

DATA DRIVEN INSIGHTS FOR SAFER AVIATION INVESTMENT



Prepared by: Huru Capital Data Science Team
Presented by: Huldah Chepkoech Rotich
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Overview

Huru Capital Investments Group is a Venture Capital firm with a presence in the construction, real estate and logistics sector in the United States of America.

Strategic Goal: Diversification of investment - Expansion into the aviation sector

Drivers: Expected growth in regional and international air transport.

Strategic Focus: Minimise operational risk and maximise safety

Project Objective

- Identify low risk aircraft makes and models.
- Understand how design and operational factors influence accident outcomes
- Guide data backed investment decisions

Problem Statement and Stakeholders

Problem Statement

- Lack of internal expertise on the potential risks of aircraft.
- Financial and reputational risk of aviation accidents

Stakeholders

- Aircraft manufacturers
- FAA and aviation authorities
- Pilots and flight schools
- Insurers

Data Overview

Data Source: National Transportation Safety Board Database US

Link:

<https://www.kaggle.com/datasets/khsamaha/aviation-accident-database-synopses>

Dataset Size: 87,000+ records from 1962 to 2023

Key Features: Make/Model, Aircraft Category, Weather, Injuries, Aircraft Damage, Number of Engines, Type of Engines, Amateur Built Status

Methodology

CRISP-DM Framework

1. Business Understanding
2. Data Understanding
3. Data Preparation
4. Exploratory Data Analysis
with Findings
5. Recommendations
6. Next Steps

Data Preparation

Output: Cleaned dataset

Steps Taken:

- Removed nulls and irrelevant columns
- Corrected data types eg Event Year to datetime
- Standardised the categorical data eg Make, Model
- Feature Engineering : Year, Fatality Rate etc

Exploratory Data Analysis

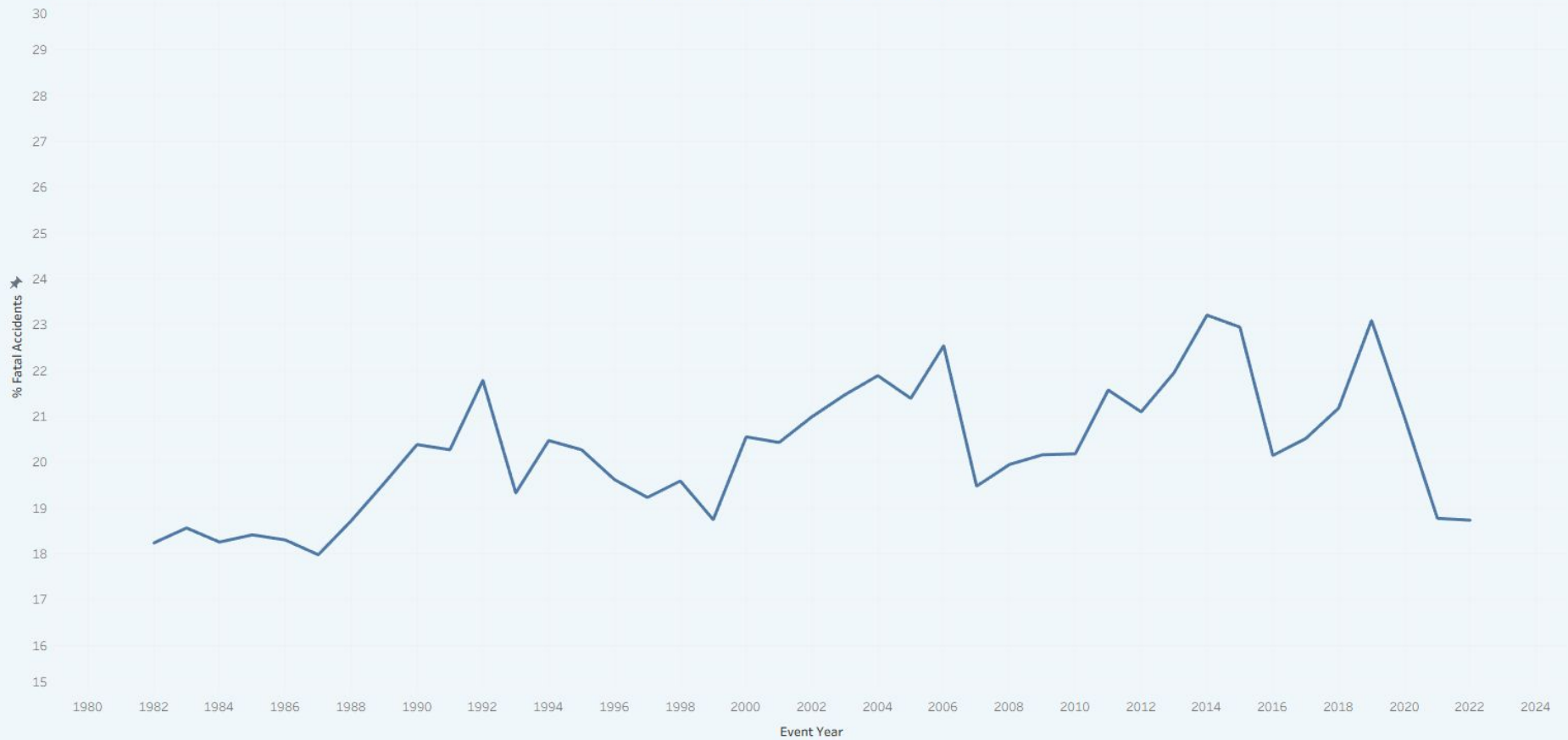
Univariate Analysis Findings

- The dataset is primarily focused on major aircraft events(accidents - 95.67%)
- Majority of records are from United States of America
- Most aircraft were of the general aviation use with single reciprocating engines and factory built(90.63%)
- The Cessna make was the highest occurring in the dataset
- Most accidents occurred under good weather (VMC), and damage to aircraft was often substantial or total destruction.

Bivariate Analysis Findings

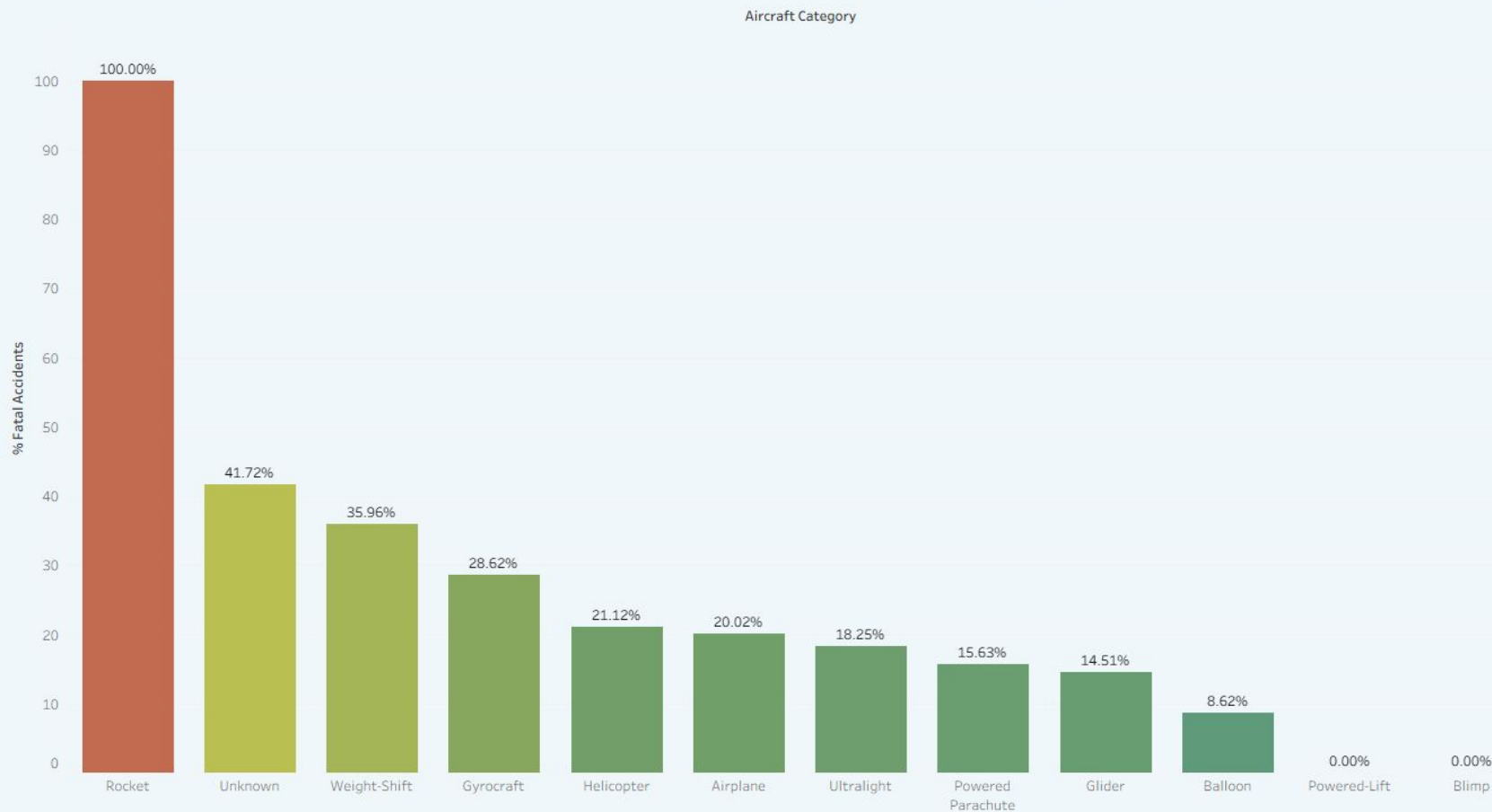
- Fatal events are almost exclusively reported as formal accidents
 - IMC weather conditions are riskier overall, with a greater likelihood of a fatal outcome when an accident occurs
 - Amateur built aircraft have a noticeably higher rate of fatal accidents compared to factory built aircraft
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% of Fatal Accidents Over Time

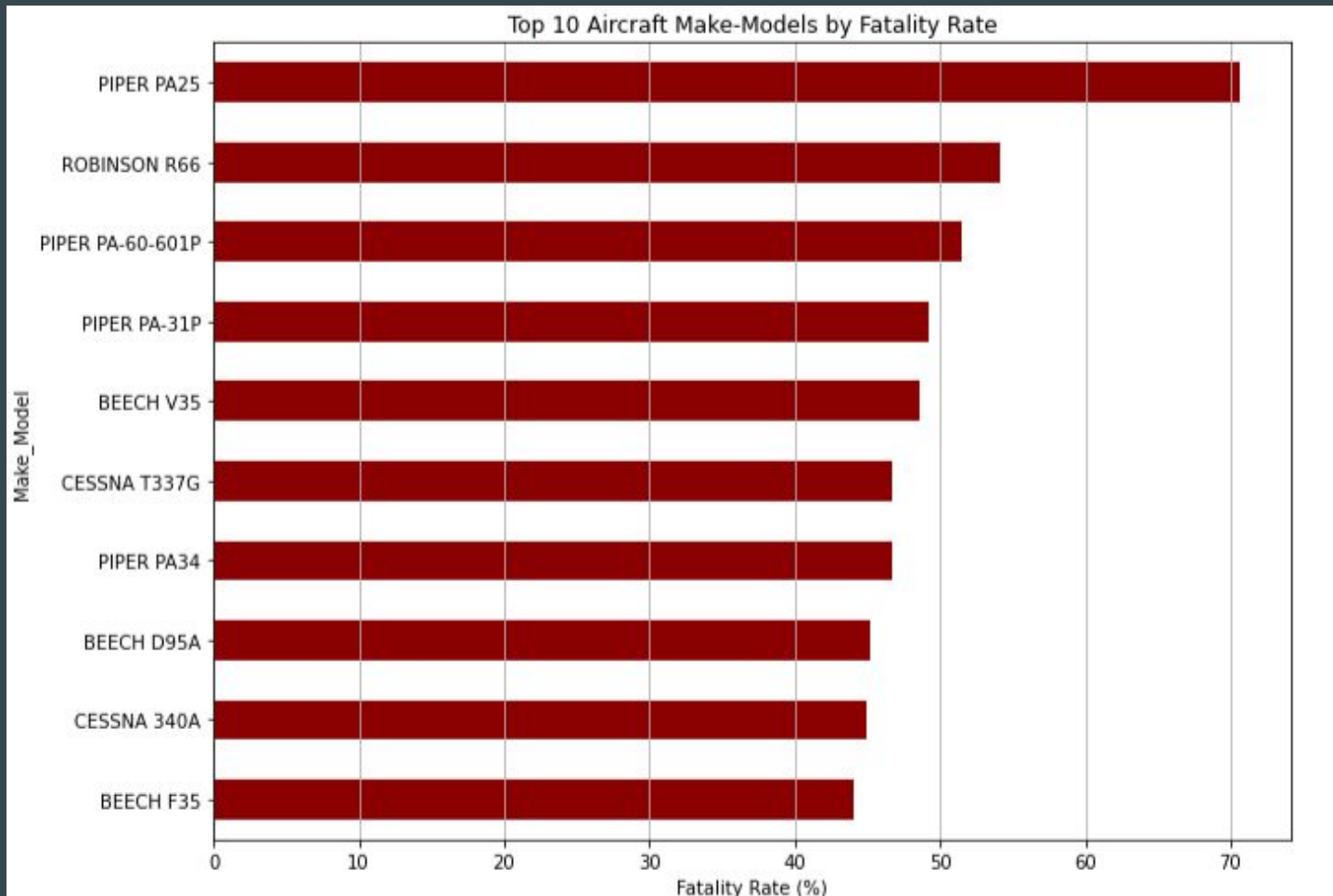


Aviation accidents range between 18-25% fatalities signaling improved safety protocols and survivability.

Distribution of Fatal Accidents by Aircraft Category



Relatively high fatality rates in general aviation aircraft manufacturers

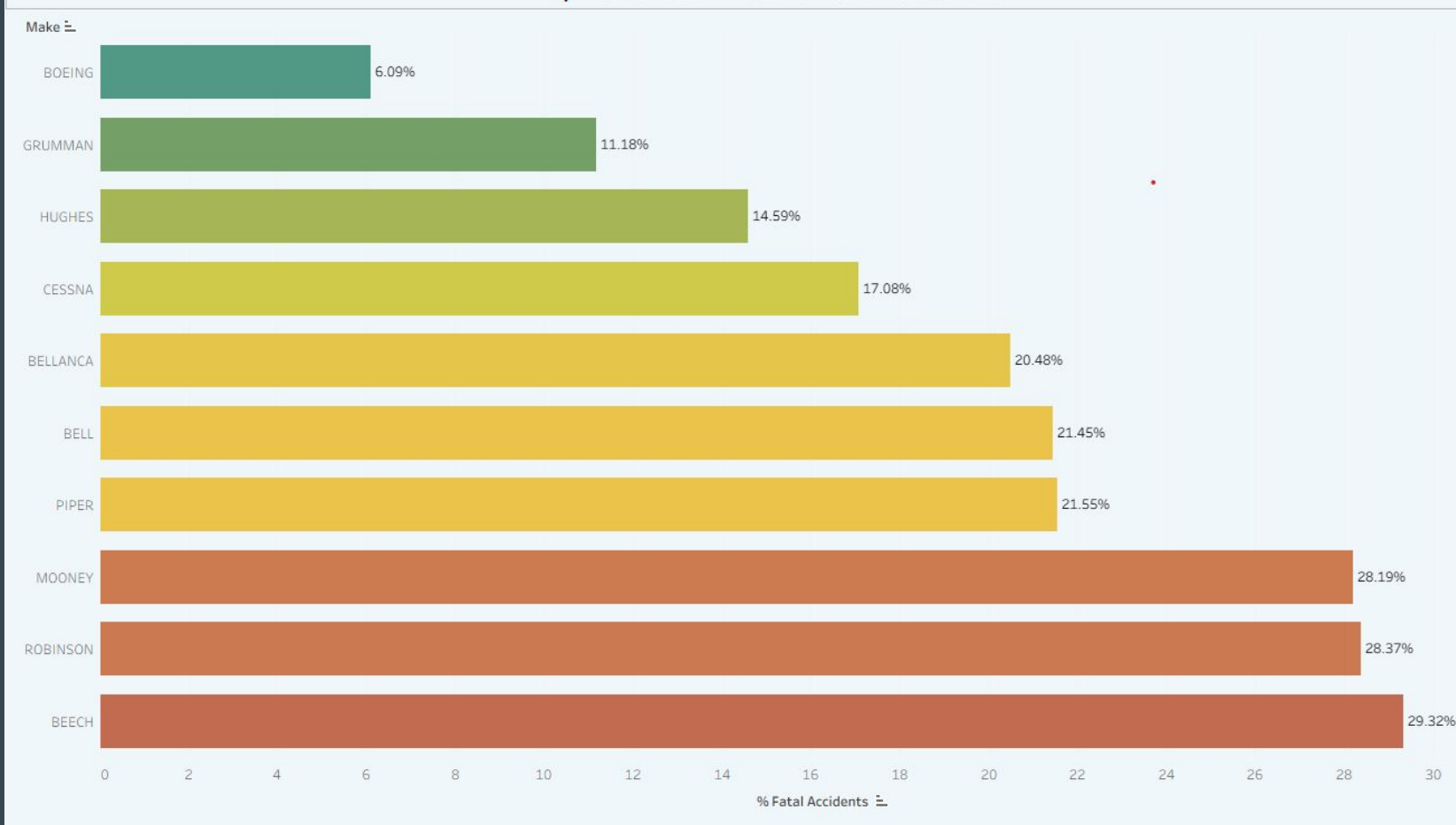


Piper, Beech and Cessna models of aircraft dominate the list of high fatalities, many of which are high-performance general aviation planes

Multi Variate Insights

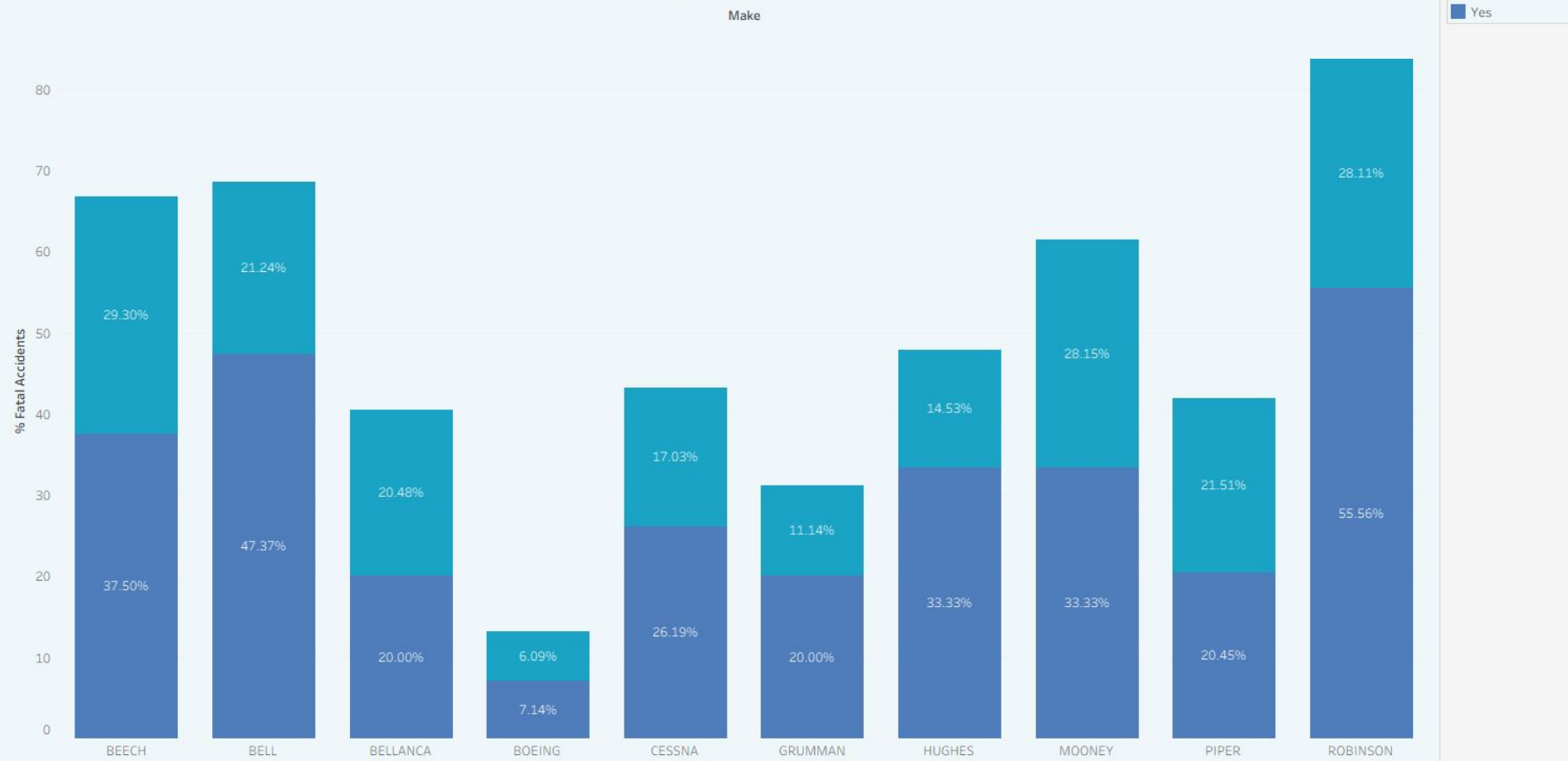
- Optimal weather conditions do not fully mitigate risk when the aircraft sustains major damage.
- Combinations of aircraft with 1 engine had higher fatalities

Top 10 Safest Aircraft Manufacturers



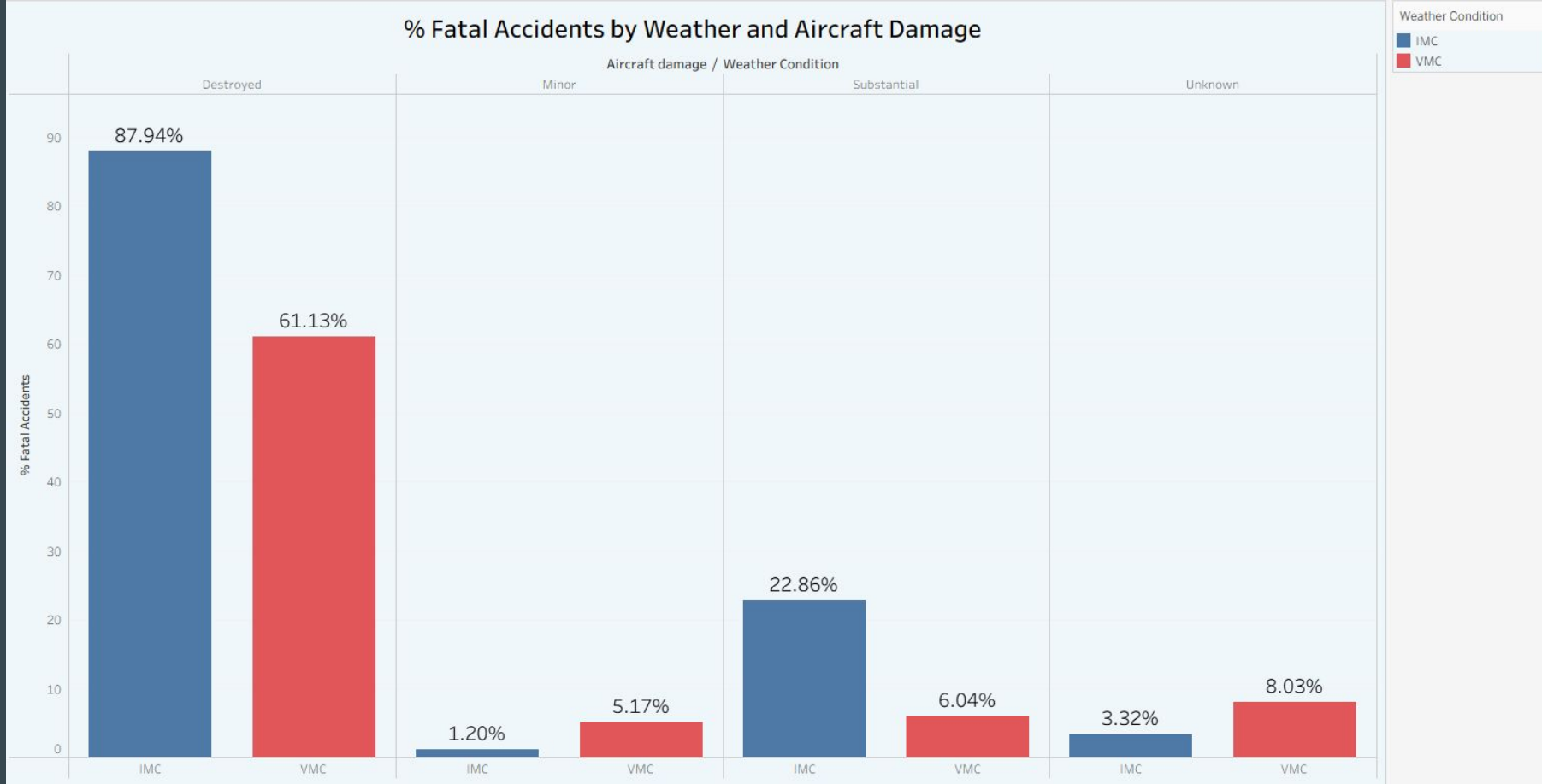
Boeing (commercial aircraft), Grumman (military aircraft) and Hughes are the top 3 safest aircraft manufacturers.

% Fatal Accidents by Make and Amateur Built



Factory-built aircraft had significantly lower fatality rates compared to their amateur-built models.

% Fatal Accidents by Weather and Aircraft Damage



Fatal Accidents still occurred under Visual Meteorological Conditions (VMC) suggesting that visual weather conditions do not fully mitigate risk when the aircraft sustains major damage.

Recommendations

- Prioritize investment in aircraft makes with historically low accident and fatality rates such as Boeing, Grumman and Hughes
- Develop a risk scoring framework for top fatal aircraft models and either avoid or subject these aircraft to enhanced inspection, pilot training or operational limits
- For commercial/high value operations, prioritize investing in certified factory built aircraft
- Prioritize multi engine aircraft for low-visibility weather conditions.

Limitations and Next Steps

Limitations

- Majority of data (92%) was from the US
- No pilot experience metrics
- Lack of operating environment information

Next Steps

- Analysis of aircraft costs, age of fleet and Maintenance history
- Final shortlist for acquisition



THANK YOU



Data Scientist: Huldah Chepkoech
LinkedIn Profile: Huldah (Chepkoech) Rotich