FLY EMIRATES AIRLINE PERFORMANCE ANALYSIS – 2015

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1. Introduction

This project analyzes the performance of Emirates Airlines using the 2015 U.S. domestic flight dataset. The goal is to evaluate operational efficiency, delay patterns, cancellation trends, and provide actionable insights to enhance airline and airport performance. The dashboard enables key stakeholders to make data-driven decisions that improve reliability, customer satisfaction, and logistics planning.

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2. Methodology

Data Sources:

- flights.csv: Core flight data including schedule, delays, cancellations
- airlines.csv: Airline IATA codes and names
- airports.csv: Airport names, locations, and codes

Tools Used:

- SQL (PostgreSQL) for data extraction and transformation
- Power BI for dashboard creation and interactive visuals

Data Preparation Highlights:

- Converted scheduled and actual time fields to proper time formats
- Mapped cancellation reasons (A/B/C/D) to labels (Carrier, Weather, etc.)
- Integrated airline and airport metadata into main flight table
- Removed nulls and blanks from critical fields (airline, airport, delay)

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3. Project Workflow: SQL → Power BI

Phase	Task	Tool
1–2	Data Cleaning, Prep, SQL KPIs	PostgreSQL
3–4	Dashboard Development	Power BI
5–6	Insight Generation + Reporting	Word/PDF, PowerPoint

Steps:

1. Clean and analyze the data using SQL (join tables, calculate KPIs, handle nulls)
2. Load final output into Power BI for visual analysis
3. Create dashboards with slicers, DAX measures, and visuals
4. Generate insights and present findings in a structured report and slide deck

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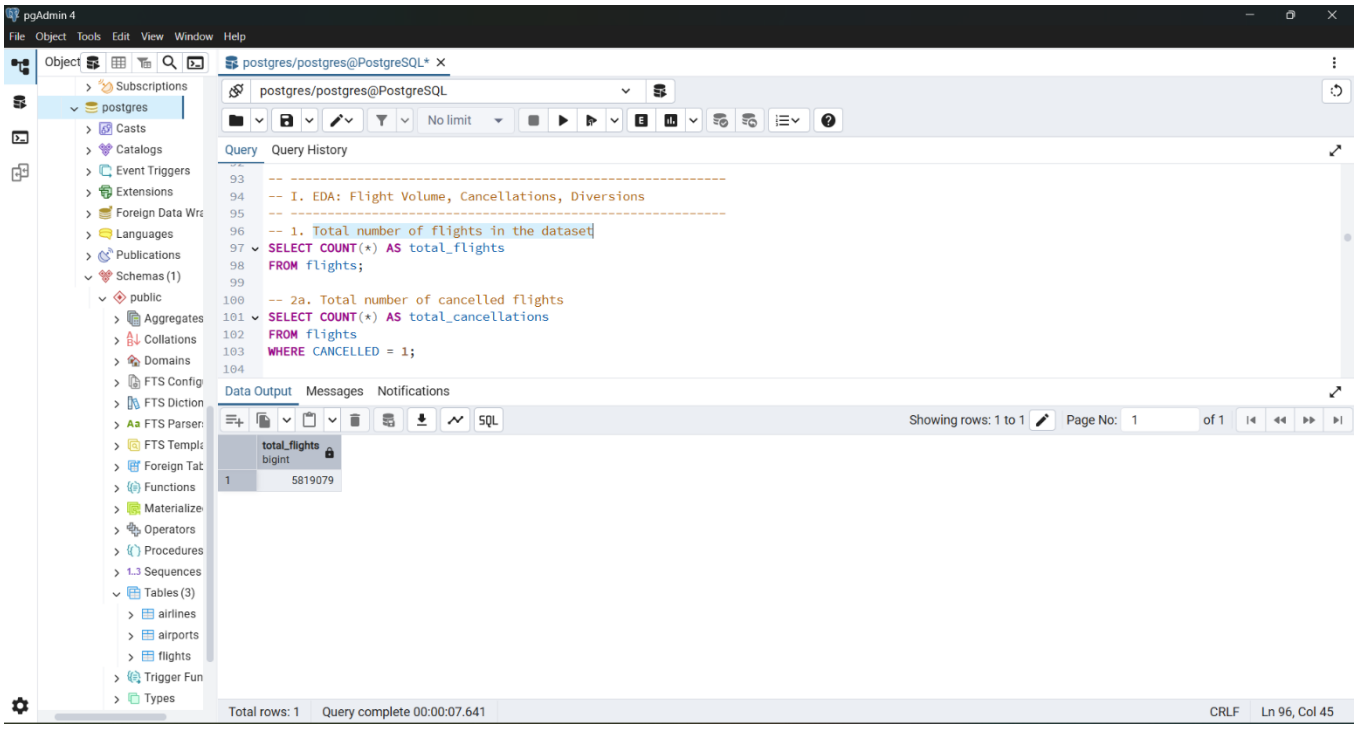
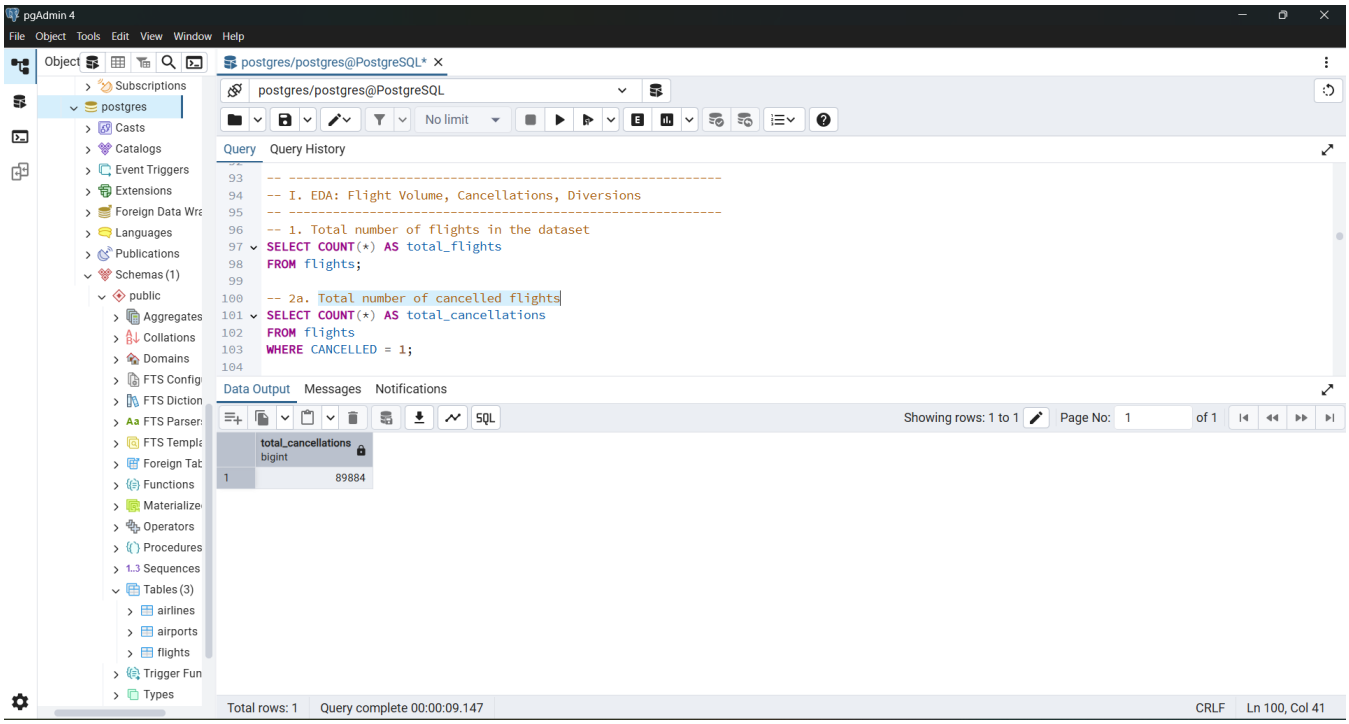
4. SQL Queries

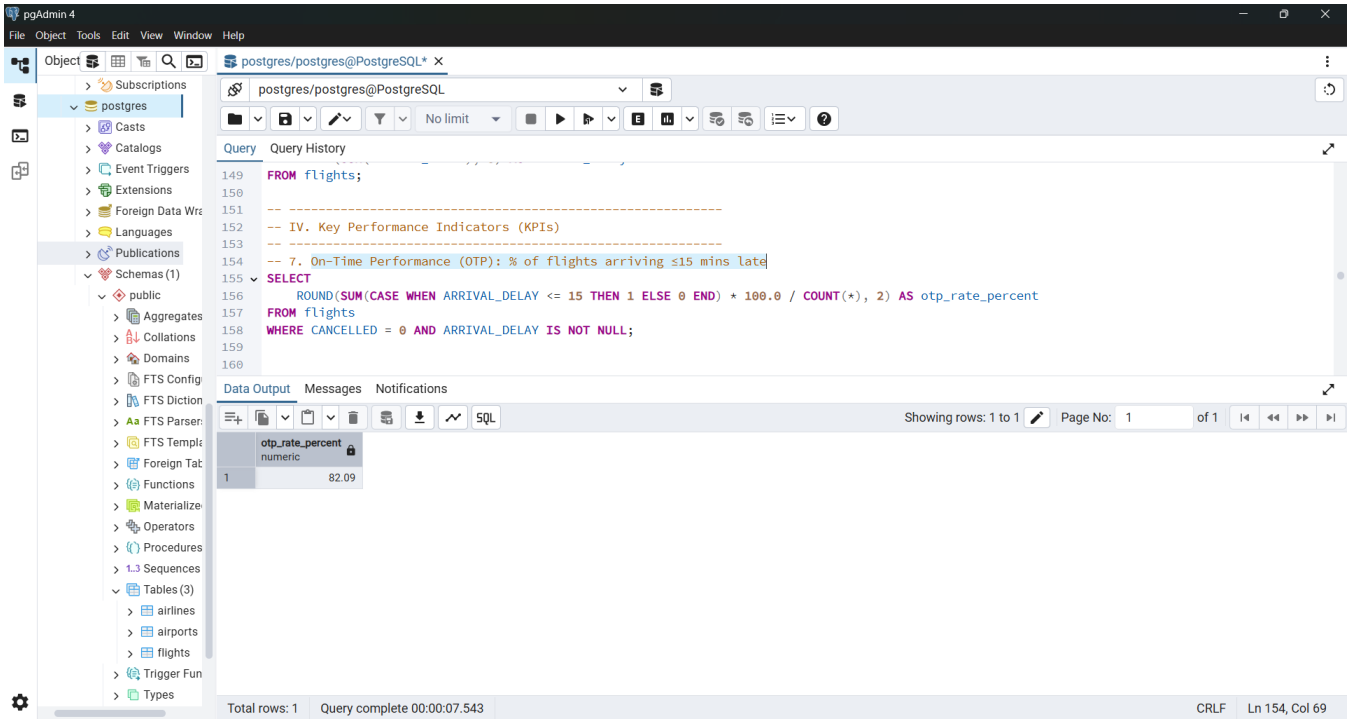
4a. Total number of flights in the dataset



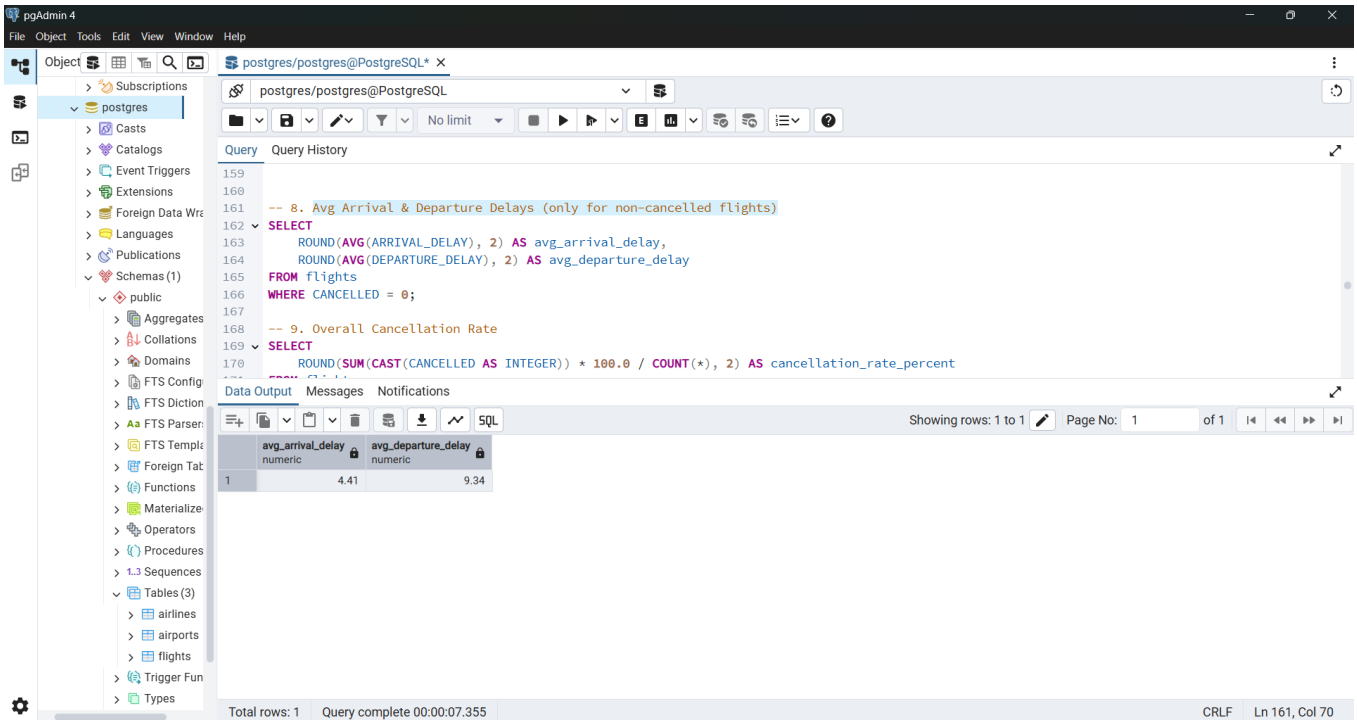
4b. Total number of cancelled flights



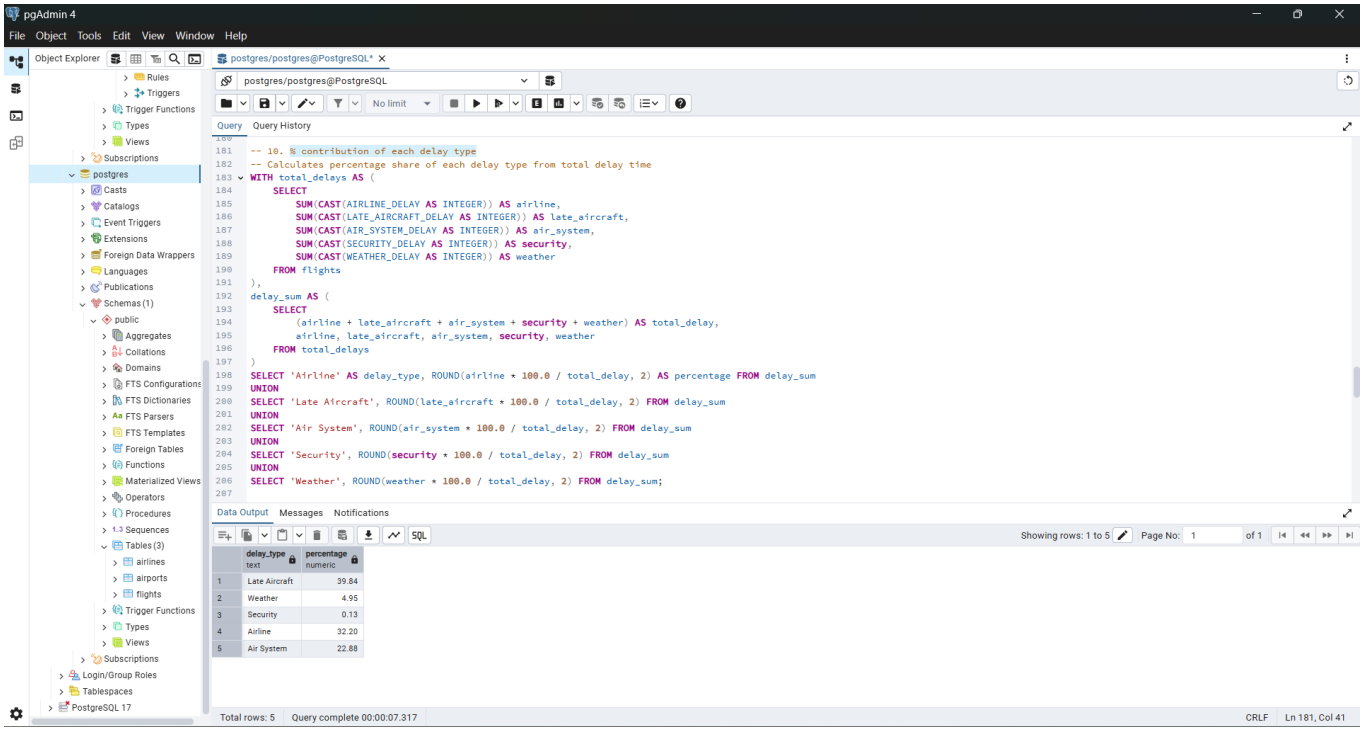
4c. On-Time Performance (OTP): % of flights arriving ≤15 mins late



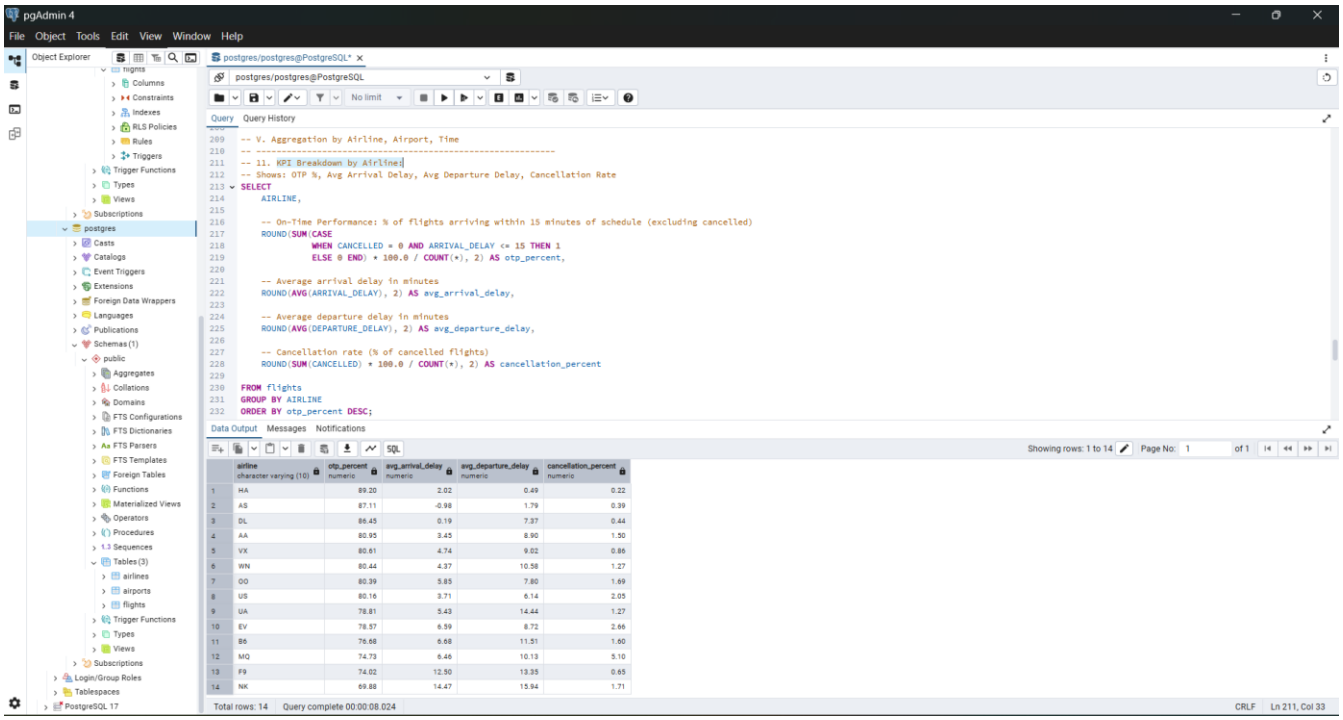
4d. Avg Arrival & Departure Delays (only for non-cancelled flights)



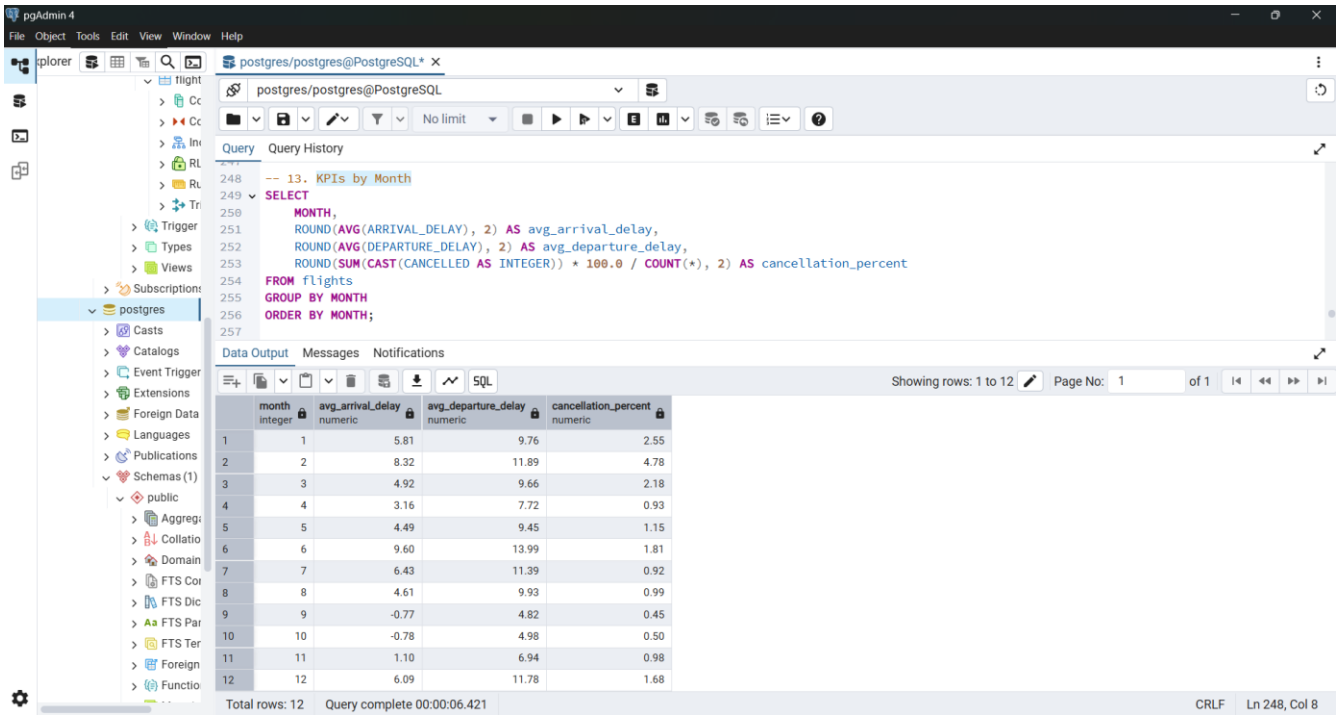
4e. % contribution of each delay type



4f. KPI Breakdown by Airline:



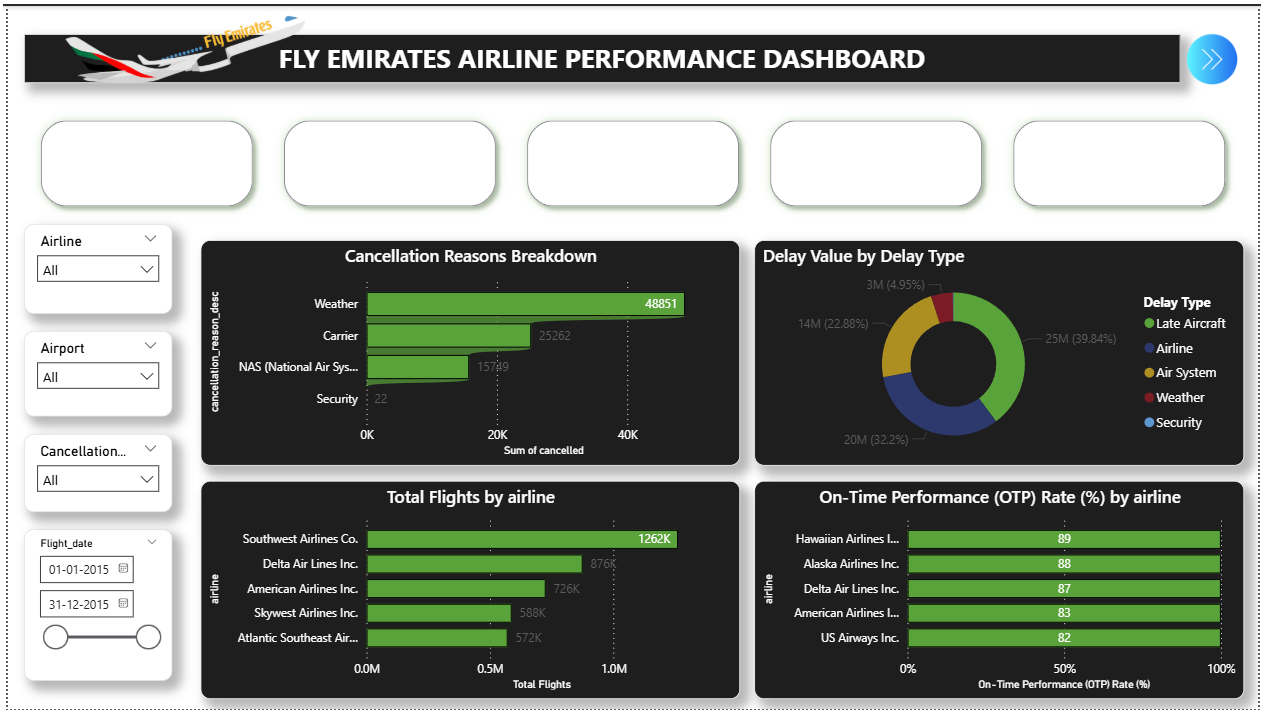
4g. KPIs by Month



5. Dashboard Overview

Page 1: Overview Dashboard

Key KPIs: Total Flights, On-Time Rate, Avg Delay, Cancellation Rate
Delay by cause, cancellation by reason, top airlines by volume



Key Insights – Page 1: Overview Dashboard (Summary)

1. **On-Time Rate at 82.4%**
   Industry-wide performance is moderate; Hawaiian & Alaska Airlines set the benchmark (>88%).

2. **Weather & Carrier = Top Cancellation Reasons**
   Weather caused ~49K cancellations, followed by ~25K due to carrier-related issues.

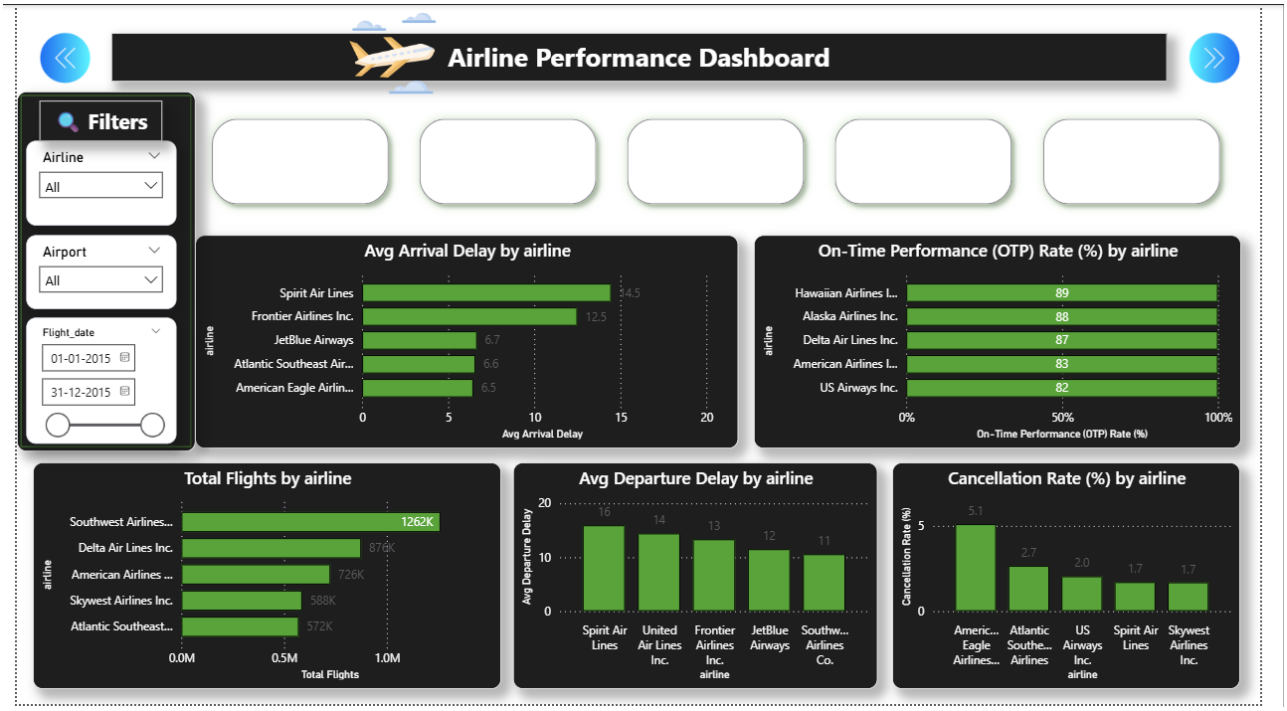
3. **Late Aircraft Drives Most Delays**
   Accounts for ~40% of total delay minutes — highlights turnaround inefficiencies.

4. **Southwest Airlines = Highest Volume**
   Operated 1.26M flights, showing significant exposure to delays and cancellations.

5. **Departure Delays Worse than Arrival**
   Avg departure delay: 9.37 mins vs. arrival delay: 4.41 mins — suggests ground-level issues.

Page 2: Airline Performance

Comparison of airlines by average arrival/departure delay, total flights, and cancellation rates



Key Insights – Page 2: Airline Performance (Summary)

1. **Spirit & Frontier = Worst Delay Offenders**
   Spirit: Avg Arrival 14.5 mins, Departure 16 mins — Frontier close behind. Indicates poor turnaround efficiency.

2. **Southwest Leads in Flight Volume**
   Operated 1.26M flights — ~45% more than Delta — yet maintains low delays, showcasing strong operations.

3. **American Eagle = High Cancellation Rate**
   5.1% cancellations — nearly 2× higher than peers — signals major reliability issues.

4. **JetBlue & Delta Perform Consistently Well**
   Balanced metrics across delays and OTP — Delta especially shows scalable best practices.

Page 3: Airport Performance

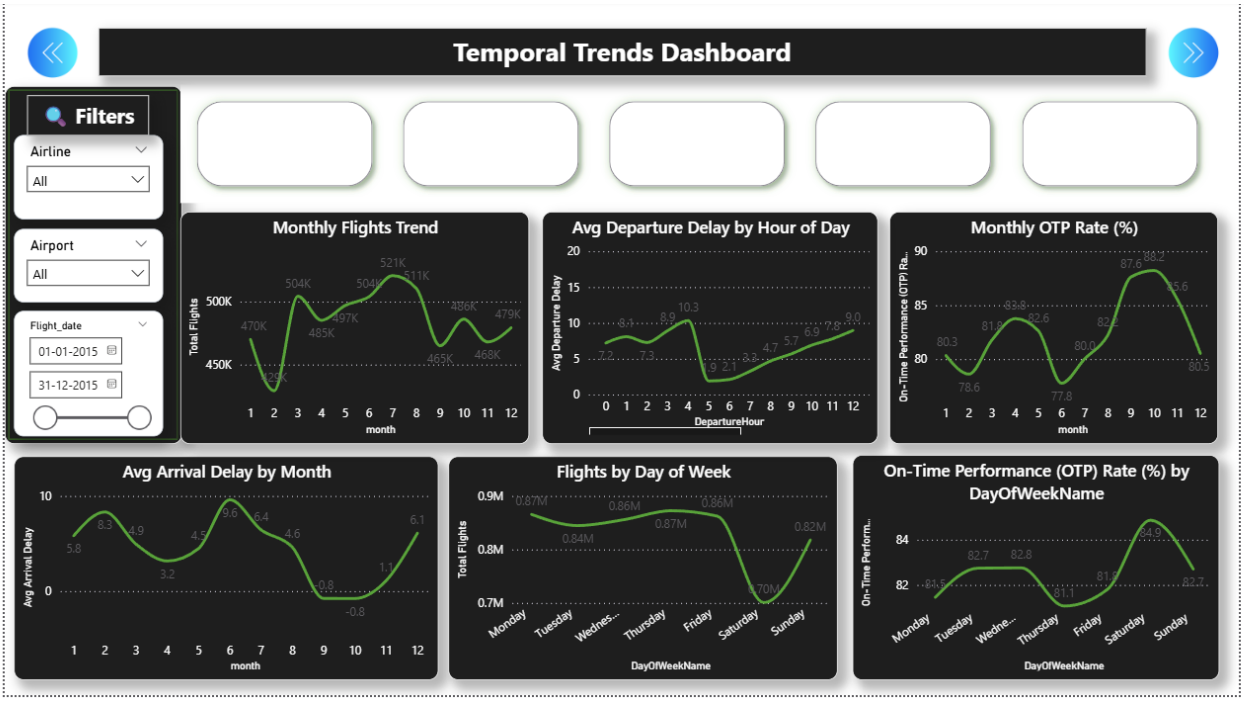
Average delays and cancellation rates across major and regional U.S. airports

Key Insights – Page 3: Airport Performance (Summary)

1. **Wilmington Airport = Highest Delay**
   Avg Departure: 29 mins, Avg Arrival: 24 mins — indicates persistent inefficiencies.
2. **Top 3 Busiest Airports Operate Smoothly**
   ATL (347K), ORD (286K), DFW (240K) — manage high volume with stable delays, showing strong capacity planning.
3. **Ithaca Airport = Highest Cancellation Rate**
   11.8% cancellations — ~8× above average; other weak performers: Mammoth Yosemite, Friedman Memorial.
4. **Regional Airports Shine in OTP**
   Canyonlands (98%), Valdez (97%) excel in punctuality — aided by low congestion and simpler logistics.

Page 4: Temporal Trends

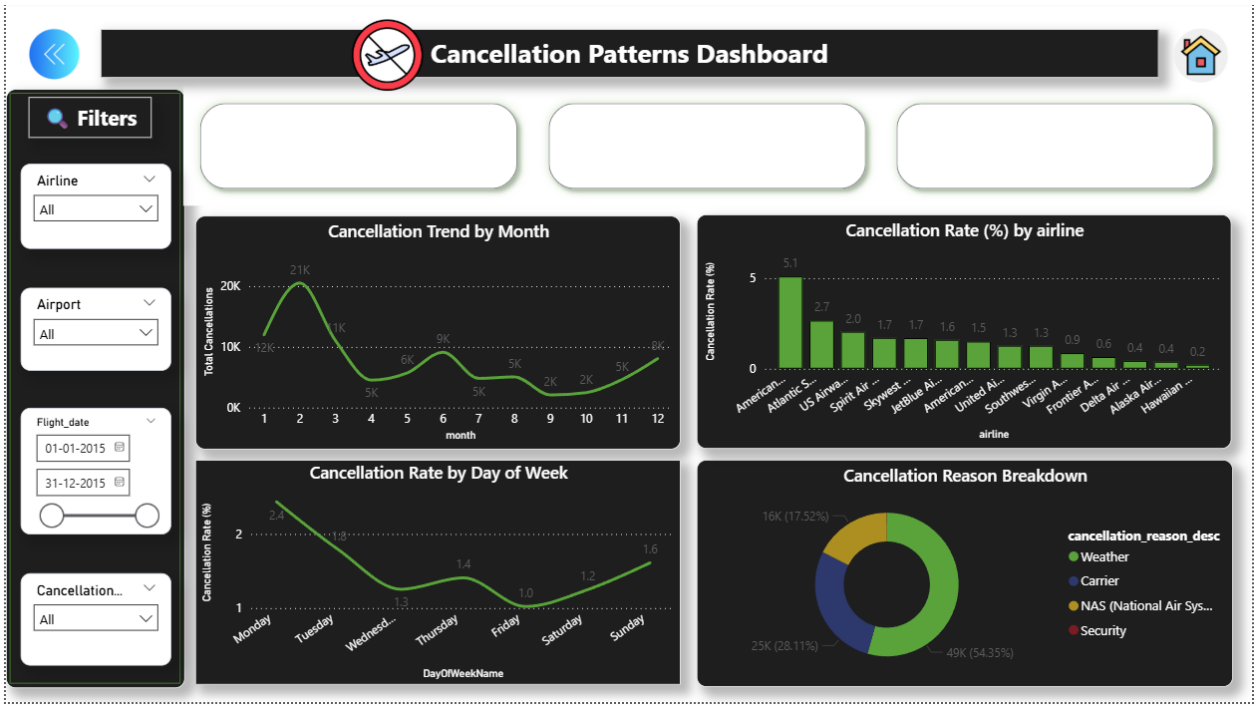
Trends in delays, flight volume, and cancellations by month, day, and hour



Key Insights – Page 4: Temporal Trends (Summary)

1. **Best OTP in November (88.2%)**
   Worst in March (77.8%) — shows seasonal efficiency shifts tied to weather/travel surges.
2. **5 AM Has Highest Departure Delays**
   Avg Delay: 10.3 mins — suggests early-morning prep and maintenance issues.
3. **April = Worst Arrival Delays**
   Avg: 9.6 mins — winter/spring weather may drive disruptions.
4. **Sunday = Least Busy but Best OTP**
   Lowest volume (0.70M), highest OTP (84.9%) — low congestion = better performance.
5. **Summer = High Volume, Poor Performance**
   June–August: peak flights but lower OTP and higher delays — likely system overload.

Page 5: Cancellation Patterns
Cancellations by airline, reason, and time periods (month/day)



❌ Key Insights – Page 5: Cancellation Patterns (Summary)

1. **Overall Cancellation Rate = 1.54%**
   ~90K out of 5.8M flights cancelled — moderately stable, but optimization is needed.
2. **March Has the Most Cancellations (~21K)**
   Peaks in Jan and Dec too — likely due to winter weather and holiday congestion.
3. **American Airlines = Highest Cancellation Rate (5.1%)**
   Nearly double that of second-highest (Atlantic Southeast) — suggests internal inefficiencies.
4. **Cancellations Spike on Mondays & Sundays**
   Mondays: 2.4%, Sundays: 1.6% — linked to travel peaks, crew shifts, or congestion.
5. **Weather = #1 Cause (54.35%)**
   Followed by Carrier (28.11%) and NAS (17.52%) — calls for better weather planning and carrier-side process improvements.

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6. Key Insights

From Page 1: Overview Dashboard

- Overall On-Time Performance: 82.41%
- Weather-related cancellations are highest (48,851 flights)
- Late Aircraft is the top delay contributor (~40% of total delay minutes)
- Southwest Airlines handled 1.26M flights

From Page 2: Airline Performance

- Spirit Airlines has highest delays: 14.5 min (arrival), 16 min (departure)
- American Eagle has the highest cancellation rate at 5.1%
- Delta and JetBlue balance high volume with lower delays

From Page 3: Airport Performance

- Wilmington Airport has the worst delays (29 min avg departure)
- Ithaca shows highest cancellation rate (11.8%)
- Canyonlands Field and Valdez Airport show 95%+ OTP

From Page 4: Temporal Trends

- March has the highest cancellations (~21K flights)
- 5 AM has the worst average departure delays
- Sundays have best OTP and lowest volume

From Page 5: Cancellation Patterns

- 54% of cancellations due to weather
- American Airlines has 5.1% cancellation rate
- Mondays show the most cancellations by day

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7. Recommendations

1. **Reduce Late Aircraft Delays:** Improve gate turnaround and ground team efficiency
2. **AI-Driven Weather Planning:** Use predictive models to manage high-risk months (March, Dec, Jan)
3. **Redistribute Early Morning Flights:** Avoid congestion and delays at 5 AM
4. **Optimize American Airlines Operations:** Focus on hub-level audits and real-time staffing

5. **Support Regional Airports:** Improve weather-readiness and alternate routing at airports like Ithaca

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8. Conclusion

The dashboard reveals strong operational patterns and clear opportunities for improvement. By optimizing schedules, enhancing coordination, and investing in predictive planning, stakeholders can reduce delays and cancellations while improving the passenger experience. Future analysis may include 3-year trends and external factors (e.g., aircraft type, crew rotation).
