✈️ Boeing 737 Fleet Reliability Dashboard

📌 Project Overview

Business Problem: Airlines face costly delays due to "Unscheduled Maintenance." The goal of this project was to analyze 500+ FAA Service Difficulty Reports (SDR) to determine which sub-systems of the Landing Gear (ATA Chapter 32) drive the most downtime.
The Solution: I engineered an end-to-end data pipeline to ingest raw unstructured text data from the FAA, normalize component names, and visualize reliability trends to drive preventative maintenance strategies.

🔍 Key Findings

1. **Sensor Failures:** 57% of defects are functional/avionics issues (low repair cost, high disruption), specifically Proximity Sensors and Switches.
2. **Seasonality:** Brakes & Tires show a **40% failure spike** in Summer months, correlating strongly with ambient temperature rise (Heat Soak).
3. **Operational Impact: 96%** of reported defects resulted in **AOG (Aircraft on Ground)** status, with only 4% eligible for deferral (MEL).
4. **Phase Analysis:** The highest volume of defects occurs during **Climb**, pointing to Retraction Actuator stress rather than Landing impact.

🛠️ Technical Workflow

1. Data Engineering (SQL)

- **Ingestion:** Loaded raw FAA CSV data into a local **MySQL** database.
- **Cleaning:** Handled data type inconsistencies (Text vs Int) and Null values in flight hours.
- **Logic:** Created a schema to handle 1-to-Many relationships between aircraft tail numbers and failure events.

2. Data Modeling (Power BI)

- **Star Schema:** Built a data model connecting the Fact Table (Defects) to Dimension Tables (Date, Temperature).
- **DAX Measures:**
    - 3-Month Moving Average to smooth volatility.
    - AOG Events calculated based on non-deferred status.
    - Risk Index calculated by weighting failure modes (Fire = 10, Leak = 5).

3. Visualization

- Designed a grid-layout dashboard mimicking internal aviation software tools.
- Implemented **Drill-Through** functionality to audit specific aircraft defect logs.
- Used **Tooltips** to reveal operational details (Deferral status) without cluttering the main view.

📂 Project Structure

- 00_Raw_Data: Source data file (FAA_SDR_Boeing737_ATA32_2024_2025.xlsx).
- 01_SQL_Scripts: Raw SQL queries used for data cleaning.
- 02_PowerBI: The .pbix file containing the dashboard and data model.
- 03_Case_Study_Report: A comprehensive PDF report detailing the business logic and insights.
- 04_Screenshots: Images used in this README.

📸 Operational Views

The Data Model (Star Schema)

Drill-Through Detail (Defect Log)

Tooltip Interaction (Defect Deferral)

📬 Contact

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