up in the air

up in the air

Redesigning the Passenger Experience in the Context of Commercial Aviation:
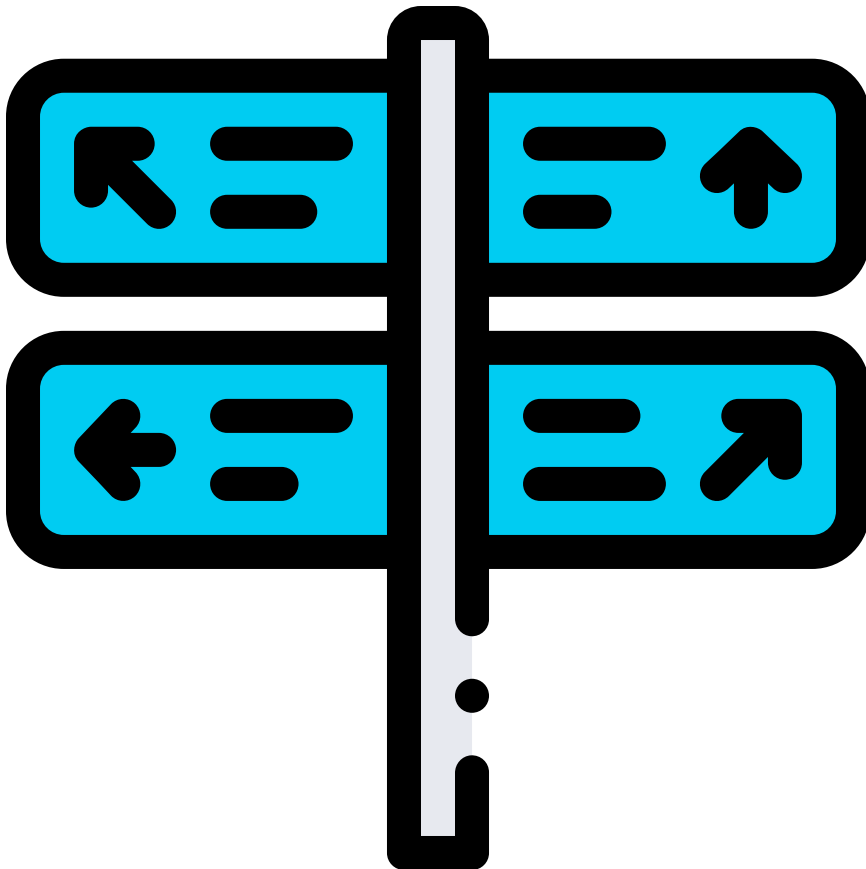# Door to Door

An architectural research project submitted to the Department of Architecture and Landscape Architecture.

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Contents

Introduction

Flight has long captured the fascination of man. Offering an escape from the grasp of gravity, creating new perspectives of the world, and providing a means for people to reach new areas that would not be possible by land, the mastery of passenger aircraft is arguably one of the greatest technological advances in history.

This industry has since grown to one of the largest economic entities in the world, with 1% of the world GDP to be spent on air transport in 2019, totaling $919 billion. It is easy to see why there is such a large market when last year there was a record 4.4 billion passengers carried by the world's airlines in 2018. This number is only forecasted to climb higher and higher as technology and accessibility make it more feasible for a wider demographic of passengers to have access to commercial aviation. Suddenly passengers are being packed in higher densities onto aircraft that have not seen upgrades for 10, 15, 20 years and older for some of the reported airline fleets in service today.

This push for quantity of passengers taking precedence over the quality of travel they experience is a shift in paradigm that cannot be ignored. Airlines are making an effort to fit as many paying passengers onto dated aircraft with antiquated amenities that don't fit the 2019 ergonomics of the ever-growing passenger. Approval ratings of accessibility, comfort and timeliness of services are dropping with each passing year, creating a lower approval rating of the cramped and disgruntled customers these airlines and airports are aiming to please. The redesign of how the passenger experiences the entire duration of travel is something that is on the mind of airlines, airports, and travel service providers across the industry. The more that people enjoy their experience, the more likely they are to return and fly again. There has to be a way to improve the user experience via lowering stress levels at pinch points, creating a more relaxed baggage handling system, making a way-finding navigation system that seems natural to the lay-person, and better improve the comfort and expediency while waiting, boarding, flying and un-boarding.
The race to create the ideal user experience from door to door, that is, from home to destination in the context of commercial aviation, could give organizations the edge they need to not only excel in terms of customer approval, but also create the new standard to which other airlines try to achieve.
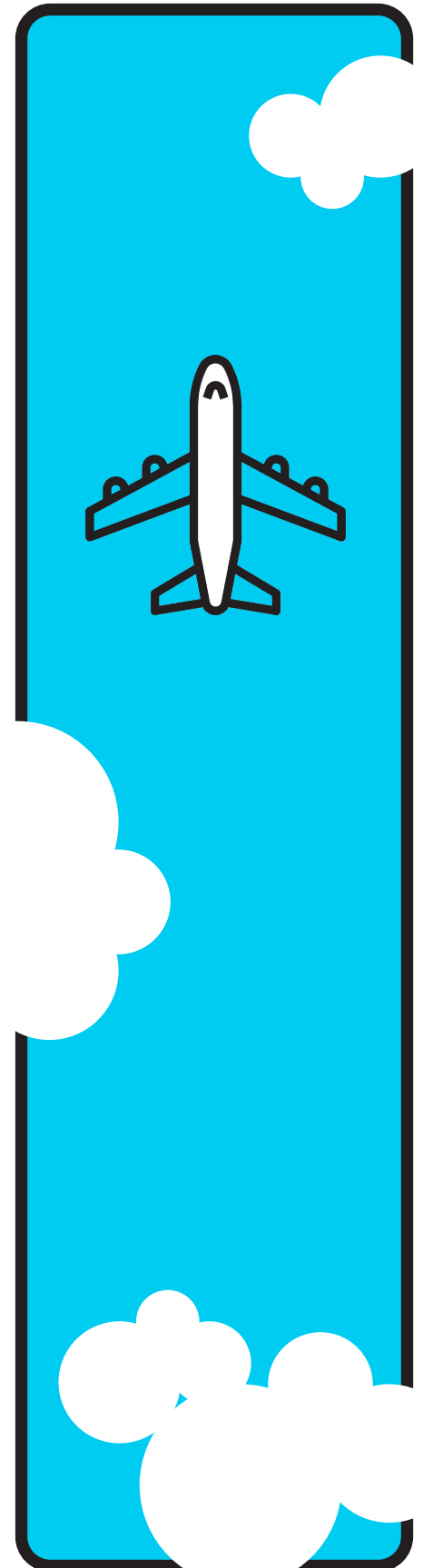
Abstract

When addressing the topic of travel, a series of mixed emotions can rise up within us. Stemming from our experience from previous trips, we may choose to see the entire trip as a positive or negative based upon a single element: air travel. I am to improve the overall perception of air travel by redesigning the passenger experience in the context of commercial aviation: door to door. What this means is that I plan to investigate and improve the expedience and convenience for the passenger when navigating to, through, and from the realm of travel via means of passenger aircraft. Rather than just focusing on improving the airport, I want to encapsulate the entire experience; from the second you leave your home to the moment you arrive at your destination. This stretches across a broad array of factors to consider, such as luggage transportation, accommodation/reservation management, as well as the atmosphere for the passenger in flight, just to name a few. As a result, I aim to create a new network of systems that is integrated cohesively to one another to focus not on the amount of money to be made, but rather on the betterment of the entire air travel passenger experience.
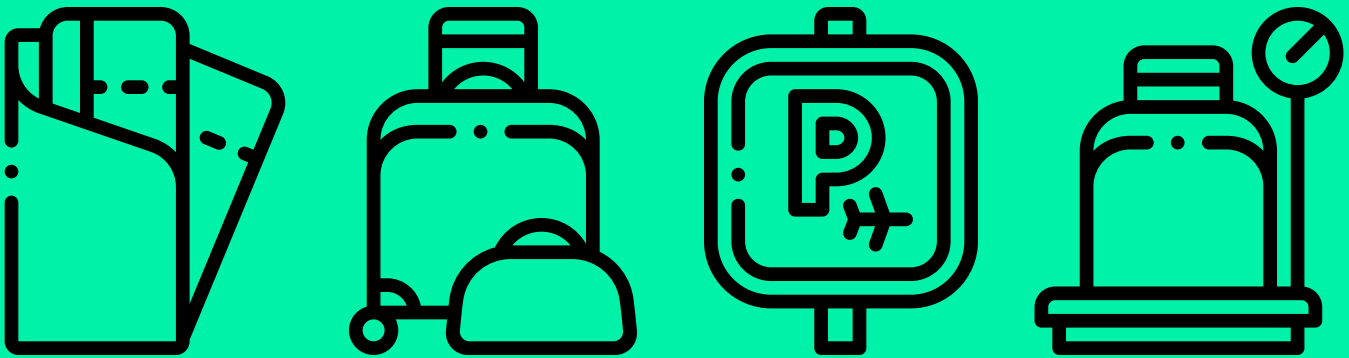
Background Information

This section will lay out the necessary points in history that created the key pieces that now combine to create our modern image of the passenger airline. This list is non-exhaustive but captures the main points that stood out as essential pieces to the overall puzzle: The creation of the airport, classifications of passenger aircraft, aircraft manufacturers, where the airline industry stands today, site specific details, and some definitions and abbreviations of common used terminology.
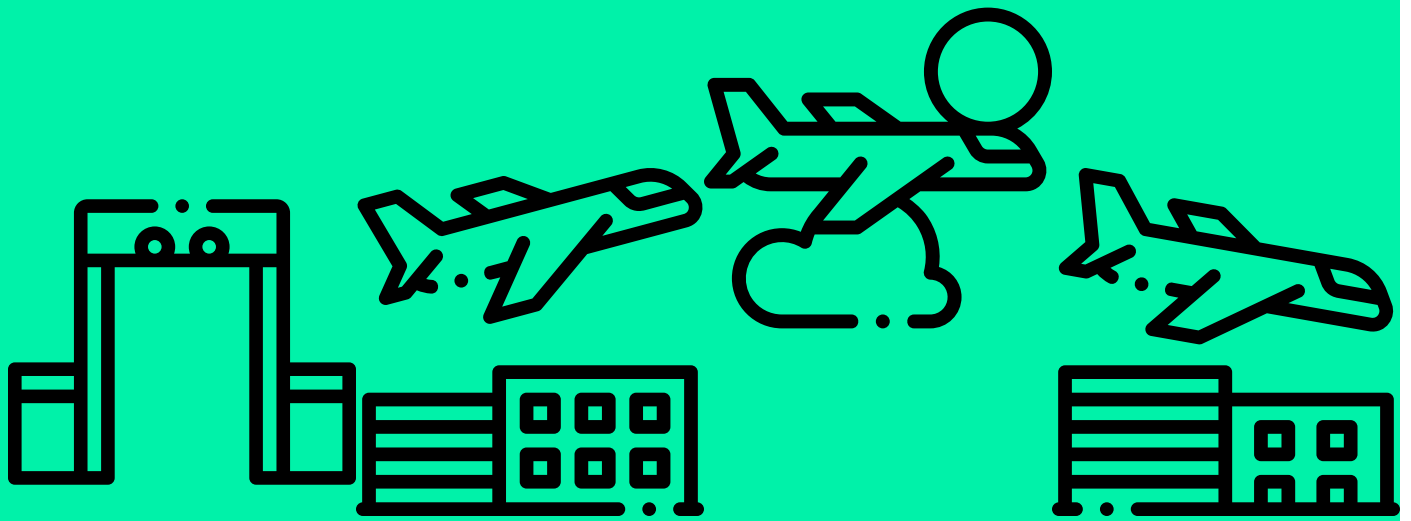
Airports Takeoff
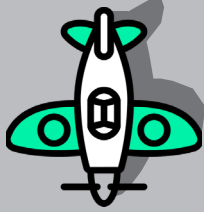
The first documented airports were nothing more than grassy fields on open plots of land used for general aviation. This meant that these were privately owned plots of land that did not follow any set standards for sizing or surface conditions. These grassy plots were left to the discretion of the owner on how they would be cleared, covered and maintained. Ideally, these plots would be cleared of any large pieces of debris, rocks or other natural materials, making it easier for the wheels or ski-type apparatus used to help the airplane touchdown or takeoff.

Pilots would have two options of discovering the surface treatment of these plots: either observe the plot for themselves before flying there or making a preliminary low pass over the plot for a brief visual inspection before touching down. Often if the visual inspection had missed something that would damage the landing gear, the pilot would risk flying into unfavorable conditions and potentially damage the aircraft, injuring or even killing the pilot onboard.

Gradually the development of these plots meant that they would become more predictable and better cared for. First gravel then paved surfaces made their way into spaces where the aircraft would have a cleaner takeoff and landing. The progression into safer surface conditions as well as the advancement of aircraft technology meant that these previously conceived dangerous vehicles were gaining a more popularity the safer they were proving to be.

These primitive aircraft were by no means on the same playing field as the aircraft we know and use today, but they were the first introduction for many to the idea of being able to take to the skies on a manmade vehicle. This concept posed more questions than answers, but still the excitement existed. Crews of one to two people were able to board the aircraft and take flight. The popularity was spreading, and more civilians wanted to be a part of this new movement. Even without a pilot's training, the lay person wanted to be able to take to the skies as well, and an important shift was about to take place: the creation of the passenger aircraft.

Aircraft by Class

Aircraft have come a long way since the Wright Brothers made their first flight near Kitty Hawk, North Carolina, in 1903. Computer technology is allowing manufacturers to develop planes that are more reliable, aerodynamic, and powerful than ever.

The various types of airliner can be broken down into 4 main categories that I found to be the most common and most reliable means in use today. Each category holds their own advantages and disadvantages which often requires the use of multiple types of airliners to connect passengers from home to destination while minimizing need for ground-based transit. This list is non-exhaustive but highlights key components and capabilities that make each type of airliner important and worth studying for this project.

Wide-body airliners: Also known as Jumbo Passenger Jets. Also known These are the largest airliners, also called twin-aisle aircraft since they generally have two separate aisles running the length of the passenger cabin within the aircraft. These are most commonly use for long-haul flights between airline hubs and major cities with many passengers onboard.
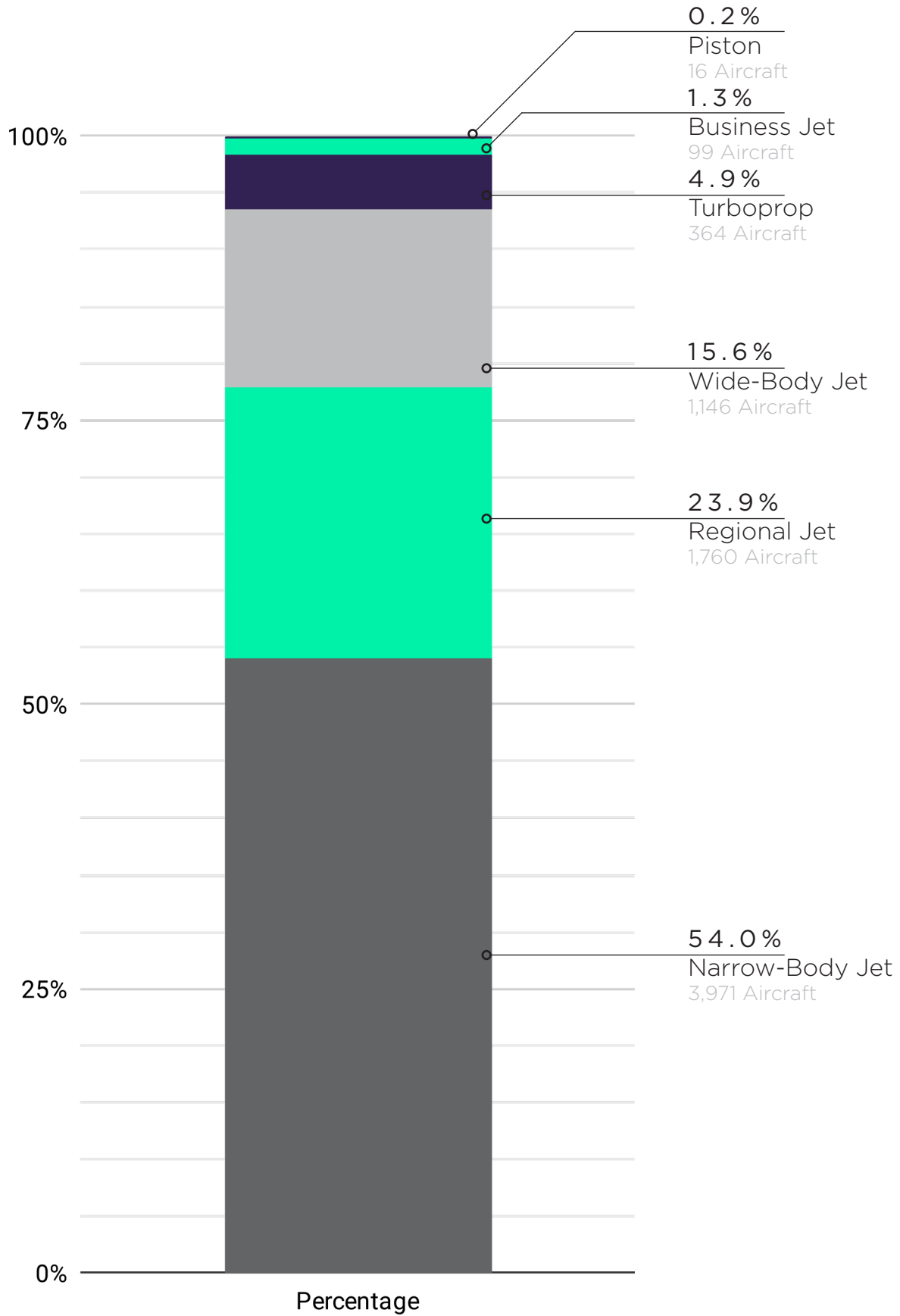
Commuterliners: Also categorized as Turboprop, this final class makes up the lightest of short-haul airliners, characterized by their common propeller-driven engines. Having such a small frame, passenger capacity can be expected to be 20 or less onboard. Depending on local and national regulations, commuterliners may not qualify as an airliner and may not be subject to the regulations applied to the larger classes of aircraft. Members of this aircraft normally lack such amenities as restrooms and food service galleys, and typically do not carry a flight attendant as an aircrew member. Turboprop engines are more fuel-efficient than jet engines as well. Since fuel is one of the greatest expenses for an airliner, this makes them a better investment. A passenger turboprop can also take off form shorter runways. This opens the doors for flying a greater variety of sort flights to meet market demands.

Regional aircraft: This is another category of narrow-body airliner called the Light Passenger Jet. These yet even smaller aircraft seat between 60-100 passengers at capacity. These are used to feed traffic into the large airline hubs or focus cities, collecting passengers from smaller regional airports that are a short-haul from the central hub. The smaller aircraft are important pieces to the grand scheme of passenger connection, as they offer further reaching impact on smaller towns and cities to connect to hub cities, generating more revenue for the legacy and flag carrier airliners. These aircraft typically do not cross overseas, but few exceptions do exist.

Narrow-body airliners: Also known as Mid-Size Passenger Jets. These are a smaller class of airliner also called single-aisle aircraft. These smaller airliners are generally used for medium-haul flights with fewer passengers than their wide-body counterparts. This class is also the most common amongst the fleet documented in 2018 within the US, as shown in table 1. Because of their versatility and relatively smaller frame, these aircraft allow the transport of passengers and cargo alike without needing to use the much larger, more expensive wide-body airliner. These are also more desirable due to their greater profitability in seasonal routes and on smaller flights. The lower price tag also makes them attractive from an investment standpoint.

United States Aircraft Fleet by Type
Data from IATA 2018

0.2%
Piston
16 Aircraft

1.3%
Business Jet
99 Aircraft

4.9%
Turboprop
364 Aircraft

15.6%
Wide-Body Jet
1,146 Aircraft

23.9%
Regional Jet
1,760 Aircraft

54.0%
Narrow-Body Jet
3,971 Aircraft

100%

75%

50%

25%

0%

Percentage

United States Aircraft Fleet by Manufacturer and Model

In order to better understand which aircraft was the most commonly used across the United States, I first looked at the most common aircraft manufacturers.

#	Manufacturer	2017	% of Fleet	2018	% of Fleet
-	All	7314	100.0	7356	100.0
1	Boeing	3171	43.4	3226	43.9
2	Airbus	1446	19.8	1556	21.2
3	Bombardier	1034	14.1	1018	13.8
4	Embraer	798	10.9	829	11.4
5	McDonnell Douglas	479	6.5	333	4.5
6	Cessna	246	3.4	248	3.4
7	ATR	47	<1.0	46	<1.0
8	Gulfstream	34	<1.0	36	<1.0
9	Lockheed	8	<1.0	14	<1.0
10	Douglas	15	<1.0	12	<1.0

Boeing, as the highest-ranking produced airliners in use today, serves as the ideal case study company to study what makes their aircraft so much better than their competitors. With 3,226 airliners in operation in the US alone, they more than double their next-closest competitor, Airbus, allowing them to hold claim to nearly 44% of all airliners in US operation today.

To find which models held the highest popularity as well, IATA also had documented which models of these previously mentioned manufacturers had the highest popularity within the US.

| #	Manufacturer	Model	2017	2018
-	ALL	ALL	7314	7356
1	Boeing	737-800	794	827
2	Boeing	787-700	585	586
3	Airbus	A320	505	521
4	Airbus	A321	350	398
5	Boeing	757-200	456	397
6	Bombardier	CRJ200	393	386
7	Airbus	A319	342	346
8	Boeing	737-900ER	292	335
9	Embraer	E175	267	311
10	Bombardier	CRJ900	270	275

Creating Giants

The Boeing 737-800 was the most common airliner in the commercial fleet reported in 2018 (as 2019 data hadn't been provided at the time of this report). This also accounts for the information showing that the 93% of all aircraft in operation in the US last year had two engines.

With such a strong presence in commercial operation, the 737-800 must be doing something right to establish its role at the top of the charts. This airliner was introduced in it's first generation, 737-100/-200 series, on April 9th, 1967 (Boeing, 2019). This "Baby Boeing", as it was called for its relatively small stature compared its larger sister aircraft in the Boeing lineup, stood at 93 feet and 9 inches long, spanned 93 feet, and weighed 111,000 lbs. With a range of 1,150 miles at a cruising speed of 580 miles per hour, Baby Boeing was no small feat of engineering.This model continued to prove very useful by standards of safe travel and continued production of revenue for its owners. The cabin was capable of housing 2 crew members, and up to 107 passengers onboard (Boeing, 2019). As the years passed and the demand for higher passengers per flight grew, so did the 737 series.

The 737-800 series has shown some great improvements since its initial introduction in 1967. With a price tag of $106.1 million, this newer model has grown to support the higher demand for a roomier passenger cabin as well as space for the aircrew to provide meals, beverages, and other creature comforts while in the air. Standing at 129 feet and 6 inches long, spanning 117 feet and 5 inches, and towering at 41 feet and 3 inches in height, this is no longer the "Baby Boeing" by any standards. The new size and power that has evolved along with this aircraft has increased its range to 2,935 nautical miles; over double what was possible with the original 737-100. Also boasting a capacity of 4 crew members and 178 passengers (typ.), the new and improved model can haul more passengers even further using less fuel thanks to advancements in technology and careful engineering. The new 737 'Superior Design' of the exterior made the wing area 25% larger, increased the fuel capacity by 30%, and delivered a 22% greater aerodynamic efficiency by redesigning old fixtures and hardware that caused drag along the shell of the plane. New interior features include a bright new color and décor, touch-screen attendant panels, passenger service lights and vents, sculpted sidewall to allow for more headroom, and color LED lighting programmed to perform differently for each stage of the flight: take-off, relaxation, cruising, meal service, and prelanding (Boeing, 2019).
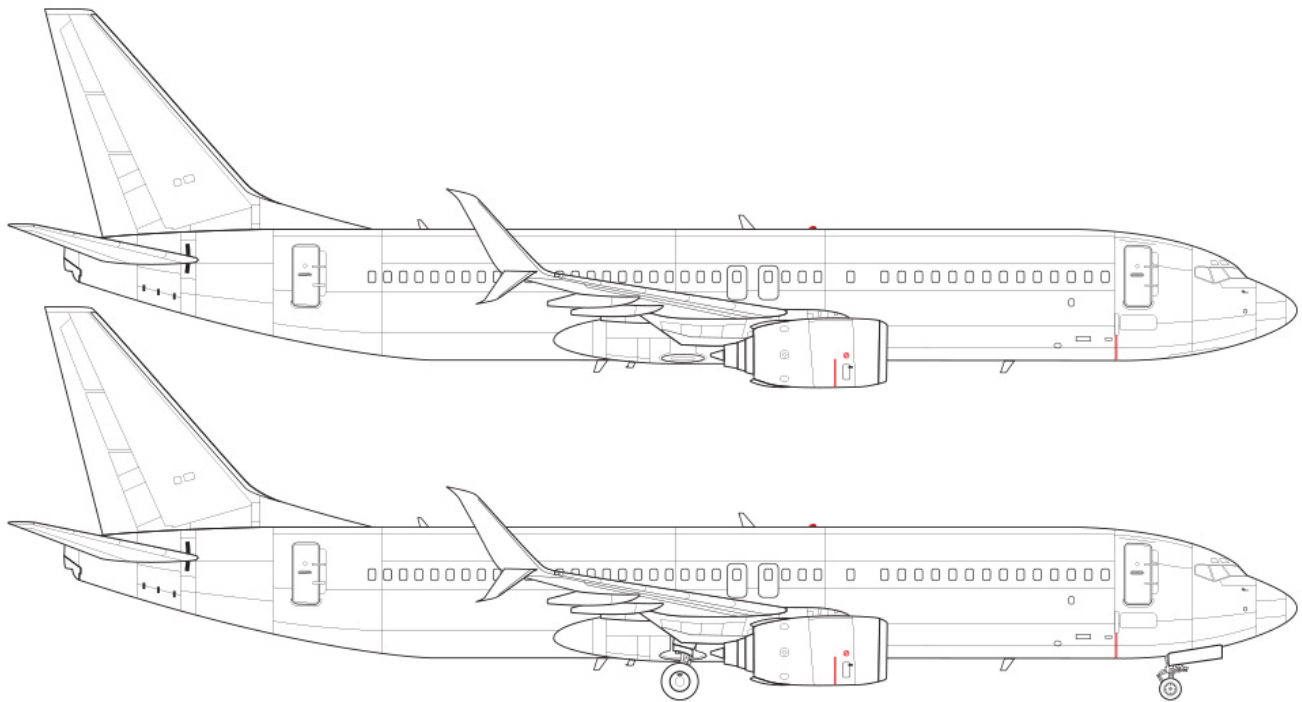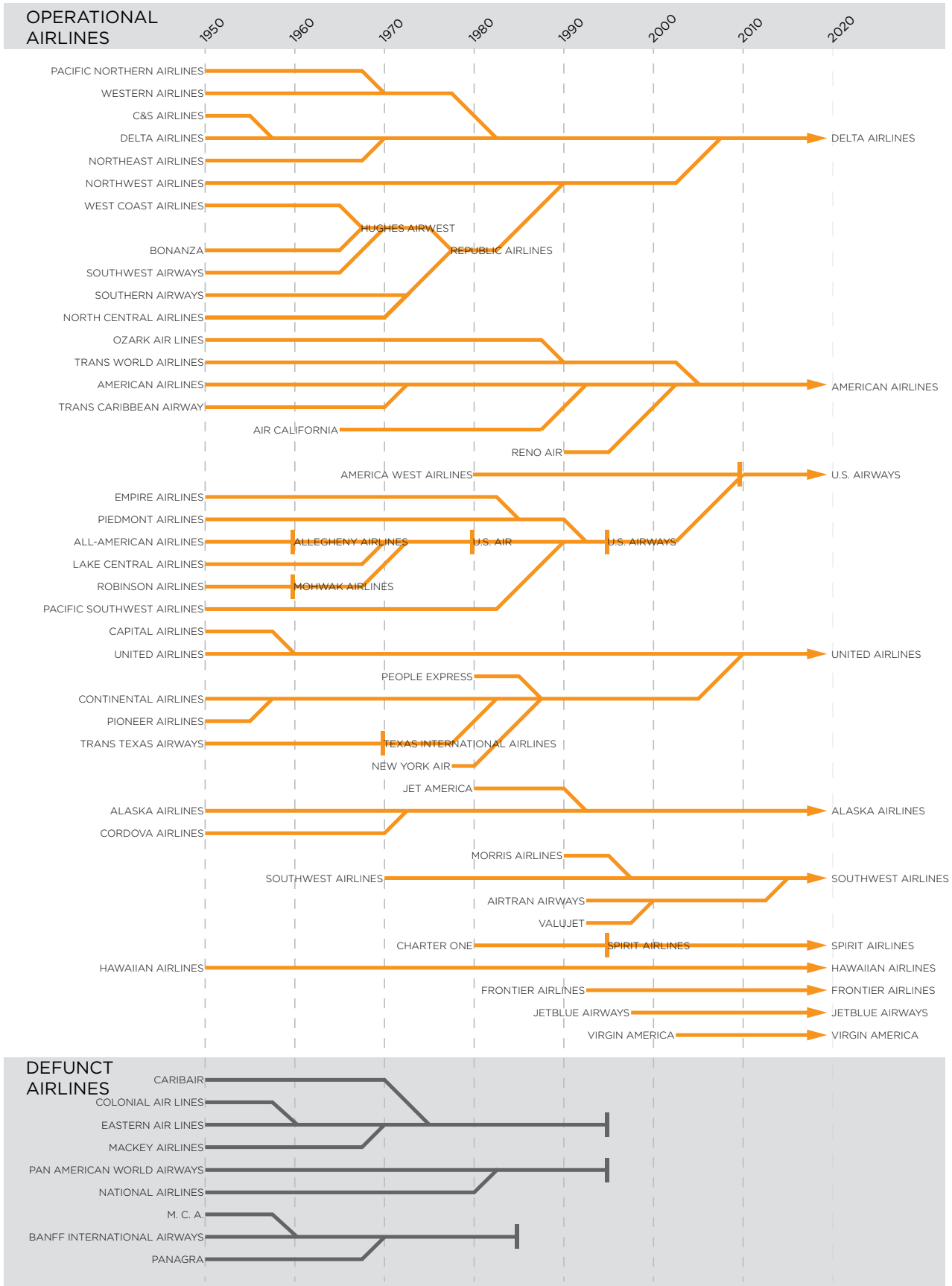
Airline Industry Today

The airline industry has been a constantly changing community that adapted and grew with the passing of time. Since commercial airline flight is an oligopoly, it makes it uncommon for new names in the industry to pop up without considerable financial backing. An oligopoly exists when a market is controlled by a small group of firms, often because the barrier to entry is significant enough to discourage potential competitors. This means that those who have been in the game longest hold an advantage if they continue to buy out their competitors. To better understand how the current airlines have changed over the years, the graphic to the right was created to demonstrate the beginning, merging, failing and progressing of airlines within US borders.

American Airlines holds the most aircraft across the top 10 airline providers reported in IATA's report (table below). It is important to point out that there is a relatively even number of aircraft of the next closest airlines as well. With the top 4 airline providers holding 46% of all commercially produced aircraft, these companies hold the highest ability to serve more passengers from more locations for fewer dollars out of the passengers' pockets. This typically means that these larger airlines have the higher appeal because they can offer better deals, lower rates, and fewer wait times and layovers for passengers looking to maintain airline loyalty. Smaller fleet airlines can offer the same services and systems as the large airlines as well, such as highly ranked Alaska Airlines. Hawaiian Airlines and Alaska Airlines are among the highest rated first-class and business class traveler experience (Blanco, 2018). These two airlines along with JetBlue and Virgin America received the highest marks for economy class flights as well.

#	Airline Provider	2017	% of Fleet	2018	% of Fleet
-	All	7314	100.0	7356	100.0
1	American Airlines	995	13.6	969	13.2
2	Delta Air Lines	932	12.7	893	12.1
3	United Air Lines	755	10.3	773	10.5
4	Southwest Airlines	760	10.4	751	10.2
5	FedEx	674	9.2	687	9.3
6	SkyWest Airlines	434	5.9	471	6.4
7	JetBlue Airways	243	3.3	253	3.4
8	UPS	239	3.3	248	3.4
9	Alaska Airlines	155	2.1	233	3.2
10	Republic Airlines	190	2.6	189	2.6

US MAJOR AIRLINE MERGER LINEAGE

1950 - 2019

OPERATIONAL AIRLINES

1950 — 1960 — 1970 — 1980 — 1990 — 2000 — 2010 — 2020

PACIFIC NORTHERN AIRLINES
WESTERN AIRLINES
C&S AIRLINES
DELTA AIRLINES → DELTA AIRLINES
NORTHEAST AIRLINES
NORTHWEST AIRLINES
WEST COAST AIRLINES
HUGHES AIRWEST
BONANZA
SOUTHWEST AIRWAYS — REPUBLIC AIRLINES
SOUTHERN AIRWAYS
NORTH CENTRAL AIRLINES
OZARK AIR LINES
TRANS WORLD AIRLINES
AMERICAN AIRLINES → AMERICAN AIRLINES
TRANS CARIBBEAN AIRWAY
AIR CALIFORNIA
RENO AIR
AMERICA WEST AIRLINES → U.S. AIRWAYS
EMPIRE AIRLINES
PIEDMONT AIRLINES
ALL-AMERICAN AIRLINES — ALLEGHENY AIRLINES — U.S. AIR — U.S. AIRWAYS
LAKE CENTRAL AIRLINES
ROBINSON AIRLINES — MOHWAK AIRLINES
PACIFIC SOUTHWEST AIRLINES
CAPITAL AIRLINES
UNITED AIRLINES → UNITED AIRLINES
PEOPLE EXPRESS
CONTINENTAL AIRLINES
PIONEER AIRLINES
TRANS TEXAS AIRWAYS — TEXAS INTERNATIONAL AIRLINES
NEW YORK AIR
JET AMERICA
ALASKA AIRLINES → ALASKA AIRLINES
CORDOVA AIRLINES
MORRIS AIRLINES
SOUTHWEST AIRLINES → SOUTHWEST AIRLINES
AIRTRAN AIRWAYS
VALUJET
CHARTER ONE — SPIRIT AIRLINES → SPIRIT AIRLINES
HAWAIIAN AIRLINES → HAWAIIAN AIRLINES
FRONTIER AIRLINES → FRONTIER AIRLINES
JETBLUE AIRWAYS → JETBLUE AIRWAYS
VIRGIN AMERICA → VIRGIN AMERICA

DEFUNCT AIRLINES

CARIBAIR
COLONIAL AIR LINES
EASTERN AIR LINES
MACKEY AIRLINES
PAN AMERICAN WORLD AIRWAYS
NATIONAL AIRLINES
M. C. A.
BANFF INTERNATIONAL AIRWAYS
PANAGRA

15

Airline Industry Today

The major airlines that remain today are Delta, American, U.S. Airways, United, Alaska, Southwest, Spirit, Hawaiian, Frontier, JetBlue and Virgin American Airlines. Of the larger airlines present today within the US, Alaska Airlines holds the highest stake in the overall passengers that passed through Sea-Tac Airport in Seattle, WA. The numbers showed that there was a clear majority when comparing the commercial airlines by total income that Sea-Tac received from passenger travel.

Total Passenger Market Share

Reported Sea-Tac Data from 2018

Others
9.5%

American
5.6%

Southwest
6.4%

United
6.4%

Alaska
48.9%

Delta
23.1%
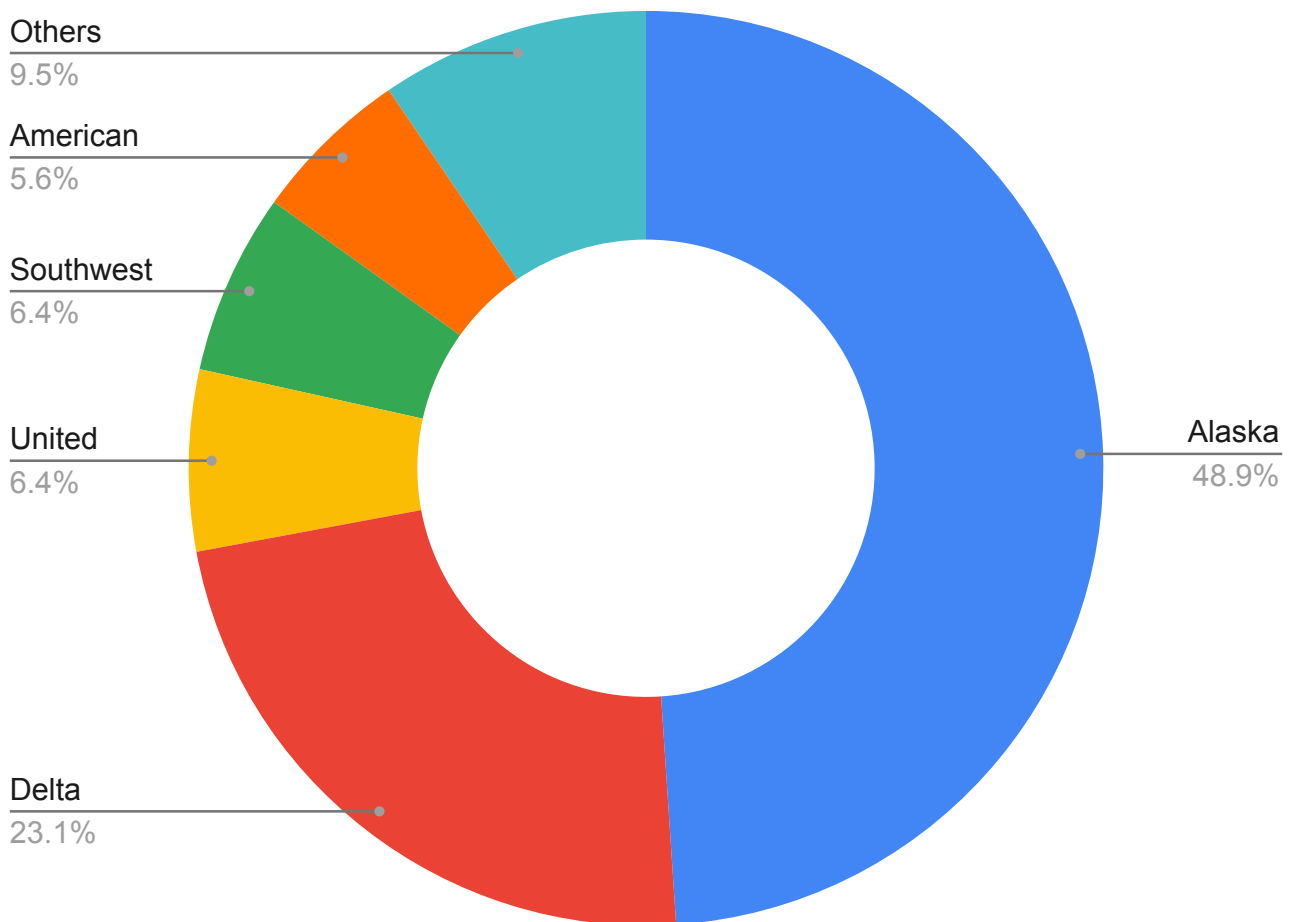
Alaska Airlines

This information led to choosing the Alaska Airlines as the focus of the proposed thesis to come. At the chosen site, Sea-Tac International Airport, Alaska Airlines averaged 300 departures per day, more than doubling its frequency on the runway of that of their next closest competitor, Delta Airlines, at 142 departures (Port of Seattle, 2018). By homing in on one airline, the attention can be focused on one set of standards and regulations to create a more detailed proposed solution. Conveniently, Alaska Airlines provided a schematic layout for their aircraft to better visualize how their passengers can expect to be seated in the main cabin shown below. The Boeing 737-800 was chosen due to its highest use in the commercial airline industry, offering just means to assume that this would be the most common airliner in the Alaska fleet.

Interior seating layout of our Boeing 737-800

Alaska Airlines had 61 of the Boeing 737-800's in their fleet (Alaska Airlines, 2019). These aircraft support a crew of 2 pilots and 4 flight attendants. Within the passenger cabin broken into three main classes; First Class hosts 12 passengers, Premium Class supports 30 passengers, and the largest, Coach Class, carries 117 passengers; in total, 159 passengers and 6 crew members would be on board a fully loaded aircraft. This will serve as the target audience for which the topic of this passenger experience redesign is catered towards.

Site Conditions

The site chosen for this thesis project located in the state of Washington is the Seattle-Tacoma International Airport, or Sea-Tac for short. This airport was chosen based upon its rank and growth as one of the top 30 international airports in the United States. (World Airport Code, 2019). Sea-Tac ranked #8 in the US based upon total enplanement of passengers; over 24 million in 2018. This number has steadily grown at a constant rate, seeing a 3.4% increase from 2016 to 2017 and a jump of 9.9% going into 2018. This rate of increased passenger traffic was only exceeded by one airport in rate of sustained growth per year – FLL, or Fort Lauderdale-Hollywood International Airport in Fort Lauderdale, Florida. This high rate of growth generated interest in how this airport handled such high capacity of passengers on its relatively small footprint.

Sea-Tac rests between Seattle and Tacoma, some of the largest cities in the Pacific Northwest. This large hub of shipping, trade goods, tourism, and major industry centers for engineering and technology companies has drawn crowds from both the domestic and international audience. Seattle, the larger of the two neighboring cities, claims most business that comes through Sea-Tac. With a population of 3.94 million and growing in its metro area, it ranks as the 15th largest city in the US. As a major gateway for trade with Asia as one of its main suppliers, it holds the 4th largest port in North America. The community has developed into a very diverse composition as well; Scandinavian, Native American, Asian American, and African American are a few of major demographics that create the rich cultural diversity that this city provides.

Sea-Tac is located in the industrial district between Seattle and Tacoma, providing the space to handle such high air traffic without having to navigate flight paths directly over the city centers, as well as isolating excess noise pollution by pulling the airport to the edges of each city. Domestic flights account for 89% of all passengers that pass through Sea-Tac while supporting 11% of international flights from its ideal location on the Pacific coastline. With 29 documented international destinations and 91 non-stop domestic destinations, air traffic controllers stay busy to make the most efficient use of its 3 runways. There are 80 gates throughout Sea-Tac and has recently announced that it will be expanding from 85 to 135 airport dining and retail establishments. This growth will provide national brands as well as local favorites a chance to capitalize on the customer base of passengers, staff and air crew that populate its concourses. The airport has one central terminal with 4 attached concourses and 2 satellite concourses that are accessible via bus service or underground light rail.
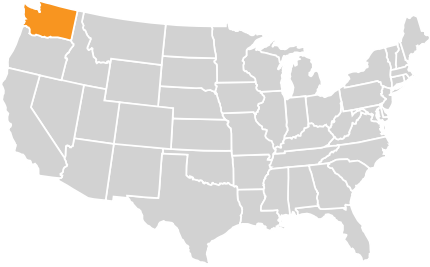
Washington

King County
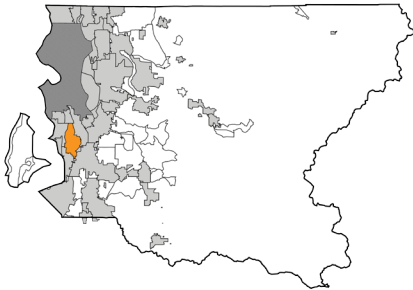
Seattle Metro Area

Sea-Tac District

Sea-Tac Intl. Airport

_Seattle | 745,000+
_Metro Area | 3.94M
_Ranks 15th Largest in US
_Major gateway for trade - Asia main supplier
_4th Largest port in North America
_High populations of Native, Scandanavian, Asian American, African American as well as a prominent LGBT community
_Major industry centers: Boeing, Microsoft, Amazon
_Noteworthy musical history as well - Ray Charles, Quincy Jones, Jimi Hendrix, Nirvana, Pearl Jam, Foo Fighters ---

_Sea-Tac stands for the Seattle-Tacoma region which it serves as an industrial hub

_Air passengers | 49.8 M
_Ranks #8 in US | #31 in World
_89% domestic, 11% international passengers
_Operates using 3 runways
+16L/34R - 11,901 ft.
+16C/34C - 9,426 ft.
+16R/34L - 8,500 ft.
_80 Gates
_Major airlines | Alaska, Delta, United, Southwest ---
_91 non-stop domestic dest.
_29 internatinal destinations
_Sea-Tac Airport was developed as a direct response to the World War II Pear Harbor attack in 1941 when military needs limited civilian access to existing airports.
_Terminal bldg dedicated 1949

Passenger Growth

Annual Passengers Worldwide
1970-2018 with Projection of 2036

■ Global Total ■ United States Total ▨ Future Projection
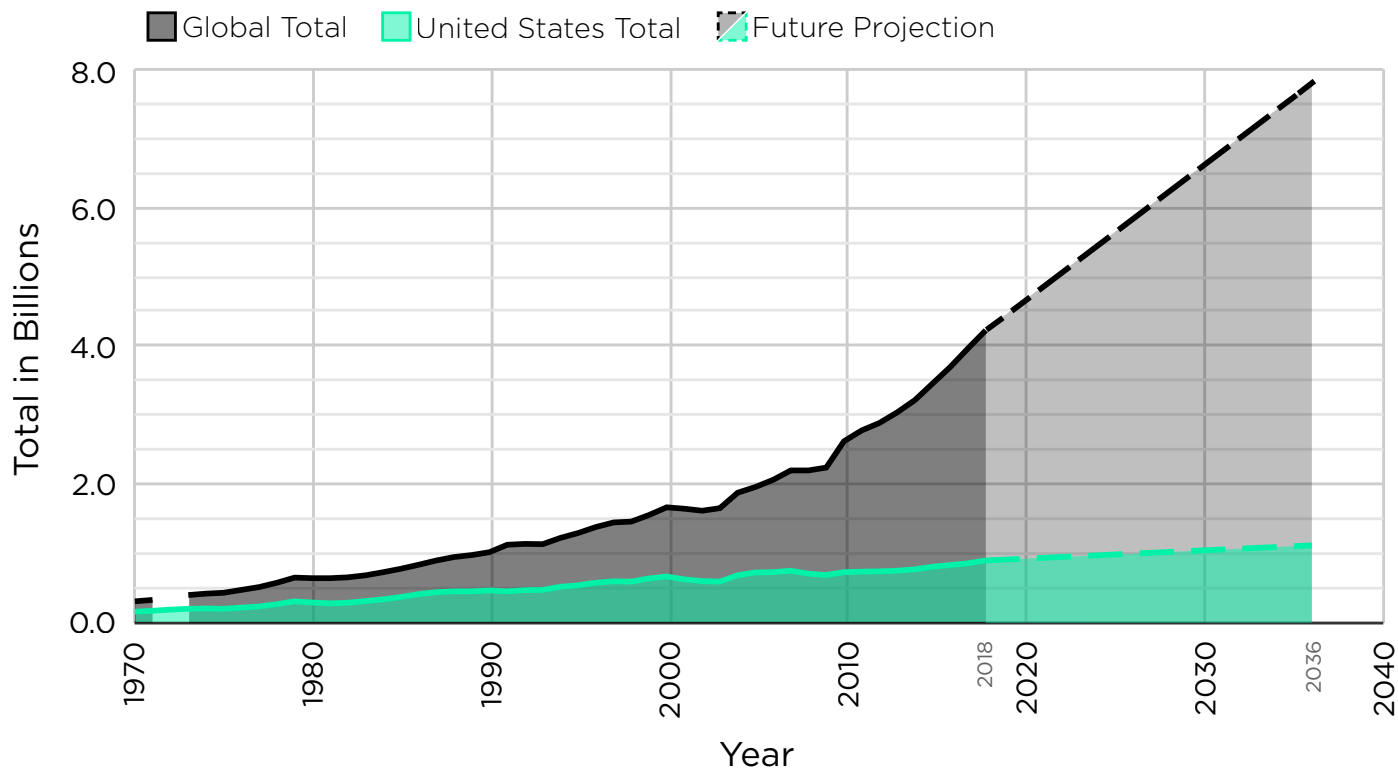
Since IATA began recording data on annual passenger counts in 1970, the numbers have steadily grown year by year. The United States, shown in gold, made up a high percentage of the global total in earlier years; accounting for approximately half of all reported passenger counts up until about the year 2000. This shows the airline industry gaining traction in other countries accross the globe, adding their name to the long list of cities in the aviation network. The total passengers reported in the year 2018 reached 4.23 billion people across the world. Research by IATA Data Reports projects that by the year 2036, this number will climb to 7.8 billion. The number of passengers in the United States is forecasted to grow at a much slower rate yet is still projected to reach up to 1.1 billion. This thesis project would help to better develop a more efficient and enjoyable process of flying on commercial airlines. If the previously mentioned projections come to fruition, the industry must start preparing now to save passengers time and minimize frustration by learning where pitfalls exist in the current system and start preparing proactively.

Passenger Profiles

Vacationer / Tourists

Using travel as a means of exploring new cultures and regions of the world, this user type aims to bridge the familiar with the foreign.

Business Person

Traveling as out of a means of necessity for commerce, this user type represents the most utility focused group where speed and reliability are paramount.

Weekend Traveler

As the short-term getaway seeker, this user type uses whatever short breaks available to travel and explore their personal desires.

Families / Groups

Larger numbers means more items to keep track of, plan for, and cater to. This user type is the largest unit of the four and create an interesting set of needs to be met in the context of commercial aviation.

The chart below was used to better understand the severity of needs of the various different user types. The categories were chosen as likely actions that would showcase both similarities and differences between users will aid in consideration of my design decisions. Values shown in this chart are based on my own personal beliefs per research of different traveler types.
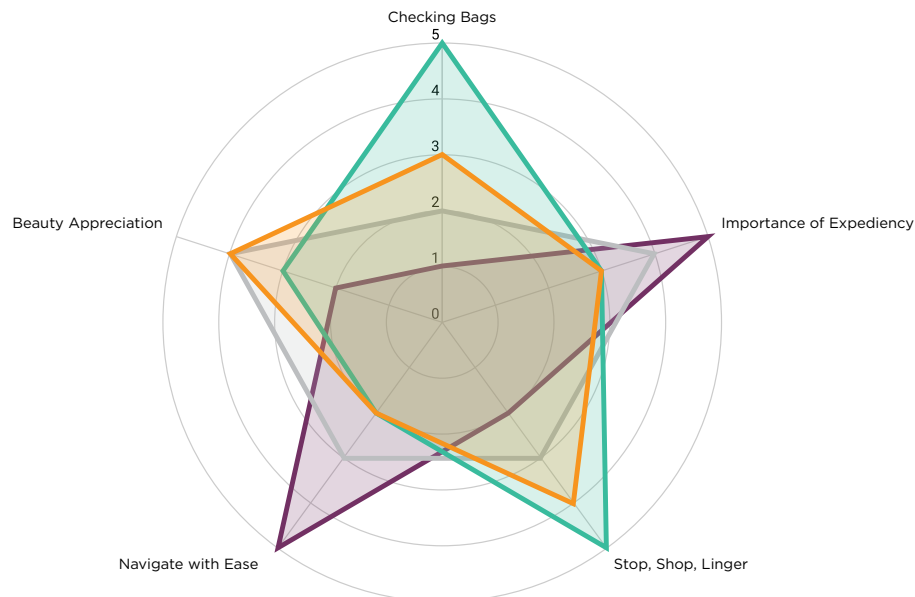
Looking Forward

The results of this thesis research were eye-opening and crucial to the success of this project. Airlines are dealing with a new type of traveler: educated, increasing aware of their needs and rights, and able to choose between a broad range of air carriers. The keys to delivering on passenger expectations are listening and innovating. The 2018 IATA Global Passenger Survey identified passengers' desire for technology that gives them heightened control over their travel experience through

1. The automation of a growing number of airport processes;
2. A single identity token for all travel processes, using biometric identification;
3. Real-time flight information sent directly to personal devices;
4. Increasingly efficient airport security that does not require having to remove or unpack personal items; and
5. Seamless border control.

Passengers are becoming more tech savvy and want the airline industry to provide new services that match this growing trend. Monitoring the location of their bags, getting updates on flight status, and getting notifications about wait times at security/immigration were leading concerns as well. Passengers are also bringing more luggage along with their personal devices, putting a higher demand on the airlines to provide the space desired within the passenger cabin.

Summary

The airline industry is an ever-growing entity that has a presence in nearly every corner of the world. With improvements in technology and engineering, it is becoming easier for people to purchase an airline ticket to take them to their desired destination. Each journey is different, with thousands of options that a passenger can choose, stitching together the pieces of their personalized travel experience.

By redesigning the passenger experience in the context of commercial aviation, designers, airport planners, airline providers and passengers alike will all be able to create a new standard of passenger travel. This thesis will act as a template for how the newly designed passenger experience could improve the physical atmosphere of the day to day operations of airline travel, as well as boost the social reputation of how airlines treat their customers. Happier customers make for more likely repeat passengers, repeat passengers means more business for the airlines. This incentive pays dividends to both the passenger and the airline and all its affiliates; the airport, air traffic control, support and facilities workers, travel planners, hotel and rental companies, etc.

The race to create the ideal user experience from door to door, that is, from home to destination in the context of commercial aviation, could give organizations the edge they need to not only excel in terms of customer approval, but also create the new standard to which other airlines try to achieve. As a result, I aim to create a new network of systems that are integrated cohesively to one another to focus not on the amount of money to be made, but rather on the betterment of the entire air travel passenger experience.

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