

Aviation Accident Data Analysis for Safer Aircraft Investment

Brian Ndungu

Aviation Accident Data Analysis for Safer Aircraft Investment

- Aviation sector is growing in emerging markets
- Our company is exploring investment in aircrafts
- Safety is the top concern
- This project aims to:
 - i. Identify aircraft models with high/low accident rates
 - ii. Understand causes & patterns of accidents
 - iii. Recommend safer investment options

Dataset Overview

- Source: National Transportation Safety Board (NTSB)
- Records: 90,348 accident entries (after cleaning: 82,196 US accidents)
- Time Range: 1948 - 2022

Selected Columns:

- Aircraft Make, Model, Damage, Engine Type
- Fatalities, Injuries, Uninjured Counts
- Location, Date, State, Flight Purpose

Data Cleaning Summary

- Dropped irrelevant & empty columns
- Focused on accidents in the United States only
- Handled missing values:
 - a. Injury data filled with 0
 - b. Dropped rows missing Model or Make
- Created new features:
 - a. Total_Injuries, Safety_Score, Year, State

Exploratory Data Analysis (EDA)

- Plotted total injuries distribution
- Identified most common aircraft models involved
- Examined regional accident trends (by state)
- Visualized accident trends over time
- Explored aircraft manufacturers with highest accident counts

Key Insight 1 - High Risk States

Top States with Most Accidents:

- California, Texas, Florida, Alaska, Arizona

Regional clustering suggests high air traffic or challenging environments.

Key Insight 2 - Common Aircraft Makes

Top Makes Involved in Accidents:

1. Cessna
2. Piper
3. Beech
4. Bell
5. Boeing

Cessna and Piper dominate due to their popularity in general aviation.

Key Insight 3 - Trend Over Time

- Decline in accidents over the years
- Spikes around late 1990s and early 2000s

Suggests improving safety practices and regulation.

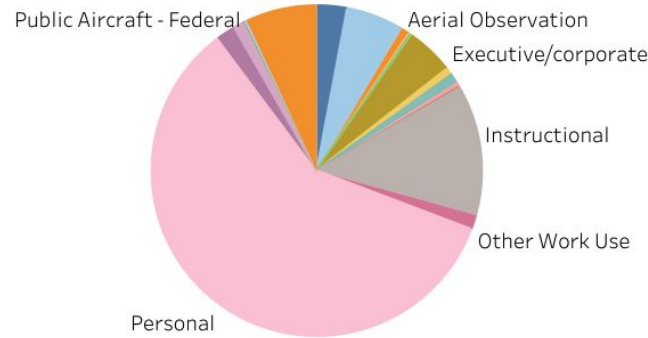
Tableau Dashboard Highlights

- **Bar Chart:** Top Aircraft Models Involved
- **Line Chart:** Aviation Accidents Per Year
- **Pie Chart:** Fatal Accidents by Flight Purpose

Interactive visuals created in Tableau to support stakeholder decisions

Aviation Accident Dashboard

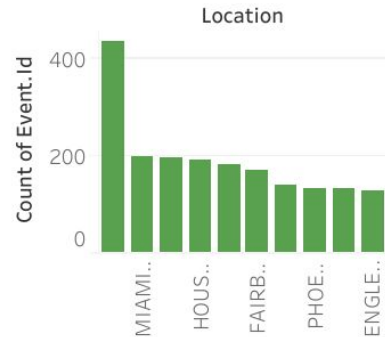
Accidents by Purpose



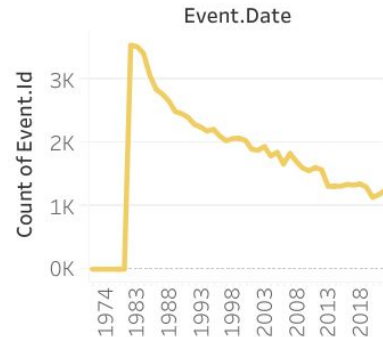
Purpose.of.flight

- Null
- Aerial Application
- Aerial Observation
- Air Drop
- Air Race show
- Air Race/show
- ASHO
- Banner Tow
- Business
- Executive/corporate
- External Load
- Ferry
- Firefighting
- Flight Test
- Glider Tow
- Instructional
- Other Work Use
- Personal
- Positioning
- PUBL
- Public Aircraft
- Public Aircraft - Feder..
- Public Aircraft - Local
- Public Aircraft - State

Accidents by State



Accidents Over Time



Recommendations

- Focus on general aviation safety
 - a. Training, maintenance, pilot certification
- Invest in regional safety programs
 - a. Especially in high-incident states
- Promote data-driven inspections & awareness
- Support further research into accident root causes

Conclusion

- Historical accident data reveals key trends in aviation risk
- Small aircraft dominate incidents, but trends show improvement
- Geographic and model-based analysis allows smarter investment
- With proper safety practices and informed choices, aviation investment can be both profitable and responsible

Thank You

Contact: Brian Ndungu

GitHub: github.com/Ndunguuu01/aviation-risk-analysis