

## **Executive Summary**

With a research on flight counts, on-time performance, aircraft age, and weather-related delays, this research examines significant changes in the US airline industry during the first quarters of 2023 and 2024. There was a noticeable drop in the number of flights operated by major airlines, which may indicate a drop in customer demand. Tuesdays and Wednesdays had the fewest delays, while Sundays had the most, according to an analysis of on-time performance. The notion that age is the principal cause of maintenance-related problems was challenged when it was shown that newer aircraft were marginally more likely to experience delays than older aircraft. Additionally, many airports experienced a higher percentage of weather-related delays, particularly those in Minnesota and Michigan, which made it challenging for airlines to operate. In order to reduce delays and boost operational effectiveness, our findings emphasize the necessity for airlines to optimize scheduling, resource allocation, and repair procedures. The research ends with practical suggestions, such as focused tactics to deal with weather-related delays and encourage travel during off-peak hours.

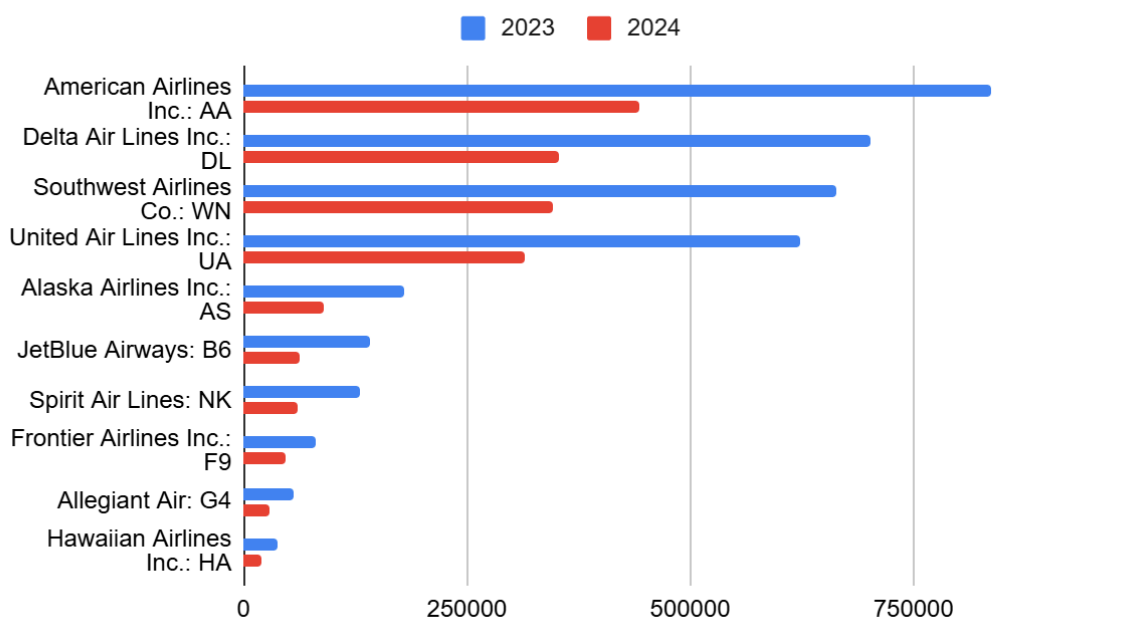
## Flight Count Analysis

In Q1 2023 and Q1 2024, the US aviation industry experienced a decrease in overall flights. The analysis of the performance of US airlines is made only for the first quarter of 2023 and the first quarter of 2024 because it allows for a direct YoY comparison, controlling for seasonality and isolating potential trends or changes within a specific timeframe.

The number of flights operated by the main US airlines decreased between 2023 and 2024. The airline with the most flights, American Airlines, saw a 47% drop in flight volume from 837850 flights in 2023 to 444020 flights in 2024. It wasn't the only airline to have a drop in flights; from Q1 2023 to Q1 2024, Delta, the second-most popular airline, saw a 49.79% drop in flights. Each airline in the database exhibits this behavior of a roughly 50% drop.

The airlines that seem to be more impacted by the number of flights are the low-cost companies JetBlue and Spirit which got a decrease of flights of 55,61% and 53,32% respectively.

### Number of Flights per Airline in Q1 2023 and Q1 2024

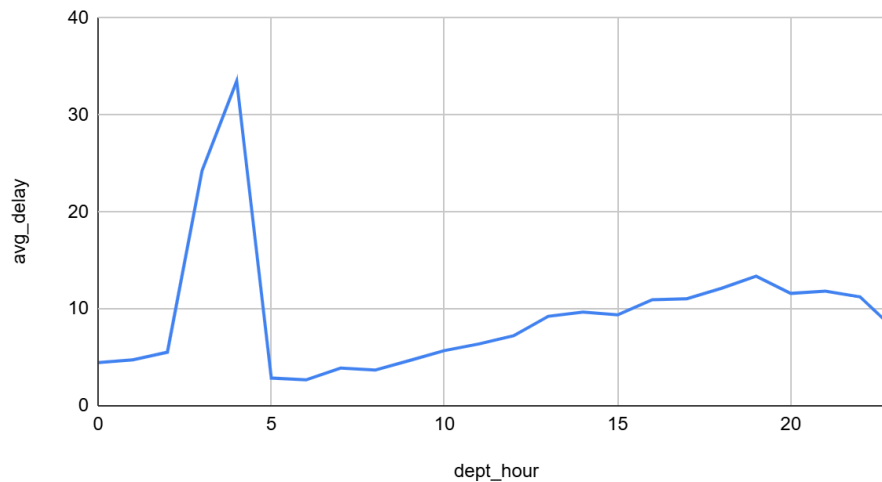


This research does not include particular passenger data for every trip, even though the data that is currently available indicates a worrying drop in flight counts in Q1 2024 compared to Q1 2023, indicating a possible loss in passenger numbers. It is impossible to state conclusions regarding passenger travel patterns without this data. However, as airlines usually change the number of flights depending on demand, the flight drop probably signifies a similar decrease in the number of total passengers.

## Time Performance Analysis

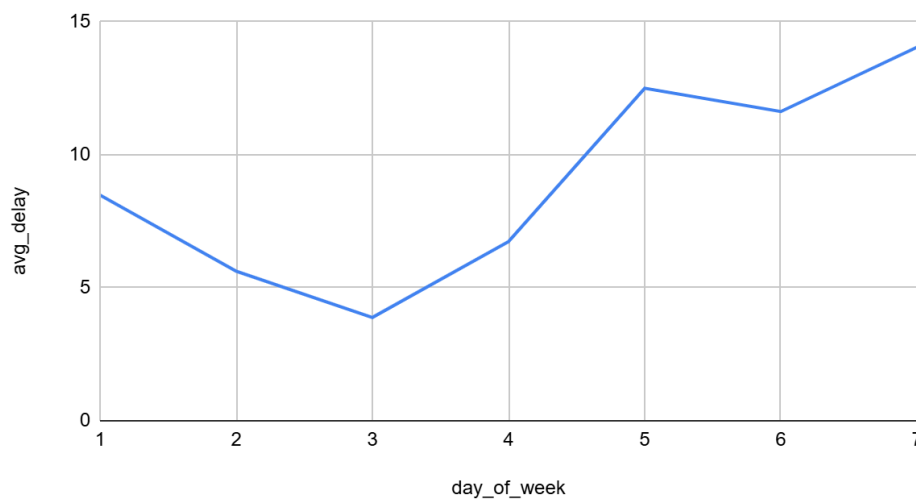
Delays are measured by the average arrival delay grouped by the different time blocks. With the fewest average arrival delays, 5 AM is the best time of day to leave. However, the worst time of day, with the biggest delays, is 4 AM, indicating that there may be problems with midnight operations or early morning air traffic congestion, that finishes at 5 am.

Average delays per hour Q1 1 2023



Tuesdays and Wednesdays are the nicest days of the week in terms of lower average delays. Sundays, on the other hand, have the worst delays of the week, most likely as a result of heavier traffic and personal trips for the weekend.

Average delay for day of the week Q1 3 2023



The 7th of the month appears to be a good day to travel if the passenger wants to minimize the delays, making it the Best Day of the Month. Nevertheless, there is not the worst day, but days 24th to 26th tend to have higher average delays.

## Aircraft Age Analysis

The data shows that the notion that older aircraft are more likely to experience maintenance problems and delays is incorrect. A sample of American Airlines aircraft, due to their high quantity of different aircraft, was analyzed in order to determine the correlation between aircraft age and delays. Ten planes that experienced delays due to late\_aircraft\_delay causes were contrasted with ten planes that did not.

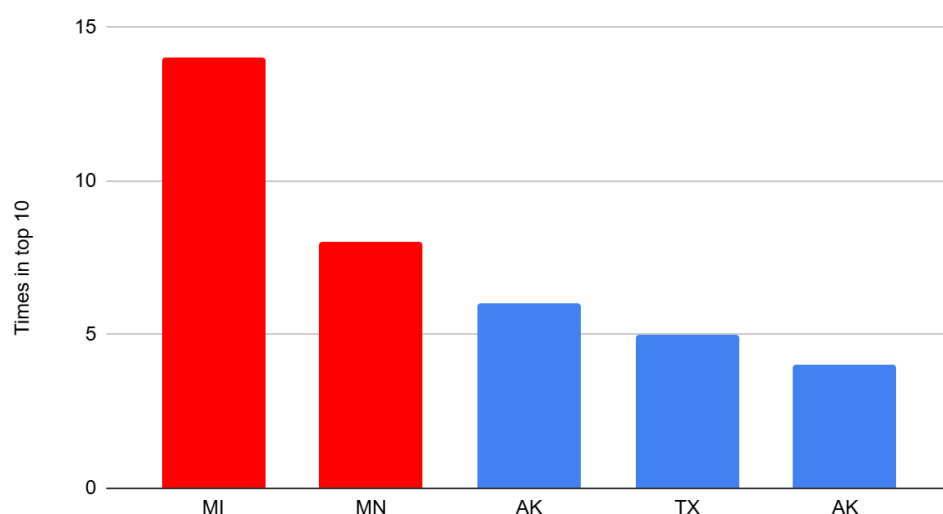
According to the data, the average age of aircraft that experienced delays for aircraft-related problems was 12.7 years, making them even younger than those that did not experience delays, whose average age was 14.7 years. This implies that modern airplanes may be just as prone to maintenance-related delays, if not more so.

## Weather Delay Analysis

When comparing Q1 2023 and Q1 2024, January has the highest average number of delays at airports due to weather conditions (8.91%). According to the airports with the most delays, weather-related delays account for 8.89% of all delays from flights in March.

The origin city was used to determine the origin of the flights because the airport\_id is not accessible for every month. Pellston in Michigan, Owensboro in Kentucky, and Iron Mountain/Kingsfd in Michigan are the airports and cities with the most number of aircraft delays caused by weather, according to an analysis of the top 10 airports with the most delays for each month of Q1 0223 and Q1 2024. Many of these high-risk sites are in Michigan, where weather-related delays account for an average of 7.39% of delays and are listed in the top 10 14 times over the Q1 of the two years, and Minnesota, where they are listed in the top 10 8 times annually with an average of 6.81%.

Top 5 states that have more delays due to weather conditions



## **Main business problems identified**

An approximately 50% decrease in flights between Q1 2023 and Q1 2024 suggests a possible decline in demand and income. Low-cost airlines like Spirit and JetBlue, which are seeing much more severe drops, should be especially concerned about this.

Delays cause passenger dissatisfaction, increase operational costs and can damage the airline's reputation. Having identified Tuesdays and Wednesdays as the days with the most delays and Sundays with the most gives us an understanding of which days we should allocate more resources like staff or equipment.

**Weather-Related Disruptions:** Delays caused by bad weather are common at certain airports and in certain areas (Michigan and Minnesota). Operations are disrupted, and on-time performance is impacted. Because of their geographic location and the dominant weather patterns in certain regions, there is nothing that can be done to control the weather, but the influence on aircraft operations can be reduced.

## **Actionable Insights**

### 1. Tuesdays and Wednesdays passenger's new fares

The worst delays occur on Sundays, while the fewest occur on Tuesdays and Wednesdays. This points to a chance to change demand and processes in the middle of the week. As a result, determine which routes have the most capacity available on Tuesdays and Wednesdays and the worst Sunday congestion. Pay attention to routes that have a lot of possibilities for business travel, and for travel on those routes on Tuesdays and Wednesdays, create a new fare with discounts, free Wi-Fi, priority boarding, and some points program for loyalty.

### 2. Establish a Prepared team for Michigan and Minnesota


Often in the top 10 for weather-related delays include Pellston, Owensboro, and Iron Mountain/Kingsford, with Minnesota and Michigan. As a result, the airline had to put together a special and trained team that has specialists in meteorology, flight operations, ground personnel, and customer support. Pay attention to operations in Minnesota and Michigan and examine past weather data for these areas to see trends and times when there is a greater risk. To understand the effects of various weather issues, correlate these previous weather delays to understand more about the conditions. Then, develop specific protocols for different weather conditions.

In terms of how to treat the customer, establish clear thresholds for preemptively delaying flights to minimize disruptions at the last minute, and identify alternative aircraft types better suited for each weather condition in these regions. Moreover, prepare communication processes to keep passengers informed during weather disruptions and possible delays, indicating their rights and benefits.

References

*N820AL (2016 BOEING 787-9 owned by AMERICAN AIRLINES INC) Aircraft Registration - FlightAware. (2016). FlightAware.*  
<https://www.flightaware.com/resources/registration/>

Appendix



help me make an executive sumamry tamplate and first draft with NO BULLET POINTS for a business report of this report, Flight Count Analysis

In Q1 2023 and Q1 2024, the US aviation industry experienced a decrease in overall...

Executive Summary Template

[Report Title]

[Date]

[Author/Department]

Overview

This report examines key trends and challenges in the US airline industry during Q1 2023 and Q1 2024. The analysis focuses on flight count variations, on-time performance, the relationship between aircraft age and delays, and the impact of weather-related disruptions.

Key Findings

Key Findings

[Concisely summarize the 3-4 most important findings from your analysis. Focus on high-level trends and unexpected results.]

Business Problems

[Clearly identify the main business challenges revealed by the data. These should be actionable problems that the airline can address.]

Recommendations

[Provide specific, actionable recommendations to address the identified business problems. Prioritize the most impactful recommendations.]

Conclusion

[Briefly summarize the overall implications of the report and emphasize the importance of the recommendations for the airline's success.]



Can u then put the message I gave u in a excel format so I can calculate it myself then



Please provide me with the message you'd like me to format in Excel. I need the content of the message to be able to put it in a spreadsheet format.

Once you provide the message, I can help you by:

- **Identifying the key data points:** I'll figure out what information needs to be in the spreadsheet's columns and rows.
- **Creating a table:** I'll organize the data into a clear and concise table format.
- **Suggesting calculations (if needed):** If your message implies any calculations, I can suggest formulas or functions you can use in Excel.

I'm ready when you are! Just paste the message here, and I'll do my best to help.

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This one This is for jan 23 description flight\_count  
American Airlines Inc.: AA 277886

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This one This is for jan 23 description flight\_count  
American Airlines Inc.: AA 277886  
Delta Air Lines Inc.: DL 232546  
Southwest Airlines Co.: WN 224860...



You got it! Here's the data organized into an Excel-friendly format. You can copy and paste this directly into Excel.

Month	Year	Airline	Flight Count
Jan	2023	American Airlines Inc.: AA	277886
Jan	2023	Delta Air Lines Inc.: DL	232546
Jan	2023	Southwest Airlines Co.: WN	224860
Jan	2023	United Air Lines Inc.: UA	204410
Jan	2023	Alaska Airlines Inc.: AS	60608
Jan	2023	JetBlue Airways: B6	46498
Jan	2023	Spirit Air Lines: NK	43752
Jan	2023	Frontier Airlines Inc.: F9	26570
Jan	2023	Allegiant Air: G4	17230
Jan	2023	Hawaiian Airlines Inc.: HA	13394
Feb	2023	American Airlines Inc.: AA	264716
Feb	2023	Delta Air Lines Inc.: DL	215348
Feb	2023	Southwest Airlines Co.: WN	202910
Feb	2023	United Air Lines Inc.: UA	194576
Feb	2023	Alaska Airlines Inc.: AS	56094
Feb	2023	JetBlue Airways: B6	44372
Feb	2023	Spirit Air Lines: NK	40384
Feb	2023	Frontier Airlines Inc.: F9	25048
Feb	2023	Allegiant Air: G4	17016
Feb	2023	Hawaiian Airlines Inc.: HA	11994

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Make a paragraph explaining that this question cannot be made since we do not have enough data of how many passengers were in each flight. But from the overall decrease of flights we could also state that the number of passengers flying in the q1 of those years has also decreased. How does the number of people flying between...



You're absolutely correct! Without data on passenger numbers per flight, we can't definitively conclude how the total number of people flying has changed.

However, the overall decrease in flight counts in Q1 2024 compared to Q1 2023 strongly suggests a corresponding decrease in passenger numbers. This is a reasonable assumption, as airlines typically adjust their flight schedules based on demand. Fewer flights generally mean fewer passengers transported.

#### How the Number of People Flying Between Different Locations Changes Over Time

This is a complex question with many influencing factors. Here are some key elements that affect how passenger numbers change over time:

- **Seasonality:** Leisure travel often peaks during holidays and school breaks, while business travel might have different peak seasons.

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- **Seasonality:** Leisure travel often peaks during holidays and school breaks, while business travel might have different peak seasons.
- **Economic Conditions:** Recessions or economic downturns can significantly reduce travel demand, while economic growth often leads to increased travel.
- **Major Events:** Global events like pandemics, political instability, or major sporting events can cause significant fluctuations in travel patterns.
- **Fuel Prices:** High fuel prices can lead to increased airfares, potentially deterring some travelers.
- **Airline Industry Trends:** Mergers, route changes, new airlines entering the market, and the rise of budget carriers all influence passenger numbers on different routes.
- **External Factors:** Weather patterns, natural disasters, and other unforeseen events can disrupt travel and impact passenger numbers.



Best Worst

Hour Day 6,5,3,4,24,5 4,21,23,18,4,4

Day Week 6,3,2,4,3,2 3,7,5,2,7,6

Day Month 17,7,7,31,7,12 11,26,24,15,4,9...



Okay, I'm starting to see the bigger picture here. Let's break down the analysis with the data you've provided:



#### Understanding the Metric: Average Arrival Delay

You're right, focusing on arrival delays is a smart move. Here's why it's a particularly relevant metric for airlines and passengers:

- **Passenger-centric:** Arrival delays directly impact passengers' schedules and plans. A late arrival can cause missed connections, disrupted appointments, and overall frustration. Minimizing arrival delays improves the passenger experience.
- **Operational Efficiency:** While departure delays can sometimes be "caught up" during the flight, arrival delays are harder to mitigate. They often reflect inefficiencies in air traffic management, gate availability, and ground operations.
- **Reputation:** Airlines are often judged by their on-time performance. Consistent

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Now let's go to the second question. When is the best time of day/day of week/time of year to fly to minimize delays? Give me what data u need to make the analysis I have the average delayed time on the arrival for the first quarter of 23 and 24 by hour, by day of the week and by day of the month



You're thinking proactively! Minimizing delays is a huge win for travelers. Here's how we can approach this with the data you have:



#### Data You Have:

- Average arrival delay time for Q1 2023 and Q1 2024, broken down by:
  - Hour of the day
  - Day of the week
  - Day of the month

#### Data You'll Need (and how to get it, if possible):

- **Historical Flight Delay Data:** To get a more complete picture, expand beyond Q1. Ideally, gather data for the entire year, or at least several years, to account for seasonal variations.
- **Source:** This might be available from the Bureau of Transportation Statistics (BTS), aviation data providers, or by scraping publicly available flight data.



insightful.

- Source: BTS data allows filtering by airport.

Analysis Approach:

1. Aggregate and Compare:

- Combine your Q1 2023 and 2024 data to get a more robust picture of the first quarter.
- If you have full-year data, compare delay patterns across different quarters to identify seasonal trends.

2. Visualize:

- Create charts and graphs to visualize delay trends by hour, day of week, and day of month. Heatmaps can be particularly useful here.
- If you have airport-specific data, consider maps or charts that highlight delay hotspots.

3. Identify Patterns:

- Look for recurring patterns. Are delays consistently worse on certain days, at certain times, or during specific months?
- If you have delay reasons, see if certain types of delays are more prevalent at

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Amazon Athena

Editor de consultas

Catalogo

None

Base de datos

a2assignmentgroup

Tablas y vistas

Crear

Filtrar tablas y vistas

Tablas (8)

actfeb24

airline\_id

airport\_id

feb23

feb24

jan23

mar23

mar24

Vistas (0)

5

limit 11;

SQL

Ln 1, Col 1

Ejecutar de nuevo

Explicar

Cancelar

Borrar

Crear

Volver a utilizar los resultados de la consulta hasta hace 60 minutos

Resultados de la consulta

Estado de la consulta

Completado

Tiempo en cola: 70 ms

Tiempo de ejecución: 481 ms

Datos analizados: 1.05 MB

Resultados (11)

Copiar

Descargar resultados

Filas de búsqueda

#

tail\_num

1

N831AA

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AWS Glue

Tables

Announcing new optimization features for Apache Iceberg tables

Optimize storage for Apache Iceberg tables with automatic snapshot retention and orphan file deletion. [Learn more](#)

Tables

A table is the metadata definition that represents your data, including its schema. A table can be used as a source or target in a job definition.

Tables (8)

Last updated (UTC) December 5, 2024 at 04:05:54

Delete

Add tables using crawler

Add table

View and manage all available tables.

Filter tables

	Name	Database	Location	Classification	Deprecated	View data	Data quality	Column statis...
	actfeb24	a2assignmentgroup	s3://normalized202	Parquet	-	Table data	View data quality	View statistics
	airline_id	a2assignmentgroup	s3://normalized202	Parquet	-	Table data	View data quality	View statistics
	airport_id	a2assignmentgroup	s3://normalized202	Parquet	-	Table data	View data quality	View statistics
	feb23	a2assignmentgroup	s3://normalized202	Parquet	-	Table data	View data quality	View statistics
	feb24	a2assignmentgroup	s3://normalized202	Parquet	-	Table data	View data quality	View statistics
	jan23	a2assignmentgroup	s3://normalized202	Parquet	-	Table data	View data quality	View statistics
	mar23	a2assignmentgroup	s3://normalized202	Parquet	-	Table data	View data quality	View statistics
	mar24	a2assignmentgroup	s3://normalized202	Parquet	-	Table data	View data quality	View statistics

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