Week 7

Flight Delay Analytics

1. Key Metrics (KPIs)

Metric	Value	Meaning
Avg Arrival Delay	60.91 min	Mean delay of arrivals
Avg Departure Delay	57.50 min	Mean delay before takeoff
Flights Counted	485K	Total flights recorded
Flights On-Time	479K	No dep/arr delay
Avg Delay by Carrier	60.91 min	Mean delay grouped by airline
Flights per Airline (Avg)	5511	Mean flights served per carrier

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2. DAX Measures Used

Flight Count

```
TotalFlights = COUNTROWS('Flight_delay (2)')
```

On-Time Flights

```
OnTimeFlights =
CALCULATE(
    COUNTROWS('Flight_delay (2)'),
```

```
    'Flight_delay (2)'[ArrDelay] <= 0 &&
    'Flight_delay (2)'[DepDelay] <= 0
)
```

Percent On-Time

```
PercentOnTime = DIVIDE([OnTimeFlights], [TotalFlights], 0)
```

Average Delays

```
AvgArrivalDelay = AVERAGE('Flight_delay (2)'[ArrDelay])
AvgDepartureDelay = AVERAGE('Flight_delay (2)'[DepDelay])
```

Average Delay by Carrier

```
AvgDelayByCarrier =
AVERAGEX(
    'Flight_delay (2)',
    'Flight_delay (2)'[ArrDelay]
)
```

Delay Cause Totals

Delay Type	DAX
Carrier Delay	SUM('Flight_delay (2)'[CarrierDelay])
NAS Delay	SUM('Flight_delay (2)'[NASDelay])
Security Delay	SUM('Flight_delay (2)'[SecurityDelay])
Weather Delay	SUM('Flight_delay (2)'[WeatherDelay])
Late Aircraft Delay	SUM('Flight_delay (2)'[LateAircraftDelay])

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3. Visuals Included & Purpose

KPI Cards

- Avg arrival & departure delays
- Flights counted
- Flights on time

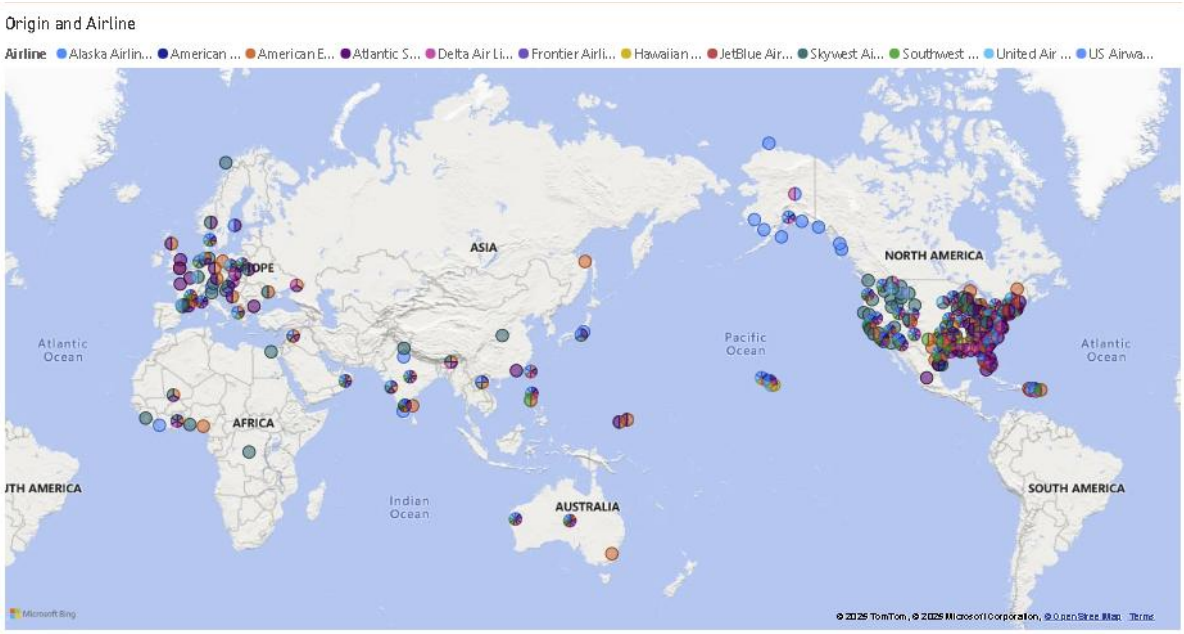
- Avg delay by carrier

These provide a quick high-level operational summary.

Global Map – Origin & Airline

Shows worldwide flight origin distribution and airline density.

Insight:
Most activity is concentrated in the US; European & Asian clusters exist but less dense.



Avg Arrival Delay by Airline (Bar Chart)

Ranks airlines by mean arrival delay.

Insight:

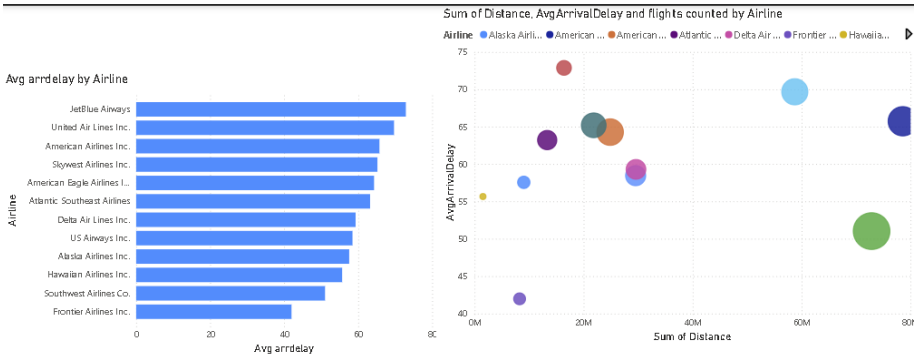
- JetBlue has highest delays.
- Frontier, Hawaiian show lower delays.

Scatter Plot: Delay vs Distance vs Flights

Dimensions:

- X = total distance
- Y = avg arrival delay

- Bubble size = flight count



Flights Counted by Airline

Insight:
Southwest > American > Skywest are top carriers by flight volume.

Total Delay by Airline

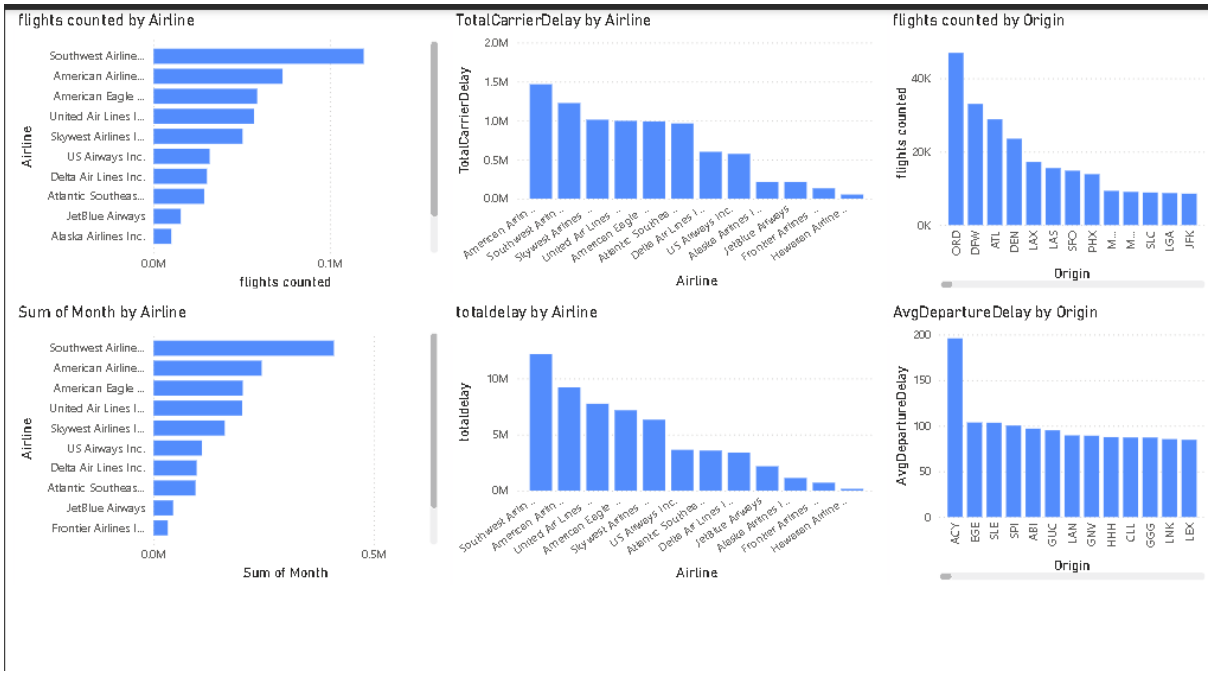
Stacked contributors to total delay.

Insight:
Southwest shows highest total delay volume.

Avg Departure Delay by Origin

Ranks airports based on departure punctuality.

Insight:
Busy hubs show worse delays.



Delay >15 min by Airline (Pie)

Proportion of significantly delayed flights.

Insight:
Southwest + American responsible for a majority share.

NAS Delay Visualization

Highlights NAS route/traffic-caused delay distribution.

Insight:
Major carriers with high traffic volume suffer more NAS delays.

Delay Cause Comparison (Bar Set)

Shows:

- NAS Delay
- Carrier Delay
- Late Aircraft Delay
- Security Delay
- Weather Delay

Insight:

- **Late Aircraft** & **Carrier** delays dominate.
- Weather delay is small → operational inefficiency, not climate, is root cause.

Total Flights & On-Time Flights by Month

Combo chart (bar + line)

Insight:

- Flight volume fluctuates monthly.
- On-time flights remain relatively stable.
- Seasonal peaks do not drastically reduce punctuality.

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4. Combined Key Insights

Airline Performance

- JetBlue = highest avg arrival delay
- Frontier & Hawaiian = best performing
- Southwest & American = largest traffic + delay volume

Larger fleets face more operational pressure.

Airport Performance

- Major hub airports show highest departure delay
- Likely due to congestion & gate turnaround

Delay Causes

Cause	Contribution
Late Aircraft	Highest
Carrier	High
NAS	Moderate
Weather	Low
Security	Negligible

Conclusion:
Delays are chiefly operational / scheduling, not safety or weather.

Seasonality

- Flight volume varies by month
- On-time performance remains strong
- No major seasonal degradation

Correlations

- Distance not strongly correlated with delay
- High-volume airports → higher operational delay
- High-volume carriers → more delay burden

5**. Final Summary**

- Flight punctuality is **generally strong**, despite large flight volume.
- **JetBlue, American, Southwest** exhibit higher delays.
- Delays are primarily driven by **late aircraft + carrier issues**, not weather.

- Major airports show worse performance due to traffic saturation.
- Seasonal volatility in flights does not harm on-time delivery significantly.
- Distance does not determine delay levels; operations do.