AIRLINES ANALYSIS REPORT

1. Metrics explanation

Metrics	Description	DAX formula
%_lateaircraft_delay	Late aircraft delay percentage	%_lateaircraft_delay = [Num_late_aricraft_delay]/ [Total_delayed_flight]
%_NAS_delay	NAS delay percentage	%_NAS_delay = [Num_NAS_delay]/ [Total_delayed_flight]
%_weather_delay	Weather delay percentage	%_weather_delay = [Num_weather_delay]/ [Total_delayed_flight]
Avg_LateAircraft_Delay_Time	Average delay time caused by Late aircraft delay per flight	Avg_LateAircraft_Delay_Time = SUM(airlines[LATE_AIRCRAFT_DELAY])/ [Num_late_aricraft_delay]
Flight_category	Flight classifications based on planned time amount needed for the flight trip	Flight_category = SWITCH(TRUE(), airlines[CRS_ELAPSED_TIME] < 180, "Short-haul", airlines[CRS_ELAPSED_TIME] >= 180 && airlines[CRS_ELAPSED_TIME] < 360, "Medium-haul", airlines[CRS_ELAPSED_TIME] >= 360, "Long-haul", "Unknown")
Num_carrier_delay	Number of flights delayed by Carrier	Num_carrier_delay = CALCULATE(COUNTROWS(airlines), FILTER(airlines, airlines[CARRIER_DELAY] >0))
Num_late_aricraft_delay	Number of flights delayed by Late aircraft delay	Num_late_aricraft_delay = CALCULATE(COUNTROWS(airlines), FILTER(airlines, airlines[LATE_AIRCRAFT_DELAY] >0))
Num_NAS_delay	Number of flights delayed by NAS	Num_NAS_delay = CALCULATE(COUNTROWS(airlines), FILTER(airlines, airlines[NAS_DELAY] >0))
Num_security_delay	Number of flights delayed by Security	Num_security_delay = CALCULATE(COUNTROWS(airlines), FILTER(airlines, airlines[SECURITY_DELAY] >0))
Num_weather_delay	Number of flights delayed by Weather	Num_weather_delay = CALCULATE(COUNTROWS(airlines), FILTER(airlines, airlines[WEATHER_DELAY] >0))

Total_airtime_PerAircraft_PerDay	Total airtime per aircraft per day	Total_airtime_PerAircraft_PerDay = CALCULATE(SUM(airlines[AIR_TIME]), ALLEXCEPT(airlines, airlines[OP_CARRIER_FL_NUM], airlines[FL_DATE]))
Total_days_used_PerAircraft	Number of days each aircraft was used	Total_days_used_PerAircraft = CALCULATE(DISTINCTCOUNT(airlines[FL_DATE]), ALLEXCEPT(airlines, airlines[OP_CARRIER_FL_NUM]))
Total_flights	Number of flights throughout the period	Total_flights = CALCULATE(COUNTROWS(airlines))
Utilization_rate	Daily average hours of usage per aircraft	Utilization_rate = DIVIDE([Total_airtime_PerAircraft_PerDay], [Total_days_used_PerAircraft], 0)/60

2. Flight delay analysis

This report focuses on analyzing flight delay reasons, including Carrier delay, NAS delay, Late aircraft delay and Weather delay.

2.1. Carrier delay & NAS delay

2.1.1. Carrier delay

+ Aircraft **15, 1, 16, 7, 3, 12, 2, 8, 19, 14** were in the top 10 aircrafts with highest **utilization rates**, ranging from **25.21** to **34.73** hours/ day.

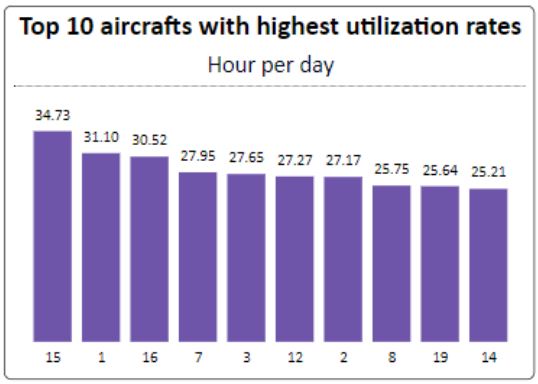
+ Most of the flights assigned to these aircraft were **short-haul (41.14%)** and **medium-haul (39.36%).**

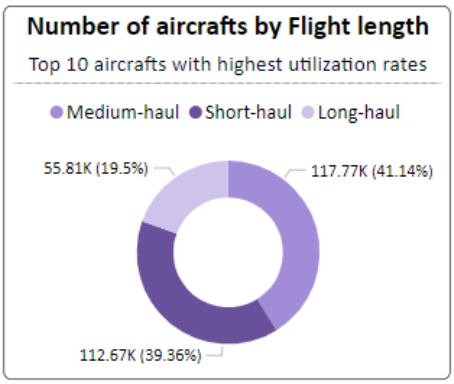
+ The delay reason occurring the most frequently in those flights was **Carrier delay**, with 7 out of 10 aircrafts having more delayed flights caused by Carrier than the others.

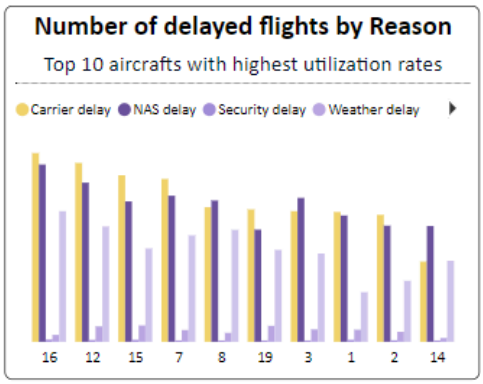
⇒ The reason caused delayed flights could be **aircraft maintenance**, which is included in Carrier delay:

+ High utilization rates of those aircrafts → more frequent maintenance → more potential delays.

+ The aircrafts used for short-haul & medium-haul flights are often less fuel-efficient than those of long-haul flights → maintenance might be needed to improve fuel efficiency → more delays.



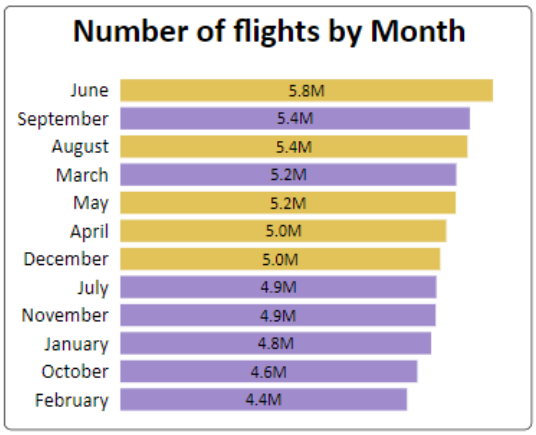


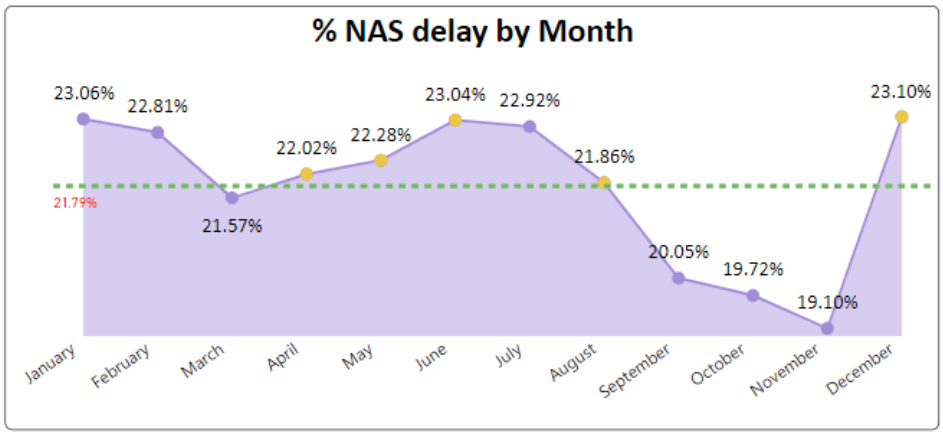


2.1.2. NAS delay

+ The number of flights were high in **April, May, June, August, December,** which also had higher % of NAS delays (**22.02%, 22.28%, 23.04%, 21.86%, 23.01%** respectively) than the NAS monthly average % **(21.79%)**

⇒ High demand in these months seem to cause **air traffic congestion** (included in NAS delay) → higher % of NAS delays.





2.2. Late aircraft delay & Weather delay

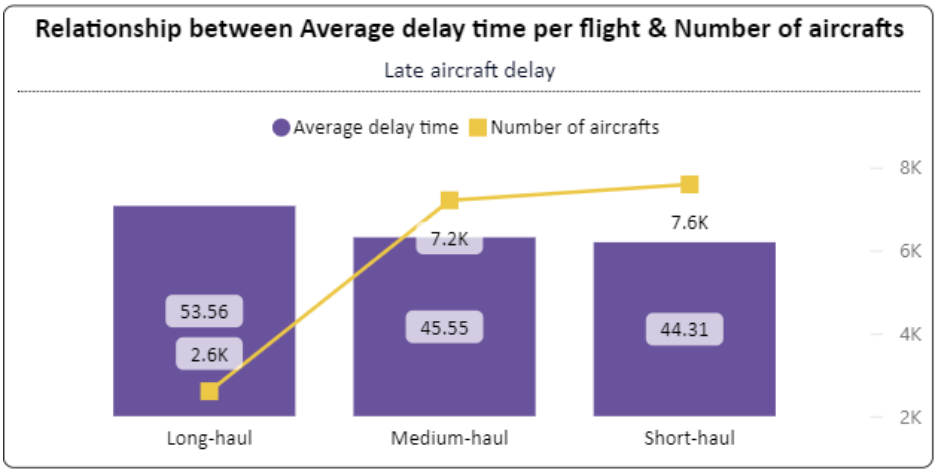
2.2.1. Late aircraft delay

(1)

+ The long-haul flights had the highest average time of late aircraft delay per flight (53.56 minutes), followed by medium-haul flights (45.55 minutes) and short-haul flights (**44.31** minutes).

+ The number of aircrafts of long-haul flights was **2.6K** - the lowest one, **7.2K** for medium-haul and **2.6K** for short-haul flights .

⇒ This negative relationship between **average time of late aircraft delay per flight** and the **number of aircraft** of each flight type seems to show that if airlines had fewer available aircrafts to replace the one arriving late → delay time increase.

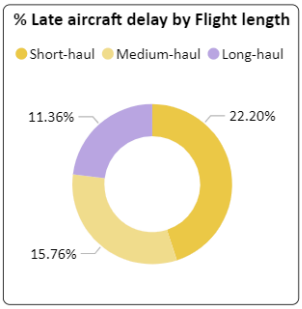


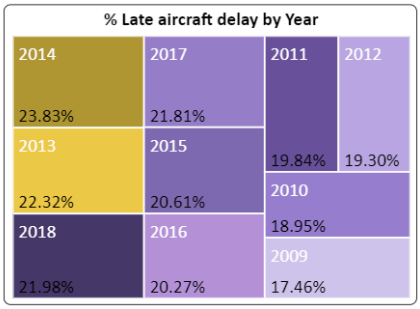
(2)

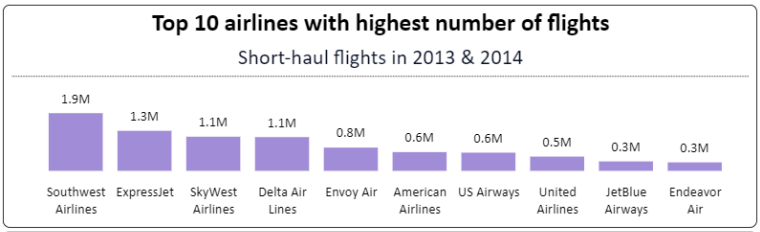
+ The highest % of late aircraft delays were **short-haul flights (22.20%)** and in **2013 & 2014 (23.83% & 22.32%).**

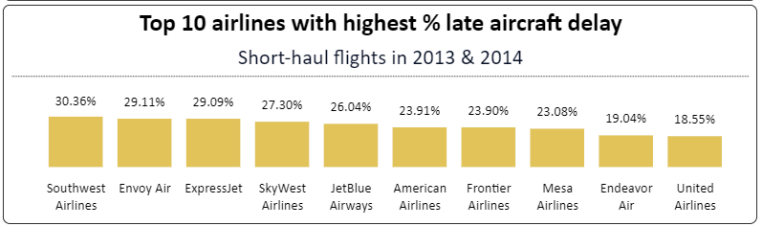
+ Most of the airlines which had the highest number of short-haul flights in these years also had high % of late aircraft delays (**Southwest Airlines, ExpressJet, SkyWest Airlines, Envoy Air, American Airlines, United Airlines, Jetblue Airways).**

⇒ There were many short-haul flights in those years which normally have short turnaround time between the flights → higher chance of late aircraft delay.





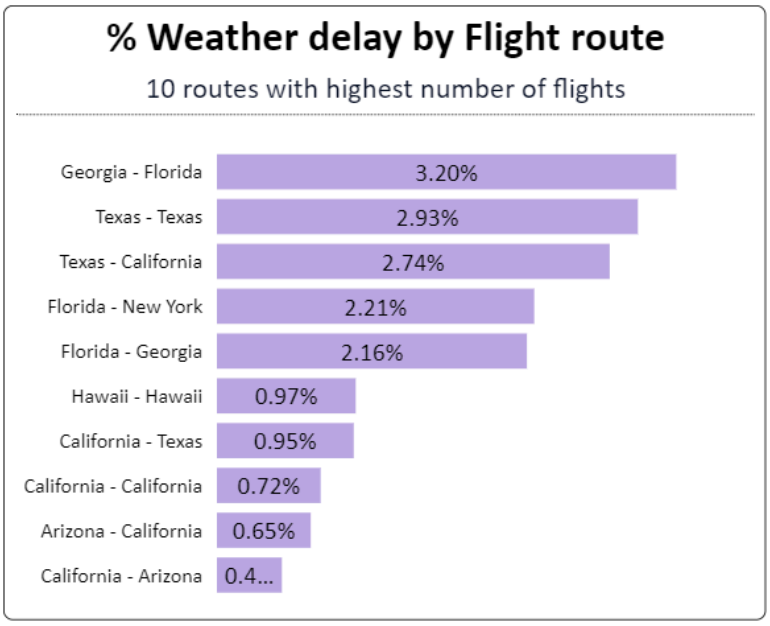




2.2.2. Weather delay

+ In the top 10 flight routes having the highest number of flights, weather delays often happened in the routes with **Georgina, Texas, Florida, California**, **Arizona.**

⇒ Tornadoes, thunderstorms, hurricanes usually occur in these states → higher % of weather delay.



3. Recommendations for minimizing flight delays

- **Carrier delay:** Invest in newer, more advanced aircrafts which require less maintenance compared to older ones.
- **NAS delay**: Encourage customers to choose flights during off-peak times by offering them lower flight fares, which helps manage demand for the busy routes.
- **Late aircraft delay**: Adjust the turnaround time among the short-haul flights and/ or investing in more aircrafts to lower the chance of delays.
- **Weather**: Use more advanced weather forecasting technology to better predict the possible delays in the states with severe weather.