Ray-Onsongo / **dsc-Phase-one-project-Ray** 🔒

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Mawingu Airlines Aviation Expansion Project

Overview

Mawingu Airlines is exploring the potential to expand its business operations into the aviation sector. This data science project aims to assess the viability of acquiring aircraft based on a thorough analysis of aviation accident data. The final objective is to recommend low-risk aircraft for potential investment using data-driven insights.

Business Understanding

With the aviation industry being capital intensive and risk-laden, Mawingu Airlines seeks to minimize investment risk by relying on historical data. The key business questions are:

- What aircraft types are most prone to accidents?
- Are there patterns in aircraft accidents based on time, location, or flight phase?
- Which aircraft characteristics correlate with low incident rates?

The stakeholders include Mawingu Airlines' executive board and the new aviation division tasked with implementing expansion strategy.

Data Understanding and Analysis

📂 Source of Data

The dataset is sourced from the **National Transportation Safety Board (NTSB)**, covering aviation accident data from **1962 to 2023**. It includes records of civil aviation accidents and selected incidents across the United States and international waters. It was compiled into a dataset known as ***Aviation.csv***

📊 Description of Data

The dataset includes:

- Aircraft make and model
- Date and location of incidents
- Flight phase during the incident
- Injury severity
- Weather conditions
- - Flight purpose and more

Initial cleaning revealed substantial missing data in some columns:

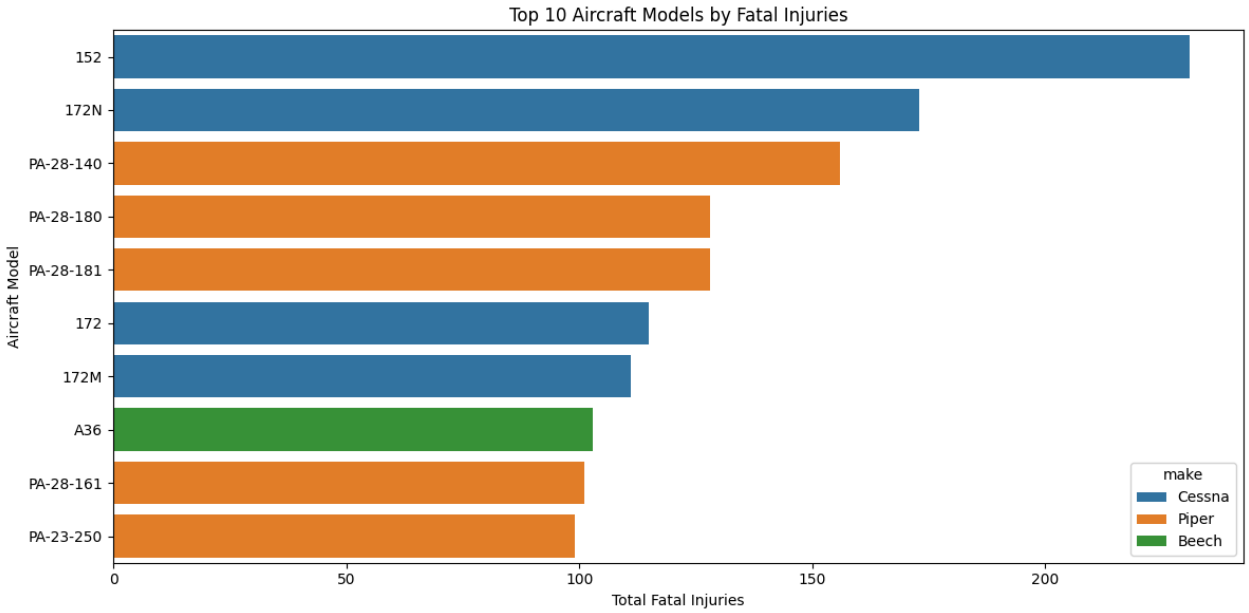
- Columns with >80% missing data (e.g., `Schedule`, `Air.carrier`) were dropped.
- Moderate and low-missing columns were imputed or cleaned for analysis.

• Visualizations

1. Top 10 Aircraft Models by Fatal Injuries

Top Fatal Models

A bar chart showing the top 10 aircraft models with the highest total number of fatal injuries.

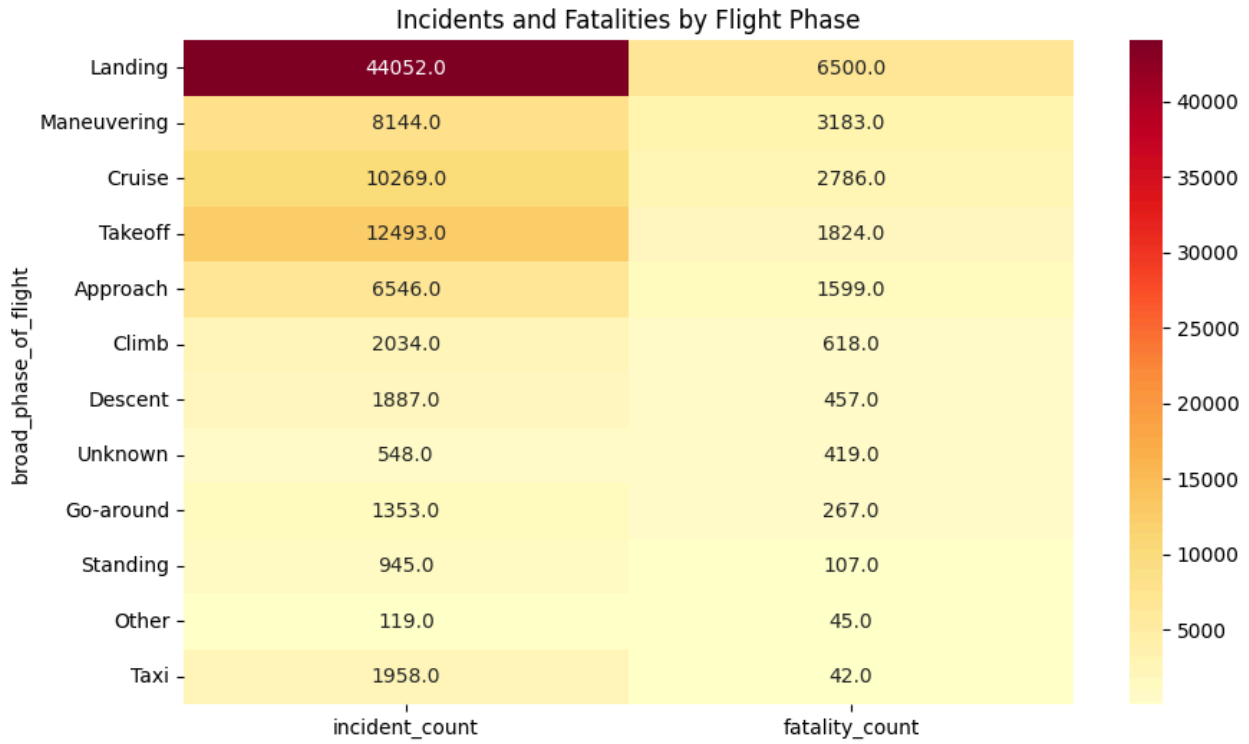


🟥 **Insight:** The **Cessna 152** and aircraft from **Cessna** and **Piper** brands appear frequently, suggesting high safety concerns.

2. Flight Phase vs Incidents and Fatalities (Heatmap)

Flight Phase Heatmap

A heatmap showing the relationship between **flight phases** and the frequency of **incidents and fatalities**.



⚠️ **Insight:** The **landing phase** recorded the most incidents (~44,000) and fatalities (~6,500), followed by takeoff and approach phases.

2. Aircraft Technical factors

Aircraft Technical factors

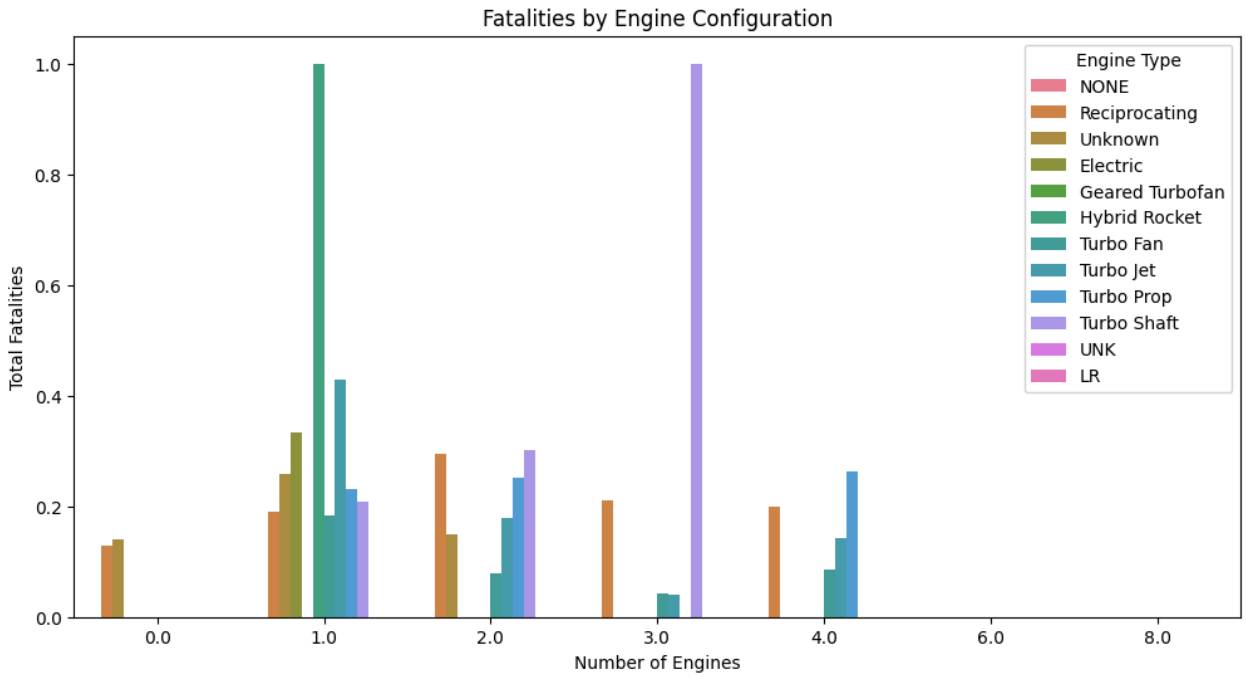
> A bar chart showing which aircraft engines suffered the most accidents.
>
> 
>
>
> **Insight:** Planes with 1 jet engine of a Hybrid Rocket type and planes with 3 jet engines of a Turbo Shaft type have been involved in the most incidents.

Tableau Visuals

For further visual please see this visualizations by tableau View the Tableau Dashboard

Conclusion

📌 Summary of Findings:

- **High-Risk Aircraft**: The Cessna and Piper aircraft brands were frequently involved in fatal accidents.
- **Low-Risk Options**: Aircraft such as 1200 and 177MF LLC demonstrated excellent safety records.
- **Flight Phase Dangers**: The landing phase is the riskiest, with significantly more fatalities than other flight stages.
- **High-Risk Engines**: Planes with 1 jet engine of a Hybrid Rocket type and planes with 3 jet engines of a Turbo Shaft type are the riskiest

✅ Recommendations:

- Focus investments on aircraft types with low incident and injury rates

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- **Jupyter Notebook** 100.0%