Toward Improving the Understanding of Traffic Network Effects of Commercial Airports

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San Luis Obispo

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Overview

- Goal
- History
- Travel Demand Modeling
- Trip Generation
- Mode Splits
- Employee Characteristics
- Trip Duration and Frequency
- Conclusions and Recommendations
The Goal

- Understand current travel demand modeling
- Compare existing methodology to actual values
- Explore notable characteristics of airports and their employees
History – The Beginning

- Many modern airports were first established between 1920 and 1940
- The DLAND in 1940 created many more
- Most were turned over to civilian uses after the war
- Air travel was initially restricted to the wealthy
History – 1978 to Now

- Aviation industry was deregulated in 1978
- Air travel exploded as the market became competitive
- Many airports lost service while others began developing into massive hubs
Current Conditions

Try to cope and add lanes as airports expand.
Travel Demand Modeling

- Many Metropolitan Planning Organizations don’t apply it for airports
- Of 47 MPOs surveyed, 23 responded
- Fifteen used a special sub generator for airport passengers
- Five used home based non work trips
- Five used non home based non work trips
Employee Modeling

- Six used a special sub generator for airport employees
- Twelve treated airport employees as typical journey to work trips
- Three modeled airport passengers but not employees
- Four modeled airport employees but not passengers
Regional modeling often uses as single TAZ when actual trips end in multiple dispersed locations.
ITE Trip Generation Manual

### Commercial Airport (021)

Average Vehicle Trip Ends vs: Employees  On a: Weekday

Number of Studies: 3  
Avg. Number of Employees: 2,649  
Directional Distribution: 50% entering, 50% exiting

<table>
<thead>
<tr>
<th>Trip Generation per Employee</th>
<th>Range of Rates</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Rate</td>
<td>10.28 - 22.94</td>
<td>5.06</td>
</tr>
</tbody>
</table>

Data Plot and Equation

Caution - Use Carefully - Small Sample Size

Manual has outdated and limited data.
<table>
<thead>
<tr>
<th>Other Agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Michigan State</strong></td>
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<tr>
<td><strong>Florida DOT</strong></td>
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<tr>
<td><strong>NACTO</strong></td>
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<tr>
<td><strong>San Diego</strong></td>
</tr>
</tbody>
</table>
Data from 20 airports with 44 million to 1.5 million annual passengers.

<table>
<thead>
<tr>
<th>Airport</th>
<th>Passengers</th>
<th>Operations</th>
<th>Employees</th>
<th>Reported Vehicle Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Las Vegas</td>
<td>43,989,912</td>
<td>605,046</td>
<td>12,000</td>
<td>13,067,000</td>
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<tr>
<td>Denver</td>
<td>43,387,513</td>
<td>560,669</td>
<td>30,000</td>
<td>12,410,000</td>
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<td>Phoenix</td>
<td>41,204,071</td>
<td>555,256</td>
<td>31,437</td>
<td>21,316,000</td>
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<tr>
<td>Minneapolis</td>
<td>36,678,868</td>
<td>532,240</td>
<td>5,273</td>
<td>2,920,000</td>
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<tr>
<td>Detroit</td>
<td>36,402,710</td>
<td>521,899</td>
<td>18,000</td>
<td>10,090,790</td>
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<tr>
<td>Miami</td>
<td>31,008,453</td>
<td>381,610</td>
<td>11,357</td>
<td>35,952,500</td>
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<tr>
<td>Seattle Tacoma</td>
<td>29,289,026</td>
<td>341,762</td>
<td>6,939</td>
<td>19,346,460</td>
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</tbody>
</table>
Results

Reported and Model Estimated Vehicle Trips

- Reported
- ITE - Employee
- ITE - Flights
- Michigan State
- Florida DOT
- NACTO
- San Diego

Airport
Selected Results

Reported and Model Estimated Vehicle Trips
Airport Mode Share
Transit Friendliness - US

The top transit oriented airports in the US are still overwhelmingly accessed by autos.
Rail transit is less prevalent for the airports with lower transit shares.
World airports all feature rail connections and significantly higher transit access percentages.
Case Study - New York City Area Airports

### Transit Share at New York City Airports

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<tr>
<th>Year</th>
<th>JFK</th>
<th>Newark</th>
<th>LaGuardia</th>
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<td>2014</td>
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Case Study - Seattle-Tacoma International Airport

Ground access served by road, rail, and transit.
Transit Map
Numbers and Mode Split

Metro Buses
- Route 180
- A Line
- Route 156

Regional
- Route 560
- Route 574

Light Rail
- Link

Mode Split at SeaTac Airport
Employee Characteristics

● Employees are always present as airports are 24 hour, 7 day a week activity hubs
● Shifts often start very early or in the mid afternoon
● Employee parking is often offsite or employees park on local streets
● Employees use transit, particularly buses, more than passengers as employers often provide discounted transit cards
Some hub airports have more daily employees than air travelers from the city.
Trip Duration

- Vehicle trips to airports tend to be either very short or very long
- Pick-up and drop-off trips are typically under a few minutes
- Parked vehicles stay for several days
Pick-up and drop-off trips create more than one auto trip for every air passenger on average.
Uber and Lyft

- With the rise of car sharing auto trips become a more convenient access mode
- Regulations regarding no airport pick ups could exacerbate the issue
- Uber and Lyft drivers often circle through access roads creating congestion
Conclusions

- Airport travel demand modeling is simplified and underutilized
- Trip generation estimates for airports are typically inaccurate by huge margins
- US airports have low transit access overall
- Airport employees work at unusual times, park away offsite, and can be more numerous than passengers
- Pick-up and drop-off trips cause significant number of airport access trips
Questions?
Acknowledgements

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Thanks to Dr. Anurag Pande for editing.
References

- https://upload.wikimedia.org/wikipedia/commons/1/1d/LAN_Airport_-_East_Circle_Dr_-_Arrivals_Departures_Parking_Sign.jpg