascade-other-improvements

[68] https://airportimprovement.com/article/cincinnati-int-l-invests-future-new-transportation-center-roadway-improvements

[69] Harry Campbell and Blair Schlecter, "Congestion at the Curb: An Analysis of Ride-Hailing at LAX and Recommendations to Optimize the TNC System at Airports" (January 2020), https://comotionnews.com/wp-content/uploads/2020/01/Congestion-at-the-curb.pdf

An argument against parity and GTCs (and for locating commercial ground transportation adjacent to the terminal) is that it results in the vast majority of users having to spend extra time and effort to reach a common ground transportation terminal. Providing customers what they want is a primary goal of many airports, and the majority want fast curbside departures regardless of their mode of choice.

Regardless of where ground transportation services are located, it is imperative for airport operators to ensure wireless internet and cellular service is available to passengers and commercial ground transportation providers. For those using a ridesourcing service, reliable and constant access to the mobile booking or driver-facing app is a necessity.

If a GTC is designed to be reconfigured without major renovations, these facilities can be more flexible than designated curb space or lots for particular modes. Modular facilities can more easily adapt to new technologies and changes in market, or mode-share, than purpose built facilities.[70]

8.2 Rethinking PMV PUDO

Friend/family PUDOs generate no revenue to the airport and create a disproportionate impact on congestion, yet they receive premium curb space. PMVs are less efficient than ridesourcing services and taxis at moving people to and from the airport. When someone is dropped-off or picked-up by a friend or family member, that vehicle is transporting an airport traveler on only one leg of the trip. Whereas taxis and ridesourcing vehicles typically drop-off a passenger travelling to the airport, and then they pick-up another passenger leaving the airport. In addition, personal vehicles: (i) tend to dwell at the curb longer while waiting for the friend/family member to emerge from the terminal; (ii) are less familiar with navigating the complexities airport roadways; and (iii) have limited to no knowledge of curbside etiquette.

Serious consideration should be given to entrance fees for friend/family PUDO or else relocating personal vehicle pick-ups away from the terminal, such as at the cell phone lot where their rides should be waiting for them.

8.2.1 Universal Access Fees

Airport managers should consider revenues received from each class of service by allocating the more visible and convenient curbside spaces to those transportation modes that generate significant airport revenue and promote efficiencies. To that end, some airports require all vehicles, including PMVs, to pay a fee to access airport roadways, including to pick-up or drop-off friends and family at the terminal. Airport access fees can be seen as a fair way to charge users for the benefits they receive from the airport.

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[70] *Id.*

Charging all vehicles to access the airport can reduce traffic congestion and pollution around the airport, as well as generate revenue for airport maintenance and security. This can improve the efficiency and safety of airport operations, as well as contribute to environmental sustainability. Charging PMVs to access the airport can also encourage people to use public transportation or ride-sharing services. This can lower travel costs, reduce carbon footprints, and promote social and environmental equities.

While not common in the U.S., airports in other countries have been charging all vehicles a fee to enter the airport roadways. For example, all major airports in Vietnam charge an entrance fee, as do most airports in the United Kingdom and Cairo International Airport (CAI) in Egypt. Cairo charges an entrance fee of 10EGP ($0.50 USD).[71] In Vietnam, at major airports such as Tan Son Nhat, Noi Bai and Danang, the fee is VND10,000 ($0.40 USD) for the first 10 minutes for cars with no more than nine seats.

In the UK, 16 of the 22 airports in the country charge motorists taking passengers to the airport.[72] This type of fee is intended to encourage the use of public transport and raise revenue for the airport.[73] In terms of pricing, London's Heathrow, Gatwick, and Luton airports have the highest prices—£5 GBP ($5.76 USD)—with Stansted charging an initial feel of £7 ($8 USD) for 15 minutes.[74] In Scotland, the airports in Edinburgh, Aberdeen, and Glasgow charge a drop-off fee of £4 GBP for ten minutes. Belfast International Airport and Birmingham Airport also charge drop-off fees, while drop-off areas remain free at Cardiff, London City, and Belfast City airport.[75]

In the U.S., Dallas Fort Worth International Airport (DFW) is the only airport that charges an entrance fee for all vehicles to access the airport's roadway.[76] The tiered toll fee structure is based on the amount of time vehicles spend on the access road that leads to DFW's terminals. The cost to use the toll road is $6 if the vehicle passes through in under 8 minutes (to discourage drivers from using the access road as a throughway to other highways), $2 if the vehicle remains on the airport for 8 to 30 minutes (the typical drop-off duration), and $3 for 30 to 120 minutes ("Meeter-Greeter").[77] The airport also charges TNCs and taxis access fees per pick-up and drop-off.

The drop-off and Meeter-Greeter tolls are a significant revenue stream for DFW. In the four years before the pandemic, the airport reported $17.9 to $18.9 million per year in revenue

[71] https://english.thesaigontimes.vn/acv-applies-new-airport-entrance-fees-for-vehicles/
[72] https://www.telegraph.co.uk/news/2022/08/27/dropping-passengers-uk-airports-can-cost-flying-paris/
[73] https://www.rac.co.uk/drive/news/motoring-news/drivers-hit-by-sky-high-airport-drop-off-fees-as-two-thirds-put-up-prices-p/
[74] https://simpleflying.com/why-uk-airports-are-raising-drop-off-fees/
[75] https://uk.motor1.com/news/607243/uk-airports-drop-off-prices/
[76] https://standbywithme.com/why-does-dfw-international-airport-charge-visitors-a-drop-off-pick-up-fee/
[77] https://www.dfwairport.com/park/terminal/; https://www.digitaltrends.com/cars/airport-passenger-drop-off-and-pickup-fees/

from drop-off and Meeter-Greeter fees (8 to 120 minutes on the airport roadways).[78] In FY 2021, the airport reported revenues of $13.7 million from these fees (approximately 11.7% of total parking revenue).[79] In FY 2022, these fees accounted for $18.3 million (approximately 9.3% of total parking revenue).[80]

While charging all vehicles to access the airport has its benefits, there are considerations. Charging vehicles to access the airport can impose a burden on travelers who have limited options or resources. Most airports in the U.S. are poorly served by public transport. In addition, some people may not have access to taxi and ridesourcing services, or they may have special needs or circumstances that require them to use private cars or taxis. Therefore, airport operators are encouraged to consider transportation options, and they should consider the expected level of resistance from passengers who might feel they are being forced to pay a fee because no suitable alternative mode of public transport exists.

Airports could charge different fees to PMVs for terminal curbside PUDO versus a more remote location to decrease congestion at the terminal. For example, Manchester Airport charges a fee if the drop-off is at the terminal, but vehicles are not charged if the drop-off occurs at a remote location that is five to seven minutes away with a shuttle that comes every 15 minutes to take passengers to the terminal.

According to Ray Mundy, the executive director of the Airport Ground Transportation Association ("AGTA"), "a pick-up and drop-off charge for private automobiles will be the next major charge for U.S. airports. The rationale is to encourage more and more people to use high occupancy vehicles and public transportation. It also has the effect of raising revenue for airports."[81] Mundy believes those two rationales could "overcome resistance to charging people for pick-up and drop-off."[82]

Change management will be key in implementing general access fees. People, at least in the U.S., expect that the curbside will be available without charge. Airports that implement universal access fees will need to prepare for pushback from the public and may want to consider engaging local media to control a favorable narrative, and manage potential adverse public opinion.

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[78] https://dwuconsulting.com/images/CAFR/DFW%202021%20CAFR.pdf
[79] https://dwuconsulting.com/images/CAFR/DFW%202021%20CAFR.pdf
[80] https://assets.ctfassets.net/m2p70vmwc019/6drHiqyYqG39hwCkRbJRaz/dc1f0809442ed61c617db99acd694a65/FY_2022_Annual_Comprehensive_Financial_Report.pdf
[81] https://www.businesstraveller.com/business-travel/2017/08/30/airport-tolls-may-coming-us/
[82] *Id.*

8.2.2 Relocate PMV PUDO Away from the Terminal Curb

Airports could decide to not allow PMVs to pick-up and/or drop-off at the terminal curbside. Instead, they could require travelers who receive a ride from a friend or family member to be shuttled between a designated PMV area or parking lot and the terminal. This reduces congestion at the curb and gives more space for more efficient modes (and modes that generate revenue for airports) to be conveniently available to passengers at the curb.[83]

An example of this is At LAX Terminal B (Tom Bradley International Terminal), where the pick-up areas for travelers being picked-up by friends/family is located on the lower level of Parking Structure 3.[84] According to LAX, this helps divert traffic from "the congested roadway and bypass the busy traditional curb where construction has temporarily reduced available space."[85] The Terminal B Pickup area is free to use and access.

Many airports around the world have designated remote locations—commonly referred to as "Kiss and Fly" areas—that allow those dropping-off friends or family to avoid congestion at the terminal curbs. From the Kiss and Fly area, travelers can take a shuttle or light rail to the terminal. For example, in the U.S., JFK Airport and San Francisco Airport (SFO) offer a Kiss and Fly zone free of charge.[86] Vilnius Airport in Lithuania has a Kiss and Fly area that is free for the first 10 minutes and then charges €4 for each additional 10 minutes in the area.[87] Lisbon Airport in Portugal and other European airports also have similar payment schemes.[88]

It is common for airports to offer "cell phone lots" where drivers picking-up friends or family can wait until their arriving friend/family has left the aircraft and is ready to be picked-up. JFK Airport offers cell phone lots conveniently located at each of the primary airport entrances, less than a five minute drive to all terminals.[89] According to JFK, the cell phone lots "not only provide a convenient place to wait for arriving flights, but also it helps keep traffic at the airport moving smoothly."[90]

Requiring travelers who receive a ride from friends or family to be picked-up or dropped-off at remote locations such as Kiss and Fly zones or cell phone lots will reduce congestion at the curb and on airport roadways. A separate entrance/exit at the remote location would allow the

[83] https://www.lek.com/sites/default/files/insights/pdf-attachments/Future-Airport-Ground-Access-Report_0.pdf
[84] https://www.flylax.com/lax-traffic-and-ground-transportation
[85] https://www.flylax.com/lax-traffic-and-ground-transportation
[86] https://www.flysfo.com/to-from/parking/kiss-and-fly
[87] https://www.vilnius-airport.lt/en/before-the-flight/car-parking/kiss-fly
[88] https://www.ana.pt/en/lis/access-parking/getting-to-and-from-the-airport/kiss-fly
[89] https://www.jfkairport.com/to-from-airport/pickup-and-dropoff
[90] https://www.jfkairport.com/to-from-airport/pickup-and-dropoff

vehicles to move directly onto surface streets and avoid traffic in the central terminal area. This would greatly reduce traffic congestion and allow faster, easier access to and from the terminal.

8.3 Rematch

Rematch is an airport matching algorithm that lets ridesourcing drivers make a pick-up at the airport immediately after a drop-off without going to the designated staging lot queue.[91] The use of rematch allows a single vehicle to service two separate passengers more efficiently than if the vehicle travelled back to the staging lot. A 2019 Rutgers University report suggests that larger airports use rematch to eliminate trips to the staging lot, limit the number of vehicles servicing passengers, and reduce deadheading, all of which eases curbside congestion and reduces carbon emissions.[92]

According to a whitepaper from CoMotion, The Rideshare Guy, and NewCities, after implementing rematch at Seattle-Tacoma (SEA) International Airport, the number of "deadhead" trips decreased by 48%, and passenger waiting time fell by almost 38 percent.[93] Prior to the implementation of LAX-it, over 65% of Lyft rides from LAX used rematch.[94] Since LAX-it, the use of rematch has declined.[95] When ridesourcing services are not allowed to enable rematch, it results in increased wait time and deadhead trips for the driver, and more greenhouse gas emissions that are harmful to everyone.[96]

Ridesourcing services that use rematch can effectively halve congestion on airport roadways. The feature could be expanded to taxis to generate additional traffic congestion mitigation.

8.4 Premium Curbside Service

Making curbside PUDO service a premium option has the dual purpose of increasing airport revenues while encouraging passengers to be picked-up and/or dropped-off away from the terminal. A 2019 Rutgers University report suggests that, if terminal-adjacent loading is either not feasible or restricted due to capacity limitations, then the airport should consider restructuring the

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[91] https://www.uber.com/en-US/blog/airport-rematch/
[92] "Addressing Airport Congestion as Traffic Takes Off in the Age of Uber and Lyft", https://bloustein.rutgers.edu/wp-content/uploads/2019/07/Addressing-Airport-Congestion-as-Traffic-Takes-Off-in-the-Age-of-Uber-and-Lyft.pdf
[93] Harry Campbell and Blair Schlecter, "Congestion at the Curb: An Analysis of Ride-Hailing at LAX and Recommendations to Optimize the TNC System at Airports" (January 2020), https://comotionnews.com/wp-content/uploads/2020/01/Congestion-at-the-curb.pdf
[94] *Id.*
[95] *Id.*
[96] https://www.businesstravelnews.com/Transportation/Ground/Scrambling-for-Solutions-As-Airport-Curbside-Congestion-Reaches-Critical-Mass

pricing scheme to allow curbside PUDO for a higher price, which will allow for convenience and incentive use of the non-curbside facility.[97]

According to the Rutgers report, "[r]estructuring the pricing scheme to allow for curbside drop-off and pick-up at an increased price allows airline passengers to opt for a shorter journey but enables airports to control TNC-based traffic by encouraging passengers to opt for the non-curbside option."[98] Notably, such a scheme would address potential passenger complaints about relocating PUDO locations away from terminals because the option would be there for those willing to pay for it. "If the price differential is sufficient enough to cause behavior change, without significantly impacting traffic," airport management could also see an increase in revenue.[99] With premium curbside service, passengers would have a choice of access points, and airport management could maintain congestion levels and increase revenue to fund operations and future capital improvement projects.

An example of premium pricing is at LAX. The airport charges a $4 fee for each PUDO by a standard ridesourcing vehicle, which are required to pick-up at a remote site (LAX-it). Limousines, which are allowed to pick-up at the Terminal curb, pay a $5 fee.[100]

SFO launched a limited curb pricing pilot in March 2019 to test if a $3 discount would be effective at diverting ridesourcing pick-ups to Level 5 of the parking garage ("L5").[101] Pick-ups at the terminal curb were charged a $5 fee, while pick-ups at L5 were charged just $2. SFO's goal was to divert approximately 45% of all ridesourcing service trips away from the curb to the garage. SFO estimated this was the number of ridesourcing trips it needed to divert in order to improve congestion along the terminal curbs. Shared rides, which were also relocated to L5, represented roughly 14% of trips at the start of the pilot. Therefore, the pilot needed to show it could shift another 30% of standard ridesourcing trips. At the end of the SFO pilot, the $3 discount ultimately diverted almost 10% of standard ridesourcing trips in the first month before tapering off.[102]

While the SFO pilot failed to achieve the airport's desired goal, it succeeded in showing that a modest $3 discount can incentivize 10% of ridesourcing customers to opt for a pick-up location away from the terminal curbside. A larger discount over a longer time period could yield higher diversion rates.

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[97] Shannon Eibert, Ian Girardeau, and Jaime Phillips, "Addressing Airport Congestion as Traffic Takes Off in the Age of Uber and Lyft" (April 2019), 13–14, https://bloustein.rutgers.edu/wp-content/uploads/2019/07/Addressing-Airport-Congestion-as-Traffic-Takes-Off-in-the-Age-of-Uber-and-Lyft.pdf
[98] *Id.* at 15.
[99] *Id.*
[100] https://www.lawa.org/-/media/lawa-web/group-and--division/files/accessfees.ashx
[101] https://medium.com/sharing-the-ride-with-lyft/solving-airport-congestion-through-curb-pricing-62fb91e13751
[102] SFO stopped the pilot after three months and moved all ridesourcing pickup operations to L5. https://medium.com/sharing-the-ride-with-lyft/solving-airport-congestion-through-curb-pricing-62fb91e13751

A criticism of a premium service fee is that it is inequitable, and it encourages single passenger vehicles, which is not environmentally friendly, and it contributes to traffic congestion.[103] Nonetheless, it creates an opportunity to institute a pricing scheme to tax curbside pick-ups more than pick-ups at a remote site like LAX-it. Passengers wanting to be picked up curbside could do so, but at a premium.

8.5 During Construction Phases of Redevelopment

8.5.1 Perform Work Overnight

One of the challenges that airports face is how to conduct construction projects without disrupting normal operations and compromising safety. One possible solution is to do construction at night, when there are fewer flights and passengers. This can have several benefits for airports. With respect to ground transportation, these benefits include: reducing the risk of accidents and incidents involving vehicles, workers, and pedestrians on the roadway; minimizing the need for roadway closures; and, increasing the efficiency and productivity of construction work, so that workers can have more space and access to the project site.

Several airport redevelopment projects have used the downtime when airports are without traffic overnight to diminish interference with airport operations. For example, LaGuardia Airport relied on overnight shifts to complete more disruptive construction tasks, such as utility or water main work, during the five hours that the airport was without traffic.[104] They also used the overnight window to transport construction materials to minimize the impact on connecting roadways.

According to *Airport Improvement Magazine*, to keep traffic flowing during redevelopment construction at Tampa International Airport (TPA), the airport's managers used "innovative phasing plans to keep access open to the existing roadways, curbs and the terminal all through construction."[105] To minimize disruptions, TPA completed some work at night, such as splicing and merging new roadways into existing roadways and building bridges over active roadways. When Washington Dulles International Airport (IAD) created the new ridesourcing-only curb, most work was performed at night to avoid the heaviest traffic.[106]

However, doing construction at night also has some drawbacks, such as raising the safety and security concerns for workers, especially in areas with poor lighting or limited access, and

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[103] Harry Campbell and Blair Schlecter, "Congestion at the Curb: An Analysis of Ride-Hailing at LAX and Recommendations to Optimize the TNC System at Airports" (January 2020), https://comotionnews.com/wp-content/uploads/2020/01/Congestion-at-the-curb.pdf

[104] https://airportimprovement.com/article/laguardia-opens-new-concourse-terminal-b

[105] https://airportimprovement.com/article/express-curbsides-tampa-int-l-will-allow-millions-passengers-bypass-ticketingbaggage-lobby

[106] https://airportimprovement.com/article/dulles-int-l-adds-separate-pickup-area-tnc-traffic

requiring more coordination and planning among airport stakeholders, such as airlines, vendors, authorities, emergency responders, and general aviation representatives. Therefore, airports should consult with all relevant parties to develop a construction safety and phasing plan that attempts to address each party's needs and goals.

8.5.2 Communication & Stakeholder Management

With respect to ground transportation, airports should maintain clear and frequent communication with all stakeholders—operators, drivers, passengers, airport personnel, and airlines—regarding impacts on operations and changes to PUDO locations, processes, and/or procedures. It is imperative to identify all impacted stakeholders early in the process and to provide them an opportunity to participate and remain informed. Oftentimes, stakeholders within the airport organization are overlooked, such as finance, IT, building and maintenance groups. Early and continual collaboration prevents airports and industry stakeholders from making incorrect assumptions about each other's operations. Bringing stakeholders onboard later in the process can be difficult.

Prior to construction, airports should apprise stakeholders of the expected phases of construction and impacts on them. For example, ground transportation operators should be made aware of estimated dates of construction phases and the changes during such phases. Changes should be communicated with as much advance notice as possible to allow operators to plan and adapt their operations. Including, for example, to adjust geo-fences when designated waiting or pick-up areas are relocated.

Changes in PUDO locations and/or procedures should be communicated to drivers and passengers before they arrive at the airport. Intuitive directional messaging through wayfinding signage and technology can guide arriving passengers to their designated pick-up location easily and quickly. Wayfinding aides on airport roadways and technology (such as via a driver app) can help direct drivers through construction activity to holding lots and pick-up locations. This creates a more pleasant experience for travelers and drivers. If budgets allow, airport operators should consider using digital (variable messaging) roadway signage, which is more nimble than static signage by providing real-time updates.

During the curbside overhaul to create multi-level express curbsides at Tampa's TPA, the airport implemented a public outreach campaign to advise passengers and stakeholders on each stage of construction. TPA also installed extensive wayfinding and signage on the airport roadways to warn drivers and direct them through construction activity.[107] The process of planning, designing and building the new rental car facility at Cincinnati/Northern Kentucky

[107] https://airportimprovement.com/article/express-curbsides-tampa-int-l-will-allow-millions-passengers-bypass-ticketingbaggage-lobby

International Airport (CVG) brought stakeholders together early and often. There was a lot of collaboration geared toward creating options for stakeholders.

Because the regulatory structure for taxis, limousines, ridesourcing, and buses/shuttles is so complicated, the Port Authority brought in consultants to provide peer and expert review regarding landside commercial ground transportation operations. The author of this report was engaged by a subcontractor to assist with managing stakeholder input when it relocated curbside pick-ups for limousines and ridesourcing vehicles during the LaGuardia Airport Redevelopment Program in 2017. The scope of the author's work included facilitating meetings with the industry and industry groups, it also included naming conventions and messaging for wayfinding signs. Stakeholders were separated into different groups based on mode of transportation (*e.g.*, limousine, black car, rideshare, livery) and role (*e.g.*, driver, operator)—and given an opportunity to provide early input on the planned relocation of pick-up areas and discuss the impact on the operations of their specific business sector.

These services have different customer bases with different needs. On the one hand, limousines and black cars are typically used by individuals who want to travel in style and comfort, and who are willing to pay a premium price for a luxury service. Limousine and black car customers often desire personalized meet and greet service inside the airport. On the other hand, taxis and ridesourcing services are more common among tourists or people who need a convenient way to get to and from the airport, and they usually cost less than limousines. Because taxis can be hired from a taxi stand, they are also more convenient for tourists who do not have the necessary app to use ridesourcing at a particular airport. For these reasons, it is highly recommended that specialists be hired to help manage these stakeholders, in the same manner that was done at LaGuardia Airport and LAX, to ensure that communication and input is obtained.

9 Carbon Footprint Analysis of PMVs at JFK Airport

To determine the amount of pollution caused by PMVs at JFK Airport, it will require data from environmental sensors at the Airport. Currently, open data sources have not been identified. In particular, data related to the amount of pollution by Terminal (eight Terminals) and level (two levels).

To determine any efficiencies that may be realized by increasing ridesourcing, limousines, and taxis, while decreasing PMV PUDO, will require a Transportation Model to be constructed to capture the effect of PMVs compared to taxis and other for-hire vehicles. This would require traffic counts, vehicle classification, and a speed study for operations to calibrate the Transportation Model. A Travel Demand Model will contribute with a baseline to capture levels of service during a certain time of day. The proliferation and increase of for-hire modes, and also the commitments by the industry to convert to EVs, could be quantified with a Transportation Model.

10 Recommendations for the JFK Redevelopment Project Based on Best and/or Recommended Practices

Curb space allocation is critical to managing ground transportation traffic at JFK Airport. Various services will be competing to access arriving passengers at the front of the terminals, such as buses, public transit, taxis, limousines, ridesourcing, and PMVs. Space is limited! By 2030, the number of passengers at JFK Airport is expected to grow by nearly one-third to over 75 million passengers.

To accommodate the expected growth, while creating a plan for the redevelopment of JFK Airport, officials should leverage curb space to reduce congestion during redevelopment construction. When possible, all modes of commercial ground transportation should be staged along the curb adjacent to the terminal where passengers expect to find them. To alleviate congestion, the airport should encourage express matching or rematch for ridesourcing services and taxis.[108]

To realize congestion mitigation benefits of a central intermodal transportation center, it is important to locate taxis and ridesourcing vehicles together in the Centralized Ground Terminal. If taxis are allowed to pick-up passengers at the curb, then more travelers will opt for the more convenient option than to traverse to the CGT to take a ridesourcing service. The traffic congestion reduction benefits will be lost along with any rematch benefits.

Relocating PMV PUDO away from the terminal, such as at the Kiss and Fly zone or the cell phone lot where their rides should be waiting for them, would free up terminal frontage space for revenue-generating commercial ground transportation operators. Relocating at least PMV pick-ups to a remote location away from the curb will reduce congestion at the curb and on airport roadways. A separate entrance/exit at the remote PMV location would allow personal vehicles to move directly onto surface streets and avoid traffic in the central terminal area. This would greatly reduce traffic congestion and allow faster, easier access to and from the terminal.

At JFK, the existing Kiss and Fly zone could be expanded into parts of the Long Term Parking Lot to allow for a mandatory friends and family passenger pick-up area that would alleviate PMV traffic. This, as well as using the rental car location at Federal Circle, also served by the AirTrain, may benefit from some creative thinking to propose temporary PUDO locations outside of the Central Terminal Area.

In addition, JFK Airport managers should give serious consideration to implementing entrance fees for friend/family PUDO. The fees would encourage passengers to use more efficient

[108] https://onlinepubs.trb.org/onlinepubs/webinars/210513.pdf.

modes of transportation while also generating revenue for the Airport, which could be used for the shuttle that would transport passengers to the remote lot and amenities at the lot. Rematch policies and access fees—even if used temporarily during construction—or a dynamic pricing model for access to the airport in general will change behavior and help mitigate traffic.

10.1 During Construction

The importance of communication during airport redevelopment cannot be overstated. Communication is essential for ensuring safety, efficiency, and customer satisfaction in the aviation industry. Airport redevelopment involves a complex and dynamic process of planning, designing, constructing, and operating new facilities and infrastructure. It requires coordination and collaboration among the various stakeholders. Effective communication can help to align the goals and expectations of these stakeholders, resolve conflicts and issues, and facilitate the smooth transition from the old to the new.

Throughout the process, airport operators should keep stakeholders apprised of changes that will affect them before they happen. To improve convenience for travelers, JFK Airport should also work with the taxi and for-hire vehicle industries (which includes Uber, Lyft) to expand the menu of pick-up options for travelers at designated locations, including premium pick-up location options that would also generate revenue for JFK Airport.

The author of this report worked as a sub-consultant to the Port Authority on landside ground transportation during the LaGuardia Airport Redevelopment Program. More specifically, the author was brought in to assist with helping manage operational changes when pick-ups for taxis, limousines, and ridesourcing vehicles were relocated to remote locations. The author helped identify issues and potential solutions in advance of implementation. The scope of the author's work also included facilitating the best practices for operating the limousine and ridesourcing pick-up area, such as providing recommendations regarding the layout for efficiency and personnel at the terminal frontage.

In 2023, the Port Authority began announcing operational changes for taxis, limousines, and Uber/Lyft services during JFK Airport Redevelopment construction impacting Terminals 1, 5, and 6. Due to Terminal 6 construction, in late April 2023, the Terminal 5 taxi stand was relocated to the Ground Level of the Yellow Garage. As for pre-arranged service by limousine and black car as well as Uber and Lyft, the Port Authority notified operators that it plans to move the pick-up area for arriving passengers at Terminal 5 to the Orange Garage near Terminal 7. ADA customer pick-up remains at Terminal 5 frontage. For everyone else, it will require at least a 15-minute journey via the AirTrain to Terminal 7 to reach the Orange Garage.

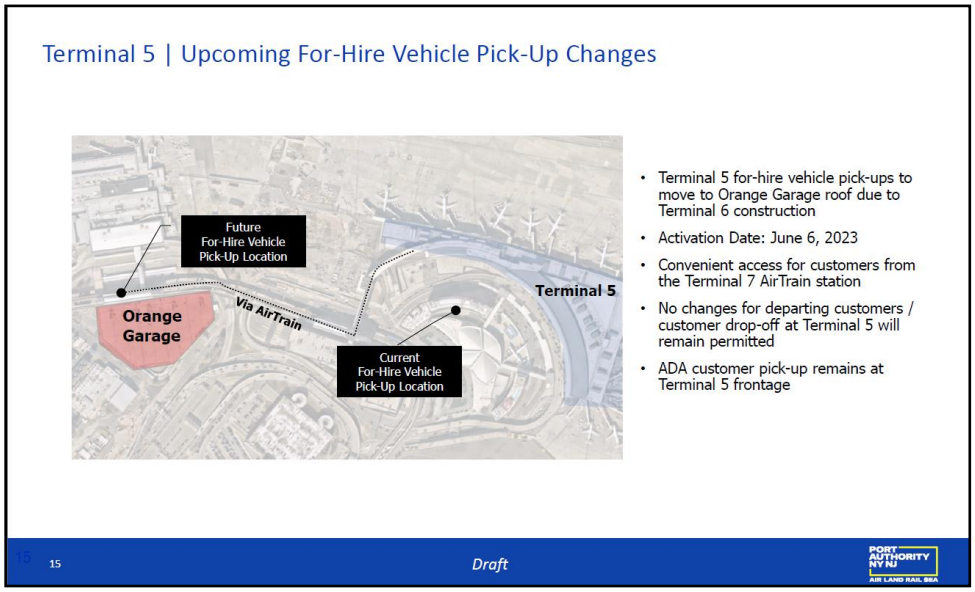

Image credit: Port Authority New York & New Jersey

At Terminal 1, rideshare and for-hire vehicle pick-ups are being relocated to a remote lot that will require a shuttle bus trip. The travel time is approximated at 15 minutes aboard the buses, which accommodate up to 35 passengers.

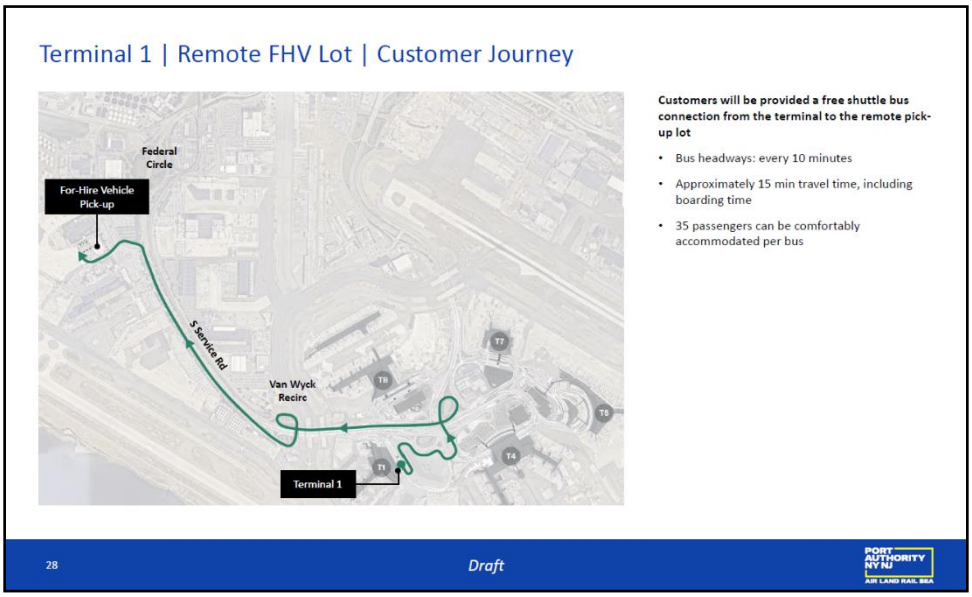

Image credit: Port Authority New York & New Jersey

The planned relocation of the limousine customer pick-up to remote locations would mean operators will be required to cease providing their customers with terminal curbside pick-up service and "meet and greet" service. Curbside pick-up service allows customers who do not need assistance with luggage to simply call the limousine service when they disembark from the plane and are ready to be picked up from the terminal. With the meet and greet service, customers are

greeted by a professional chauffeur or company representative who assists with their luggage and escorts them to a waiting limousine. Both services are fundamental to the limousine business model, and often non-negotiable for travelers who use these services.

The decision to eliminate terminal curbside pick-up and meet and greet service could have far-reaching consequences. Travelers who use luxury services could opt to use another airline to avoid the inconvenience of flying in to Terminal 5, which houses the New York-based JetBlue as well as Cape Air, and Terminal 1, which is home to numerous international airlines.[109] Limousine and black car customers are often first class and business travelers, which are a critical segment for airline profitability. These travelers pay higher fares, book more flexible tickets, and buy closer to departure. Though they represent only about 12% of all passengers on average, they can account for up to 75% of an airline's revenue on some flights.[110]

The Port Authority should consult with the airlines and reassess the need to relocate pre-arranged service to a remote location. The proposed roadway construction is not closing or altering the frontage at Terminal 5 or Terminal 1, and personal motor vehicles will still be allowed to pick-up friends and family outside baggage claim as usual. There is little reason to ban limousines from continuing their normal operations as well.

Construction and pick-up location re-assignments may have financial repercussions on the mostly minority Uber, Lyft, and taxi drivers, as well. The Port Authority should consider conducting a study on the adverse disproportionate impact on these drivers' income while planning for airport renovations that may impact landside commercial ground transportation. Comments from drivers – and possibly a survey of those drivers who endured the LaGuardia Airport renovations detailing their income losses – could be helpful in the planning process to minimize negative effects.

Staging construction will be key to addressing the need of airport access in connection with arriving passengers. To diminish interference with airport operations, more disruptive tasks should be completed during overnight shifts when there is less traffic. Temporary headhouse operations or temporary arrival halls, which accommodate baggage claim and other services, should include welcome centers to clearly and effectively communicate ground transportation options to arriving customers to expedite their departure from the airport. It is just as important to move passengers

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[109] https://www.jfkairport.com/flight/airlines. Terminal 1 serves Air China, Air France, Air New Zealand, Air Serbia, Air Senegal, Asiana Airlines, Austrian Airlines, Azores Airlines, Brussels Airlines, Cayman Airways, China Airlines, China Eastern, Eastern Airlines, EgyptAir, EVA Air, Flair Airlines, ITA Airways, Korean Air, Lufthansa, Philippine Airlines, Royal Air Maroc, Saudi Arabian Airlines, SWISS, TAP Portugal, Turkish Airlines, Viva Aerobus, and Volaris.

[110] https://www.investopedia.com/ask/answers/041315/how-much-revenue-airline-industry-comes-business-travelers-compared-leisure-travelers.asp

from the arrivals gate to their mode of transportation expeditiously to facilitate future matching and increased traffic flows. Instituting monitored waiting areas within the temporary arrival halls will also free up space on the frontage where customers can easily wait to access their pre-arranged transportation options, while staying secure inside of the building until their ride arrives.

11 Conclusion

Managing airport landside commercial ground transportation is a complex and challenging task that requires coordination among various stakeholders, such as airport operators, transportation providers, regulators, airlines, and customers. Airport landside ground transportation includes all modes of transport that connect the airport with the surrounding area, such as taxis, limousines, ridesourcing, shuttles, rental cars, and private vehicles. There is no one-size-fits-all approach. However, lessons have been learned from successes and misses at other airports, especially with respect to managing the terminal frontage space.

From experience, we have developed best and recommended practices and general policy/operational principles that airports of all sizes may implement. These principles include:

- Create separate, designated space for different modes of transportation to perform pick-ups;
- Locate ground transportation services that customers normally expect to find at an airport curbside in a visible location adjacent to or a walkable distance from the terminal;
- Make ground transportation centers "mode neutral" for taxis and ridesourcing;
- Ensure terminal curbside pick-up is available for customers with disabilities or mobility issues;
- Remote PUDO areas should be well lit, clearly marked, and grade separated, if possible;
- Consider making curbside PUDO service a premium option for a fee;
- Consider charging a fee for all vehicles to access the airport curbside for pick-ups and drop-offs, including private PMVs;
- Allow rideshare and taxi operators to use rematch; and
- Review existing contracts to ensure actions are in line with the contract terms.

Airports considering or undergoing major redevelopments should engage and collaborate with relevant stakeholders to ensure that their input and feedback are incorporated in the planning and implementation process. They should also monitor and evaluate the performance of the airport landside system and adjusting the plan as needed to respond to changing conditions and unforeseen challenges. It is also imperative that clear and consistent communication is provided to the public and the airport users about the airport redevelopment project and its impact on airport ground transportation, as well as the available alternatives and options.

By following these best practices, airport managers can ensure that airport landside ground transportation is well-managed during airport redevelopment projects and that the finished project meets the needs and expectations of the airport users and the community.

Appendix A - Peer Reviewers

The peer reviewers of this report submitted significant comments and revisions. The peer reviewers may not agree with every single recommendation in this report, but each peer reviewer has indicated support for the goals, mission, and overall recommendations of the report.

Patty Clark

CEO, Project Gestalt, Inc. (current); Principal, PCAA, a business unit of Project Gestalt, Inc. (current); Aviation Strategy Officer, The Port Authority of New York & New Jersey (prior)

Patty Clark is a 25+ year veteran of the aviation industry, having served in a senior capacity for most of her career in the Aviation Department at the Port Authority of New York & New Jersey. Through PCAA, she is continuing that career-long mission for effecting positive change within the industry to make it more efficient, accessible and affordable to all.

She started her career in public service as a 17-year-old working for U.S. Senator Daniel Patrick Moynihan. After completing her BA in Public Administration at Fordham University, she moved to the Senator's DC office, where she worked for an additional seven years. While there she worked closely with the Port Authority on several strategic initiatives, such as Homeport. She formally joined the agency in the Aviation Department a decade later.

Her first assignment was to secure the federal, state and local approvals, and more than $2 billion in funding enabling the agency to construct and now operate the JFK AirTrain. Subsequently, she held several senior positions there and became the department's first Chief Aviation Strategy Officer, where she was responsible for developing the strategy for long-term development of the Port Authority's airport system using a multi-disciplinary approach to develop, deliver and communicate timely, high-quality solutions for the most complex challenges facing airports. Additionally, she served as senior advisor to the LGA and JFK Redevelopment Programs, from conception to start of construction, utilizing her knowledge of financing, environmental regulation, strategic planning, and community engagement.

During her tenure, Patty supervised air service development, and diversifying service. A strong believer that competition benefits the traveling public, she served on the Worldwide Slot Guidelines (WSG) Strategic Review, Task Force on Access to Congested Airports and was named to the Expert Group on Slots, which evaluates proposals and makes recommendations to the international governing body.

Throughout her career she has been devoted to stimulating innovation, adding diversity and contributing to industry education to staff which helped to strengthen and retain the workforce.

At PCAA, Patty continues to work with the public and private sector clients to help improve the aviation industry. She also serves as a mentor for Women in Transportation Seminar, and helped to start and now operates the Mentorship Program at the International Association for Women in Aviation. In addition, she serves on the Board of Trustees for Vaughn College, a Hispanic-serving institution dedicated to the aeronautics and technology fields, and as a member of the Board of Directors of the Big Apple Greeter, a volunteer-led tourism organization who share their love of New York with visitors to the area.

She has been recognized for her contribution to the industry by being the recipient of several prestigious awards, including The Francis X. McKelvey Award (January 2022), which was issued by National Academy of Science, Aviation Group at the Transportation Research Board for a lifetime of dedication to and impact on the aviation industry. In 2018, she was one of ten honorees to receive the Lifetime Achievement Award issued by City & State New York/AARP to people who "have distinguished themselves by helping the city in civic affairs" in recognition of her career in civil service starting with U.S. Senator Daniel Patrick Moynihan, then work for the Port Authority of NY & NJ, including the JFK AirTrain and saving the Survivors' Stairs at the World Trade Center site. The American Planning Association, NY Metro Chapter, awarded Patty with the Andrew Haswell Green Award for Lifetime Achievement, recognizing individuals who have made outstanding contributions for a period of at least 15 years.

Patricia L. Gatling

Commissioner and Chair, New York City Human Rights Commission (2002–2015)

Patricia L. Gatling has a broad practice that focuses on transportation law, employment law and employee benefits, government relations, litigation, alternative dispute resolution, and general corporate matters. She counsels clients on matters that incorporate regulatory compliance, white collar defense and investigations, administrative law and public policy. As a member of the Transportation Practice Group at Windels Marx, Ms. Gatling applies her formidable credentials pertaining to access issues, the Americans with Disabilities Act, and state and local human rights laws on behalf of clients seeking wheelchair accessibility, compliance and regulatory strategy, and general corporate advice.

Drawing on her extensive public policy experience in the area of employment law and criminal prosecution, she advises clients on the adoption of strategic policies to avoid employment discrimination claims by reviewing overall company personnel policy and operations, developing codes of conduct and monitoring systems and conducting workplace training. She provides guidance regarding the resolution of conflicts within the organization, with city, state and foreign governments, media outlets, organized labor, community associations, and not for profit and advocacy organizations.

Ms. Gatling also provides corporate diversity counseling, advice on international employment issues, and conducts internal investigations. She can also assist clients with policies to address the challenges of globalization by providing advice to corporations and governments on the legal, political, economic, and security aspects of conducting business in foreign jurisdictions, including crisis management.

Prior to joining Windels Marx as Counsel, Ms. Gatling served as Commissioner of the New York City Human Rights Commission and Chairperson of its 15-member board (2002 to 2015), appointed by Mayor Bloomberg and serving under Mayor de Blasio. The New York City Human Rights Commission enforces the strongest anti-discrimination laws in the country, protecting numerous classes of individuals in the areas of employment, housing and public accommodations.

As the Commissioner, she managed a mayoral agency comprised of attorneys and human rights specialists with a budget of $12 million dollars. She negotiated contracts and settlements, hosted and trained international officials, conducted diversity and inclusion seminars, produced numerous publications, created public information campaigns, and directed investigative efforts. Some of her most notable investigations targeted diversity and discrimination issues in a range of industries, including:

- limited demonstrations of management diversity within the advertising industry;
- customer profiling within the retail industry, including a report entitled "Shopping While Black"; and
- lack of disability access among large housing providers within the real estate industry.

Ms. Gatling served as the Deputy Secretary for Civil Rights under New York State Governor Andrew M. Cuomo. She oversaw the operations of the Department of Civil Service, the Governor's Office of Employee Relations, the Division of Veterans Affairs, the Division of Human Rights, and the Public Employee Relations Board. Ms. Gatling was responsible for a full range of legal, policy, legislative and operational matters affecting civil / human rights and labor issues statewide.

Ms. Gatling is the former First Assistant District Attorney at the Kings County District Attorney's office (Brooklyn, New York) the third largest office in the country. There she managed the legal and administrative operations of an office comprised of 1500 law enforcement professionals. Prior to her becoming one of the top executives in the office she served in many supervisory capacities including Bureau Chief of the Major Narcotics Investigation Bureau.

Ms. Gatling was a Special Assistant Attorney General at The Office to Investigate the New York City Criminal Justice System. While there, she litigated and investigated corruption cases involving public officials, police officers, judges, and corrections officers, specializing in the prosecution of police brutality and death-in-custody cases. Ms. Gatling was a Special Narcotics Assistant Prosecutor at The Office of Special Narcotics Prosecutor Sterling Johnson, Jr. She prosecuted individuals involved in large narcotics syndicates.

Ms. Gatling worked as a Senior Trainer with John Jay College of Criminal Justice, as part of the U.S. State Department's International Law Enforcement Academy (ILEA). She taught approximately 1,000 senior law enforcement officials from over 100 countries "Human Rights, Human Dignity and the Law" in Botswana, Thailand, Hungary and the Dubai Police Academy in the United Arab Emirates. She has been a guest at law firms, U.S. companies, foreign governments and academic institutions, speaking / lecturing on issues including diversity and inclusion in employment law, disability access, the U.S. criminal justice system, human rights and security, indigenous people's rights, public health and civil rights. Ms. Gatling was co-producer of the film Fighting for Justice: New York Voices of the Civil Rights Movement. She has published articles

on criminal prosecution, diversity and inclusion and human rights and security. She also served on the New York City Charter Revision Commission.

Ms. Gatling is currently a member the International Association of Prosecutors and the National Black Prosecutors Association (President–1994). She is a member of the University of Maryland Francis King Cary School of Law Board of Visitors and the Board of Trustees for the New York Lawyer's Fund for Client Protection.

Dr. Camille Kamga

Director, University Transportation Research Center; Associate Professor of Civil Engineering, The City College of New York

Dr. Camille Kamga is an Associate Professor of Civil Engineering at the City College of New York, the flagship institution of The City University of New York (CUNY). He has been the Director of the University Transportation Research Center (UTRC) since 2012; the Acting Director of UTRC since 2009; and the Associate Director of the CUNY Institute for Urban Systems (CIUS) since 2002.

UTRC asserts a significant role in the region and nationally, conducting research and projects on surface transportation, carrying out training and educational programs, and actively disseminating the results of its work.

CIUS is a multi-campus Institute addressing infrastructure issues that incorporate new technologies, institutional forms and change and issues of financing.

Since 2010, Dr. Kamga has continued to serve in a leadership capacity as member of the Board of Directors of the Intelligent Transportation Society of New York (ITS-NY)—a professional group providing education and outreach to foster the understanding of ITS applications and technologies. He chairs the education committee of the society. Since 2011, he has been very active with the governance of the International Association of Transportation Regulators (IATR) with the responsibility to develop its educational program. He also serves in many other professional organizations and committees. He is a member of the standing committee on Urban Transportation Data and Information Systems (AED20) and was a member of the standing committee on International Cooperation (A0010). He is the chair of the Research Council for the Urban Transportation Data and Information Systems committee.

Dr. Kamga continues to actively participate in numerous transportation-related projects at UTRC. His research interests include: intelligent transportation system; modeling and traffic simulation; analysis of very large transportation networks; use of real-time information for travel; transportation modeling using mobile sensors; transportation planning and policy, transportation operations; sustainability and environment; and, transportation safety.

Dr. Kamga's research has been funded by numerous grants from the U.S. Department of Transportation; the New York State Department of Transportation; the New York Metropolitan Transportation Council; the New York State Energy and Research Development Authority; the New Jersey Department of Transportation; New York City Transit; the Port Authority of New York & New Jersey; the National Science Foundation, and the Volvo Research and Education Foundation.

Ray A. Mundy, Ph.D.

Executive Director, Airport Ground Transportation Association

Ray A. Mundy, Ph.D. is the Executive Director of the Airport Ground Transportation Association (AGTA), Professor Emeritus of the University of Tennessee, Knoxville, and Director Emeritus from the Center for Transportation Studies at the University of Missouri-St. Louis. Dr. Mundy has authored several books and numerous transportation articles during his business and academic career. He has served on the boards of both private and public transportation companies. Dr. Mundy has been a consultant to over 40 cities, airports, and private industry in the U.S. and Canada and is frequently called upon as an industry speaker and expert witness in cases before the industry.

The Airport Ground Transportation Association is an industry trade group comprised of airport ground transportation operators, airports, and suppliers of goods and services to the industry. Dr. Mundy has served as their Executive Director since 1976. Currently he authors a monthly publication, AGTA Insights, and a weekly industry summary of current articles of interest to the industry. The AGTA holds two industry meetings per year.

Brian Sadek

Counsel, Dentons (current); Principal, Sadek Legal PLLC (current); Vice President of Legal and Authority Affairs, Wayne County Airport Authority (prior)

Brian Sadek is a proven leader with two decades of experience in the government and transportation sectors.

His zeal for service emerged early. Upon turning eighteen and after one semester in college, he enlisted in the United States Army, where he served in South Carolina, Virginia, Japan, and Michigan, primarily in reserve roles, before being honorably discharged in 2005. Later, during his undergraduate studies and while in law school, he interned or worked for various governmental and legislative entities, including a Member of Parliament in the Canadian House of Commons, the Speaker of the Michigan House of Representatives, and the City of Chicago.

Building on these experiences, he began his legal career at a large law firm in Chicago, focusing on public law and finance before being hired by the Regional Transportation Authority (RTA) of Northeastern Illinois, a client, as its Deputy General Counsel. While at the RTA, he led a division with three employees and $1.2 million USD budget, providing counsel to the RTA on key projects such as the I-90 bus-on-shoulder pilot, a program for grants to local communities to study transit-oriented-development near commuter rail stations, and the RTA's 2011 Federal Transit Administration triennial review.

Brian next joined the Wayne County Airport Authority (WCAA), a two-airport system with approximately 19,000 badged employees and $350 million USD annual budget, where his work made a lasting impact on Michigan's transportation landscape, particularly at airports. At WCAA, he served as Vice President of Legal and Authority Affairs, in which role he acted as WCAA's General Counsel and oversaw the Legal, Authority Governance, and Legislative Affairs Departments. His work included securing agreements with transportation network companies (Uber/Lyft) that resulted in tens of millions of dollars of new WCAA revenue and contained new industry standards for airports; developing a food donation program which established DTW as one of the largest food donors in southeastern Michigan; and drafting and implementing a new Airport Ordinance, new Ground Transportation Regulations, and a new Procurement and Contracting Ordinance. He also obtained important legislative wins, including a WCAA-specific

exemption from statewide preemption of local transportation network company regulation; a first-of-its-kind extension of airport police jurisdiction in response to UAV incursions; and a WCAA-specific carve-out from a statewide civil forfeiture ban.

Brian remains active in his community, having served as a member and the inaugural Chair of the Michigan Regional Transit Authority's Citizens Advisory Committee; a member of the Board of Trustees of the Detroit Historical Society; and a member-owner of Motor City NYE, a public New Year's Eve celebration in the heart of Downtown Detroit.

He earned his BA in Political Science from the University of Michigan, a JD from Northwestern University School of Law, and an MLA in Management from Harvard University (Extension), where he earned Certificates in both Strategic Management and Entrepreneurship and Innovation.

Carlton Thomas

Board Chair, International Association of Transportation Regulators (current);
Airport Landside Access Manager, City of Austin Aviation Department (prior)

Carlton Thomas started his career in the Transportation field in 1988 with the City of Baton Rouge (La.) Public Works Department. After working nearly 20 years with the Austin Transportation Department, he ultimately landed with the City of Austin's Aviation Department as the Airport Landside Access Manager. Carlton's experience includes development, management, and administration of regulatory enforcement and parking programs and program development with the Austin-Bergstrom International Airport's Landside Operations group.

In 2014, Carlton was named IATR's Regulator of the Year for outstanding service and commitment to his city and the industry and he is currently the Board Chair of the IATR Board of Directors.

Carlton is a veteran of the United States Army who studied Civil Engineering at Louisiana State University, and Business Administration at Huston-Tillotson University in Austin, Texas.

After 33 years of public service Carlton made the decision to retire, and now he spends his time with his family, especially his four grandsons, traveling, and making TikToks.

Vincent Vesce

Principal and CEO, V Squared Strategies, LLC (current); Senior Manager – Airport Access Programs, The Port Authority of New York and New Jersey (prior)

Vincent Vesce has been the Principal and Chief Executive Officer of V Squared Strategies, LLC since 2012, a multi-faceted business development and consulting firm based out of New York that has a major focus in the Aviation and Transportation industry. He has more than 25 years of experience in the industry, having spent most of his career at The Port Authority of New York and New Jersey managing the airport operations at all five PANYNJ airports. Vincent currently serves as an advisor in the review of industry best and/or recommended practices and operational efficiencies for many airports and business entities, nationally.

V Squared Strategies is well known in the industry for providing service to those in need of a thorough understanding of government contract administration, airport redevelopment projects, inter-modal transportation programs and infrastructure, parking management, airport access, and operations.

As V Squared Strategies has developed over the last 10 years, they have been retained by numerous clients/companies on the business development front, as an advisor on operational and technical matters, as well as in a public relations capacity. This type of work requires that Vincent not only manage and meet with customers related to the work being performed on behalf of his clients but is also consistently meeting with prospective new clients in an effort to further develop his business portfolio.

The companies that V Squared Strategies service have a national presence in the industry, periodically requiring representation in relation to the work performed as part of the airport management contracts that his clients hold. The larger clients will hold contracts in the New York market, as well as major hub cities throughout the U.S and Europe. V Squared Strategies has developed a team of industry experts to accommodate those needs wherever they may be throughout the United States and abroad.

V Squared Strategies will also be retained as part of a team of companies that work on project specific developments, which from time to time requires subcontractors to aid in support of the performance of a particular project.

Christopher O. Ward

Executive Vice President of Business Development, BRAVO (current); Executive Director, Port Authority of New York and New Jersey (2008–2011); Commissioner, New York City Department of Environmental Protection (2002–2005)

Christopher O. Ward currently serves as Executive Vice President of Business Development for BRAVO, a Cooperative Company. During his years in the private sector, Christopher was the executive vice president and chief executive of a $17.4 billion infrastructure and support services firm in New York City where his areas of responsibility included transportation, water and wastewater, environment, power, and buildings and places. Christopher also served as executive vice president for both major projects and business development for two national companies.

His more than 30 years of infrastructure and government experience include a successful tenure as executive director of the Port Authority of New York and New Jersey from 2008 to 2011. There, he led the World Trade Center rebuilding effort to deliver on a commitment to open the 9/11 Memorial by the 10th anniversary of the tragic events at that site. He was also president of the Port Authority's wholly owned entities: Port Authority Trans-Hudson Corporation, the Newark Legal and Communications Center Urban Renewal Corporation, and the New York and New Jersey Railroad Corporation. His previous positions at the Port Authority included chief of planning and external affairs as well as director of port redevelopment.

Earlier in his career, Christopher spent much of his professional career with the City of New York in various capacities, including as senior vice president for transportation and commerce at the Economic Development Corporation, assistant commissioner of the Department of Telecommunications and Energy, director of research at the Department of Consumer Affairs, and Commissioner of the New York City Department of Environmental Protection.

In the private sector, Christopher was an executive vice president for the metro area at AECOM, executive vice president of Dragados USA, chief executive officer of American Stevedoring, and managing director of the General Contractors Association of New York, Inc.