US Commercial Aviation Fleet Audit (2024)

7.09M Records | $4.6 Billion Liability | Python to Power BI

Executive Summary: Fleet Reliability Audit

SCALE

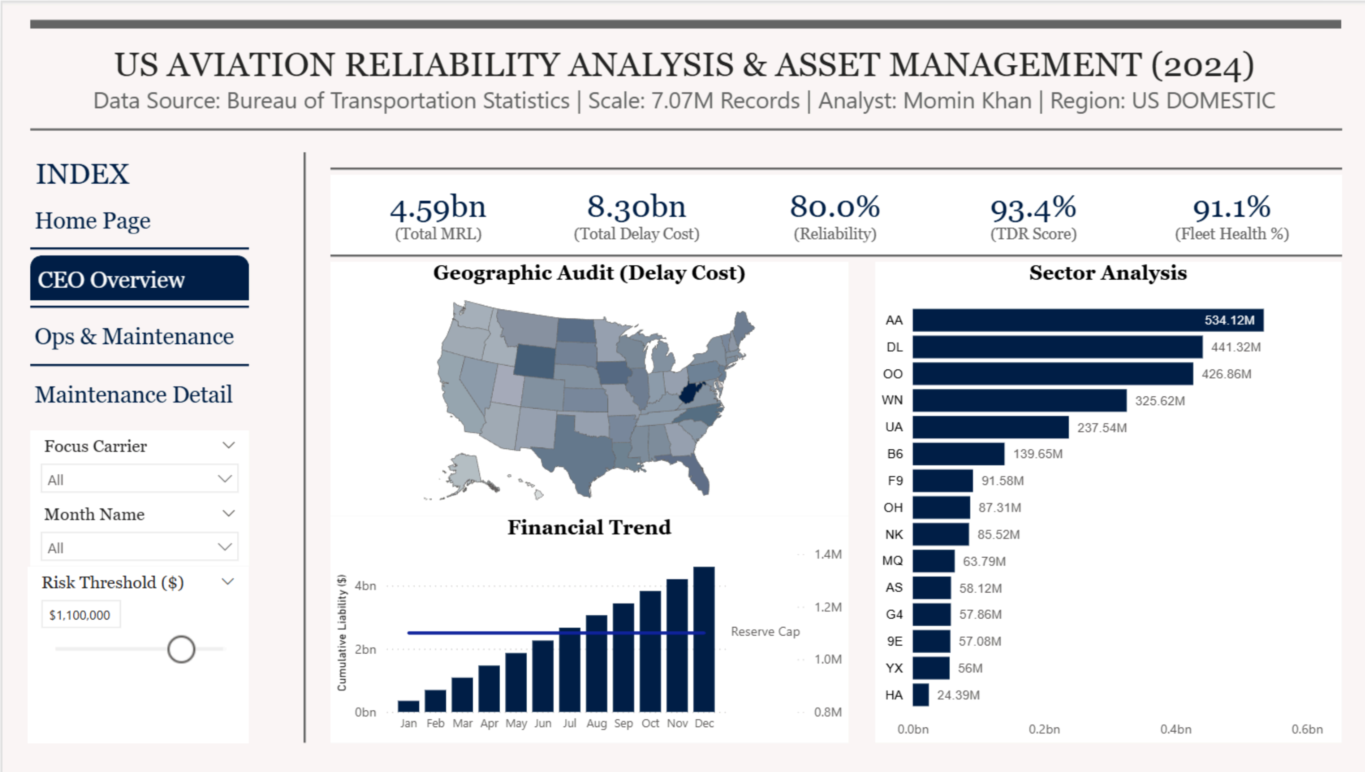
Ingested 7.09M flight records (BTS & FAA) to construct a comprehensive US domestic fleet baseline.

KPI ENGINEERING

Modeled real-time Technical Dispatch Reliability (TDR) to identify **$4.6B in delay liabilities**.

BUSINESS IMPACT

Deprecated legacy Excel workflows, reducing reporting latency from Monthly to **Sub-Second**.



Risk Segmentation: Isolating $150M Exposure

THE CHALLENGE

Fleet averages hide outliers. We need to find aircraft burning cash faster than they generate revenue.

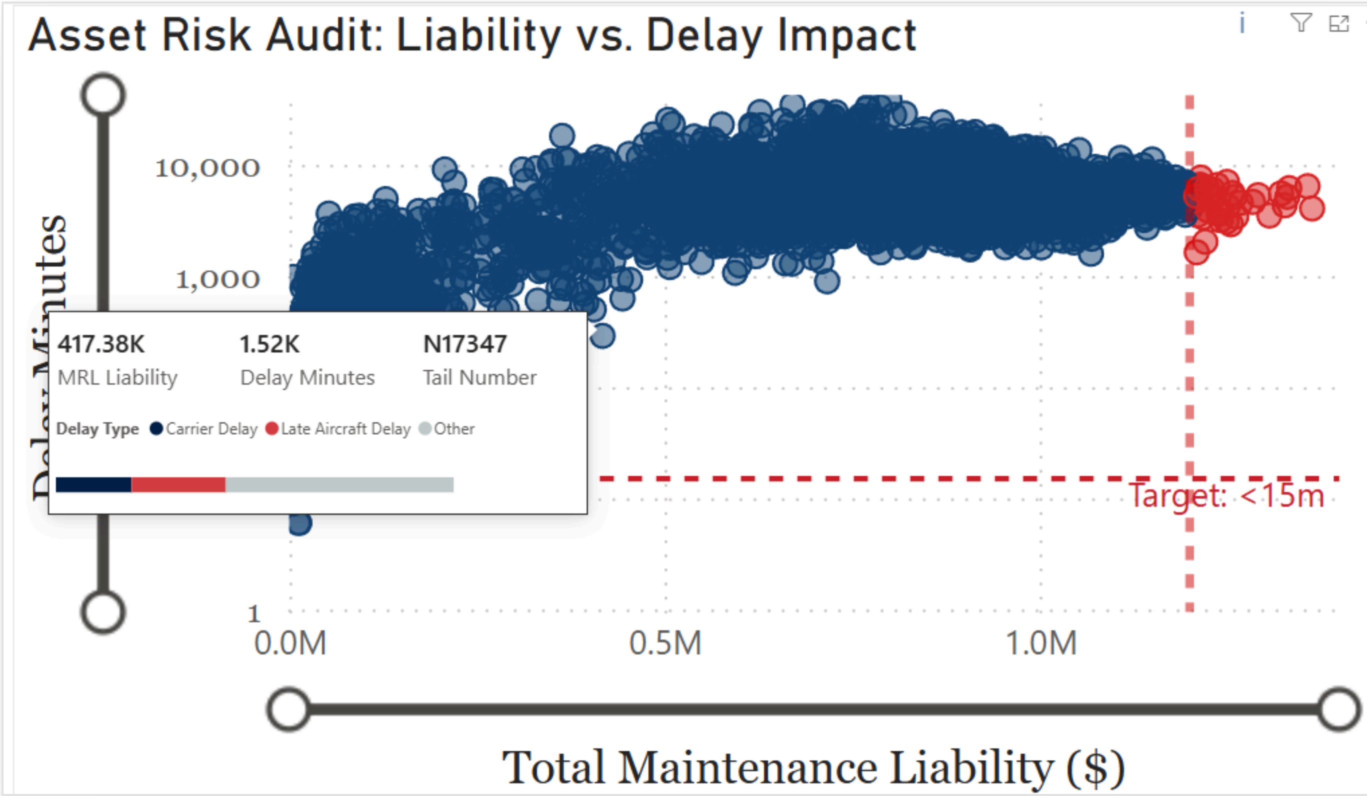
THE MODEL

A bottom-up "Burn Rate" algorithm calculated for every individual flight leg:

```
Liability = (Hours × $250) + (Cycles × $180)
```

PARETO INSIGHT

The Scatter Plot reveals that **5% of the fleet** (top-right quadrant) drives 80% of maintenance risk.



Root Cause Forensics: Traceability

THE PROBLEM

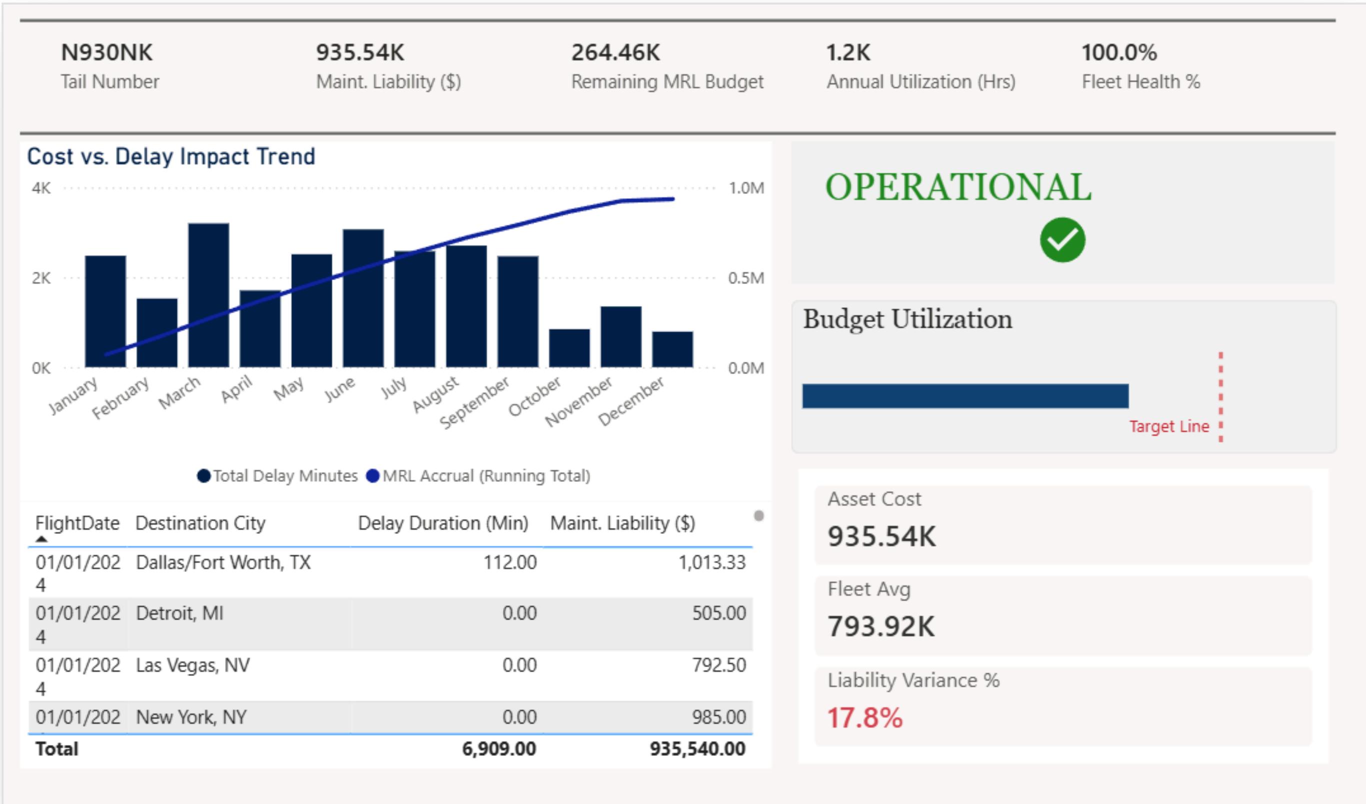
High-level dashboards often fail to explain *why* a metric is red.

THE SOLUTION

Engineered "Drill-Through" functionality. Right-click any executive metric to jump to the granular flight log.

DATA INTEGRITY

Validated against "Ghost Aircraft" audits to ensure no flight is attributed to the wrong airframe.



Engineering Scale: Star Schema Architecture

THE ARCHITECTURE

Standard Kimball Star Schema. Optimized for Power BI's VertiPaq engine.

FACT TABLE

Fact_Flights: Narrow, long table containing integer keys for high-speed aggregation.

PERFORMANCE RESULT

- Storage: Parquet compression reduced file size by ~85%.
- Speed: Dashboard refresh < 10 seconds.