



Airport Management & Planning Team

Boarding Pass Redesign

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Introduction

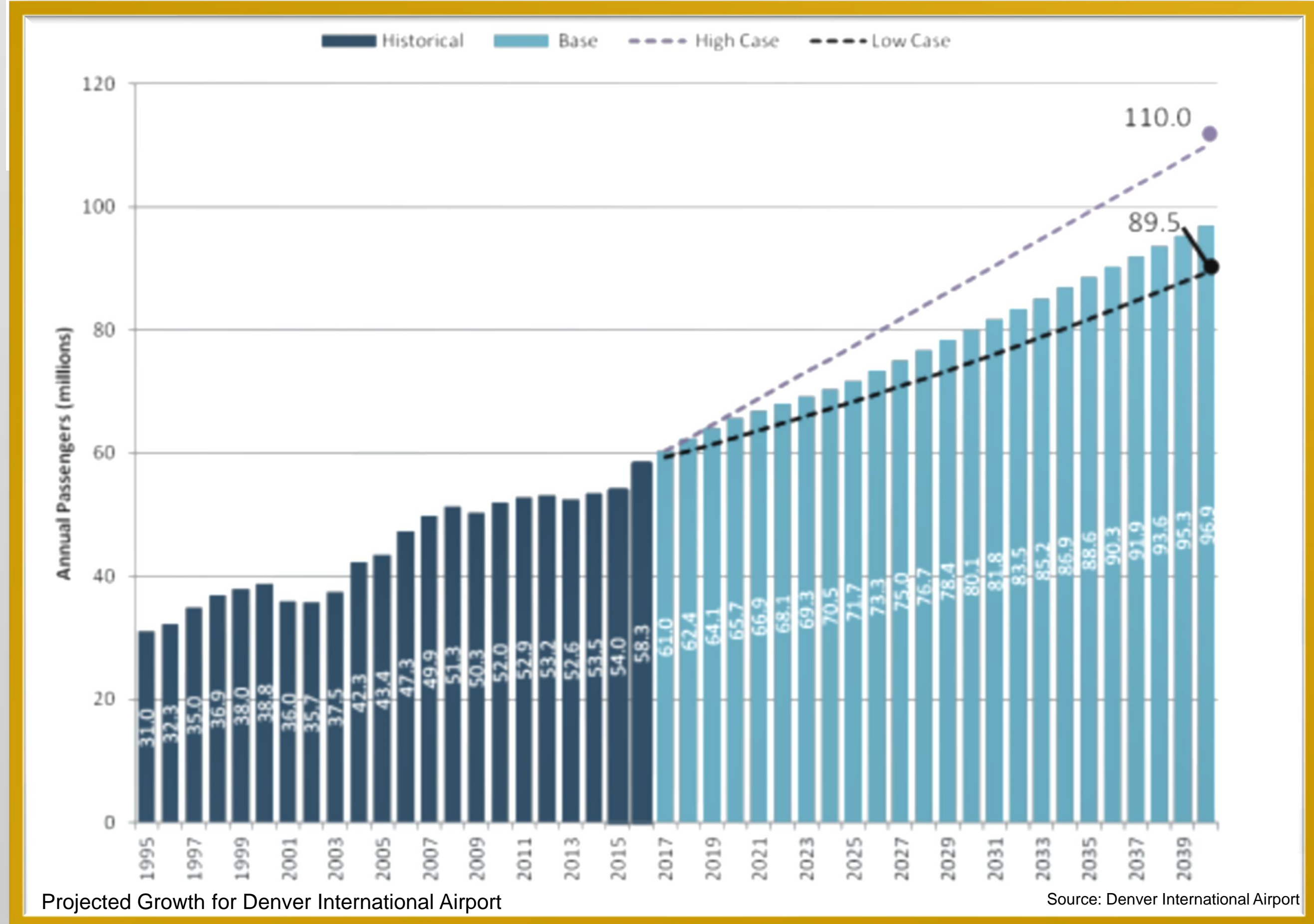
The Built World Enterprise is a student run organization at Michigan Technological University. The Airport Management and Planning Team (AMP) works within the enterprise to compete in the Airport Cooperative Research Program for Addressing Airport Needs (ACRP).

The ACRP is designed to engage students from across the country in addressing challenges faced by modern airports. Challenge areas are separated into several broad categories, one being Airport Management and Planning. The AMP team is addressing the challenge of increased ground congestion within airports; specifically looking at causes of congestion related to passengers arriving and departing the airport.

Background

Design Challenge

The challenge is to design a sustainable and economically feasible solution to alleviate traffic congestion, whether from ground transport or movement of passengers, at major airports around the world. This is especially important as the commercial aviation industry continues to grow annually, creating more demand for air travel, and the need for airports to be able to accommodate more passengers efficiently. Congestion is a challenge for the passenger because it can cause delays and result in a stressful environment.



Literature Review

The main factors of congestion are curbside space, dwell times, navigation/terminal layout, signage, check-in and baggage services. As the demand for air traffic continues to increase, airport facilities for these are strained to handle the number of passengers.

Specific topics researched in-depth include:

- Curbsides
- Baggage Facilities
- Satellite Terminals
- Automated People Movers (APMs)
- Consolidated Rental Car Facilities (CONRACs)
- Autonomous Vehicles

Materials and Methods

Interaction with Professionals

William Sproule, Professor Emeritus who specializes in research of transportation planning and design, was the team's main contact for information on congestion issues at airports. According to him, some of the most prominent issues are the operations and management of ridesharing services at airports, as well as lack of physical curbside space leading to traffic congestion. Dr. Sproule also mentioned the pros and cons of "cell phone lots" at airports, which give drivers waiting to pick up passengers a separate waiting area to prevent them from idling at the curbside and blocking space; however, this is only a limited solution for private cars and does not help congestion from other modes of transport used at the airport. The team also spoke with Dennis Hext, manager of the Houghton County Memorial Airport, who shared that the greatest challenge with implementing new systems at an airport is making sure passengers feel that their experience was improved, and that there is always a learning curve involved with such an implementation

Proposed Solutions: Advantages/Disadvantages

Solution	Benefits	Challenges
Automated People Mover (APM) System		
Tram or light rail system to transport passengers between airport terminals or various parts of the airport.	If used at the curbside as well, it would alleviate traffic congestion and separate off various modes of transport.	However it has a high upfront cost for construction and implementation of the system, as well as developments to existing airport infrastructure which is vastly different depending on the airport and may not always be feasible.
Autonomous Vehicles (AV)		
Restrict passenger-driven vehicles at the curbside and elsewhere on airport premises where congestion is an issue, and only allow automated ones.	Innovative and practical potential; vehicles can communicate with each other and the rider can significantly cut down on vehicle traffic congestion at airport curbsides. Ridesharing companies such as Uber and Lyft which have a presence at airports, could also benefit from using these.	However, there are many setbacks such as the very limited research and development into autonomous vehicles at present, as well as high cost and risk of implementation and maintenance of autonomous fleets.
Offsite Transportation Centers (OTCs)		
Relocate operations such as rental car facilities, and central hubs for transport in and out of the airport, to a separate facility away from the main terminal and shuttle passengers between the airport and new facility with a tram or bus system. A few airports are using such an approach, such as Tampa International Airport which has a dedicated Consolidated Rental Car facility (CONRAC).	Would move a lot of the congestion away from the curbsides at the airport terminal and spread it out overall to allow for better organization of traffic going in and out of the airport facilities. It would also consolidate rental cars and transportation facilities to a single location rather than having each operator in a different part of the airport.	However, it is expensive and not always feasible to construct new infrastructure, especially at airports located in heavily urbanized areas where there is already a space constraint. It would also be expensive and time-consuming to get passengers and airport staff used to the new infrastructure, and be able to navigate it.

Key Factors & Considerations

Drawbacks of the previous solutions lead to readdressing the problem on a specific area. Specifically on congestion caused by passengers moving through the airport, as curbside changes would alter this pattern. The team decided that the most economically and physically feasible idea would be to redesign boarding passes. This solution is something that can be standardized to almost any airport in the world, and has more innovative potential compared to the previous ideas as it has not yet been implemented in practice. Currently, standard boarding passes tend to be primarily a tool for airlines to organize operations. They are not a user-friendly method of telling passengers crucial details about their flight such as boarding, gate location, time changes, etc. A major cause of delays and passenger congestion in airport stems from confusion over these boarding passes.



Example of a Traditional Pass

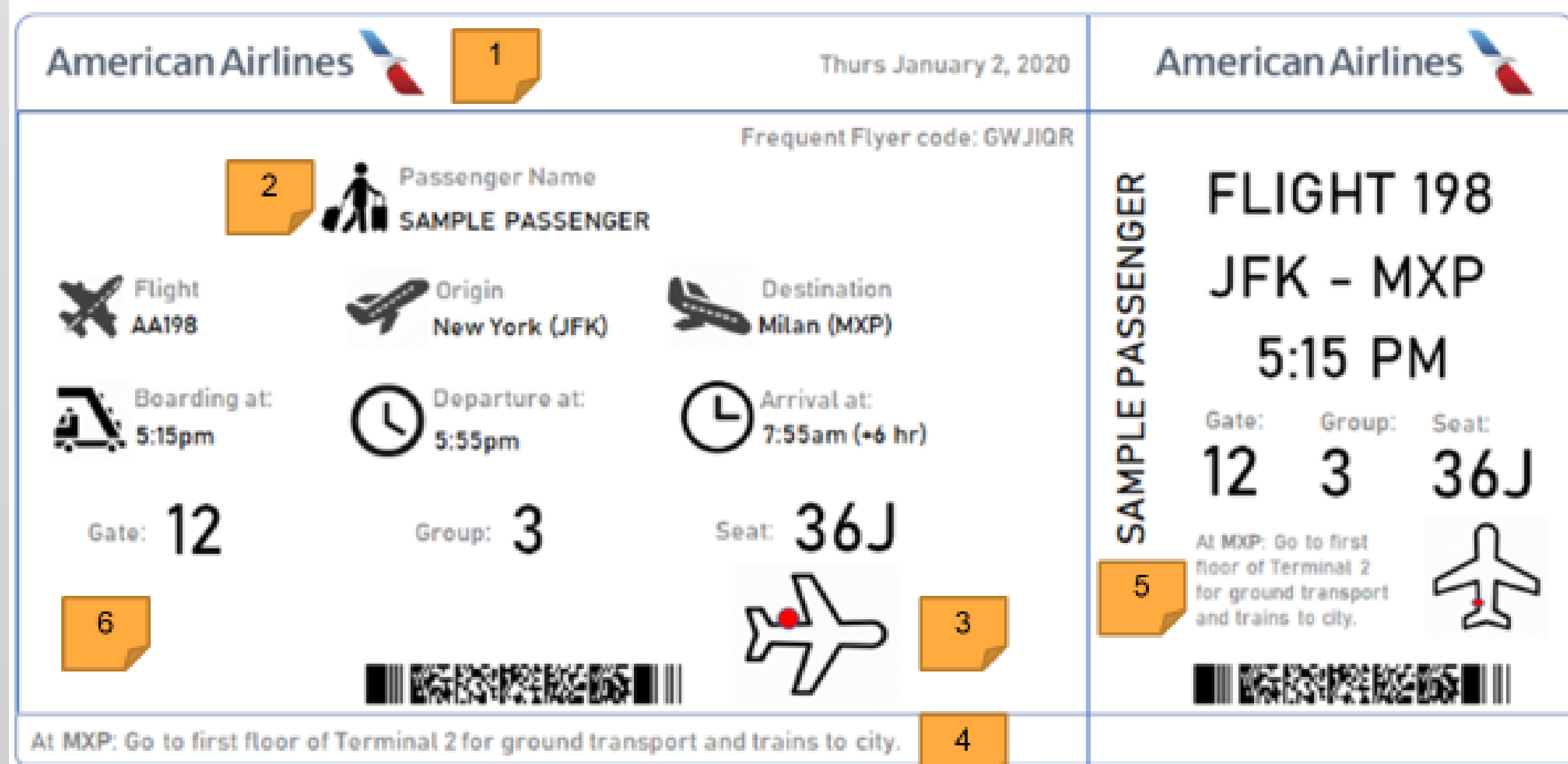
Final Design

After considering both curbside and pedestrian congestion the solution chosen was a redesigned boarding pass. The standard format of a boarding pass was redesigned to create a more minimalist presentation that would make it easier for passengers to find crucial information at a glance and eliminate congestion and delay associated with miscommunication.

The goals associated with redesigning the pass are:

- Clearly communicate vital information
- To function across language barriers
- Coordinate with signage

Outcomes desired include reduced congestion by preventing missed flights, reducing challenges with locating gates or other locations, and provide alternate resources to find information (ie. QR Codes)



- 1 - Clean, minimalist design to quickly find information
- 2 - Simple icons to avoid language barrier issues
- 3 - Rough map of aircraft to show where passenger's gate and seat are
- 4 - Information for public transit, etc. at final destination
- 5 - Space for QR code to access more information

Ideal implementation

In recent years, many airlines have begun phasing out paper boarding passes and replacing them with mobile ones instead, which has led to the electronic versions becoming more common. This solution was designed with the physical passes in mind, although the redesign can easily be applied to mobile versions as well.

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Discussion

The decision to focus on improving communication was based on the insight that the success of any new methods implemented to reduce congestion will depend on positive reception by the users (aka passengers). Offsite Transportation Centers, which were considered as a solution, are a good example of this. Although they may reduce congestion at the curbside, there would be a learning curve and sense of the confusion for the user. Redesigning the boarding passes to be more user friendly results in a more communication to the user.

Safety Analysis

Safety is top priority for all operations within airports. As such a safety analysis is required for any new project. In the case of boarding pass revisions physical hazards are virtually non-existent. Concerns are based on communication errors resulting in things like missed flights as opposed to injuries. As can be seen in the matrix below:

Hazard	Likelihood	Consequence	Risk
Confusion with New Graphics	D	C	Medium
Misinterpretation of New Graphics	D	C	Medium
Improved Pass is not Helpful	C	B	Low Med
Lose Pass	C	C	Medium
Passengers Complain about Design	C	B	Low Med

Cost Analysis

The greatest setback to redesigning boarding passes would be the up-front cost of redesigning boarding pass distribution systems in order to print, read, and share the appropriate information, as well as the initial design process to create the new graphics and layout. Up-front costs include:

- Graphic Design
- System Configuration
- Staff Education
- Data collection & Link/Digital Mapping
- Possible Signage Updates

The greatest cost advantage is that the cost associated with boarding passes would not increase after the initial transition.

Future Testing

Testing the concept of a redesigned boarding pass would be a low risk project, since it would not directly impact the function of an airport. Some options to gather user input, both from an airline perspective and a passenger perspective would include:

- Passenger Survey
- Airport Employee Survey
- Trail passes at a single airport

Tests would be relatively simple and depend largely on user feedback.

Conclusions

The redesigned boarding pass is a single solution to a the multifaceted problem of congestion.

The pass does not necessarily represent a unique solution on its own. The purpose is to develop a method to more clearly communicate instructions to passengers; Ideally in a way that can be implemented for other options like OTCs or APMs. Systems that would generally confuse first time passengers. If updating the boarding passes proved effective to improve passenger understanding of a familiar airport operation, they could be implemented in the future as a way to facilitate education of a new operation.