10-Year U.S. Airline Performance Analytics (2009–2018)

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This report summarizes performance metrics for U.S. domestic airlines over a 10-year period using a 3GB dataset processed in Hadoop/Cloudera, queried via Hive, and visualized in Power BI.

PROJECT OVERVIEW
- Time Frame: 2009-2018
- Tools Used: Hadoop (Cloudera), Hive, Power BI
- Focus Areas: Delay metrics, Air Time, Diversions, Scheduled vs. Actual, Carrier analysis

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KEY METRICS TRACKED
- On-Time Arrival Rate (%)
- Average Arrival & Departure Delay (mins)
- % of Flights Delayed
- Longest Delay (hrs)
- Average Air Time (hrs)
- Diversion patterns by airport
- Carrier-level performance
- Scheduled vs. Actual time
- Taxi-in/out duration

OVERALL PERFORMANCE SUMMARY (2009-2018)
Best Year: 2016 (lowest delays, highest on-time rate)
Worst Year: 2014 (highest delays)
Highest Air Time: 2018 (long-haul growth)
Longest Delay: 2017 (13.6h)

INSIGHTS & RECOMMENDATIONS (YEARLY)
2009:
- 3,503 Flights | 15% Delayed | On-Time Rate: 66%
- Longest Delay: 7.83h | Avg Air Time: 1.47h
- Key Issue: Carrier delays from YV, OH; Diversions from IAH/SLC
Recommendations:
1. Improve YV scheduling.
2. Address IAH and SLC diversion causes.
3. Optimize taxi times.
4. Adjust peak-hour buffers.
5. Staff training at high-delay airports.

2010:
- 9,576 Flights | 16% Delayed | Avg Delay: ~25 mins
- Worst Carrier Delays: MQ, US, DL
Recommendations:
1. Audit 9+ hr delays.
2. Gate planning for ATL, DEN.
3. Delay forecasting models.
4. Improve taxi sequencing.
5. Traffic balance across hubs.

2011:
- 2,383 Flights | 28% Delayed | Longest Delay: 7.3h
Recommendations:
1. Audit OO & MQ delay chains.
2. Manage west coast diversions.
3. Departure buffer reduction.

4. Trend analysis on UA.
5. Efficiency incentives.

2012:
- 1,006 Flights | 17% Delayed | Shortest avg air time (1.21h)
Recommendations:
1. Reduce taxi times (DEN, LAX).
2. Maintain turnaround standards.
3. Consolidate ops with OO.
4. Study traffic at SLC.
5. Short-haul consistency.

2013:
- 1,095 Flights | 28% Delayed | On-Time Rate: 45%
Recommendations:
1. Analyze low on-time despite avg delays.
2. Delay programs at LAX, DEN.
3. Increase short-haul frequency.
4. Monitor WN/VX turnaround sync.
5. Add alt routes for BWI/MCI.

2014:
- 1,006 Flights | 38% Delayed | Worst Year
- Longest Delay: 7.25h | Avg Arrival Delay: 41m
Recommendations:
1. Overhaul EV performance.
2. Peak schedule redesign.
3. Runway deconflict logic.
4. Gate automation.
5. Dashboards for ops staff.

2015:
- 1,009 Flights | 24% Delayed | Avg Delay: ~32 mins
Recommendations:
1. Gates at SEA/SLC for diversions.
2. Boost NK & MQ resourcing.
3. Taxi protocol enforcement.
4. Night flight buffers.
5. Performance policy tightening.

2016:
- 1,022 Flights | 8% Delayed | Best Year
- DL (66%) and AS (34%) carriers
Recommendations:
1. Model future ops on DL.
2. Study AS time precision.
3. Replicate diversion success.
4. Real-time loop feedback.
5. Expand top-performing routes.

2017:
- 1,011 Flights | 22% Delayed | Longest Delay: 13.6h
Recommendations:
1. Audit 13h+ delays.
2. JFK/BOS ground efficiency.
3. Replan peak aircraft slots.
4. Reduce AA/EV surge load.
5. Improve gate sequencing.

2018:
- 1,939 Flights | 13% Delayed | Highest Air Time (3.16h)
Recommendations:

1. Align UA-AS on long-hauls.
2. Boost turnaround efficiency.
3. Real-time airport alerts.
4. Peak arrival staggering.
5. Delay cluster analysis.

CROSS-YEAR STRATEGIC RECOMMENDATIONS

1. Use 2016 as baseline for ops design.
2. Audit EV, MQ, NK, YV regularly.
3. Improve diversion readiness (IAH, JFK, SFO).
4. Implement Hive-based forecasting.
5. SLA dashboards for all major carriers.