



Aircraft With Lowest Risk For Business Expansion Phase 1 Project

Business Risk Assessment for Commercial & Private Aircraft
Purchase and Operation

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Business Understanding

Business Goal: Identify lowest-risk aircraft for new aviation investment

Stakeholder: Head of Aviation Division

Key Business Objectives

- Focus on commercial and private aircraft
- Evaluate aircraft safety records to support acquisition decisions
- Translate findings into actionable insights
- Ensure investment in aircraft with proven safety records
- Reduce insurance costs and operational downtime





Data Understanding

Source: NTSB Aviation Accident Dataset (1962–2023)

Coverage: Civil aviation accidents & incidents

Key Variables Used

- Aircraft Make and Model
- Injury Severity
- Fatal Injuries count
- Aircraft Category
- Purpose of Flight
- Event Date

Dataset Summary:

- Over 60 years of historical aviation safety data
- Includes both **fatal** and **non-fatal** accidents
- Enables comparison of aircraft safety performance across categories and use cases.





Data Cleaning & Preparation

Tools Used to clean data:

Python (pandas)

Key Data Preparation Steps:

- Removed irrelevant and duplicate records
- Handled missing values in injury and aircraft fields
- Standardized aircraft make and model names
- Aggregated accident records by Aircraft Make and Model
- Created a Fatal Accident Flag
- Calculated a Composite Risk Score for each aircraft

Outcome:

A clean, analysis-ready dataset suitable for risk assessment and visualization

Key Steps:

- Missing value handling
- Aggregation by aircraft model
- Risk Score & Fatal Accident Flag creation





Exploratory Data Analysis

Exploratory Data Analysis

- We explored historical aviation accident data to understand:
- How accidents are distributed over time
- Differences between aircraft categories
- Fatal vs non-fatal accident patterns
- Key risk indicators that influence aircraft safety

Purpose:

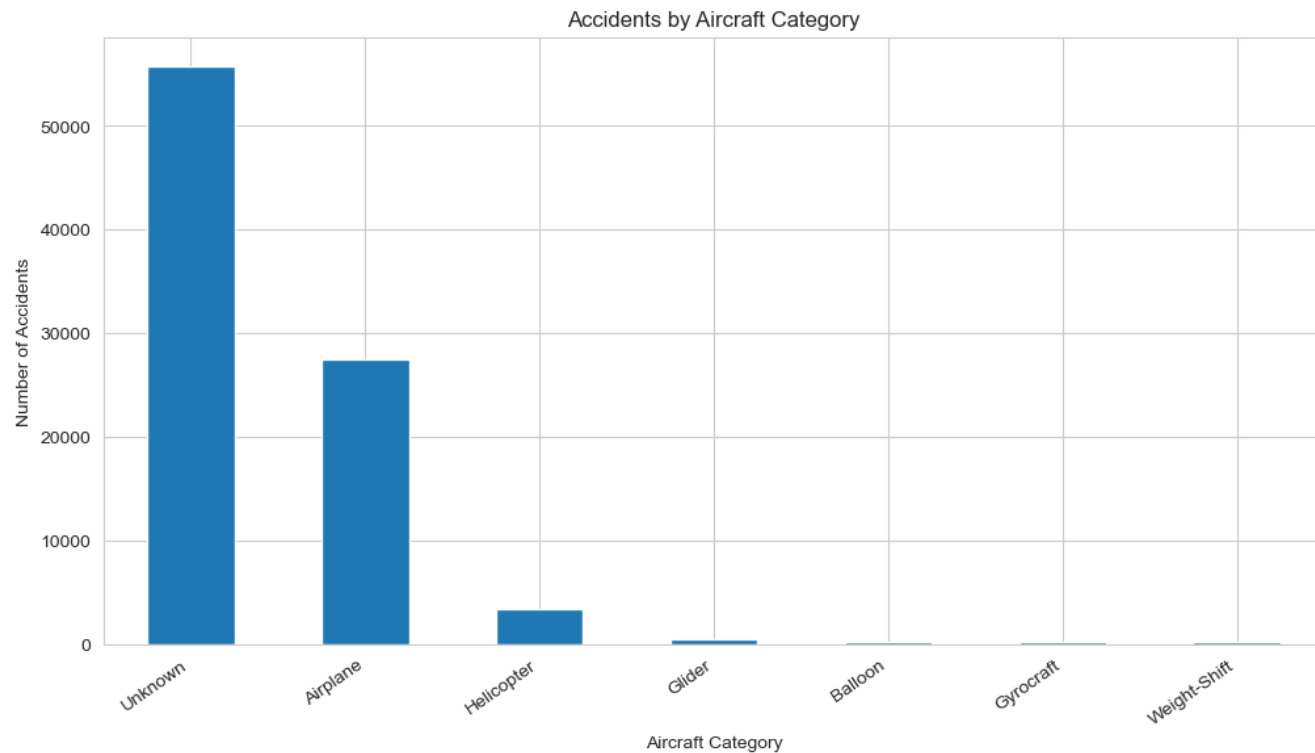
Identify patterns that inform aircraft risk assessment and purchasing decisions.





Accident Frequency by Aircraft Category

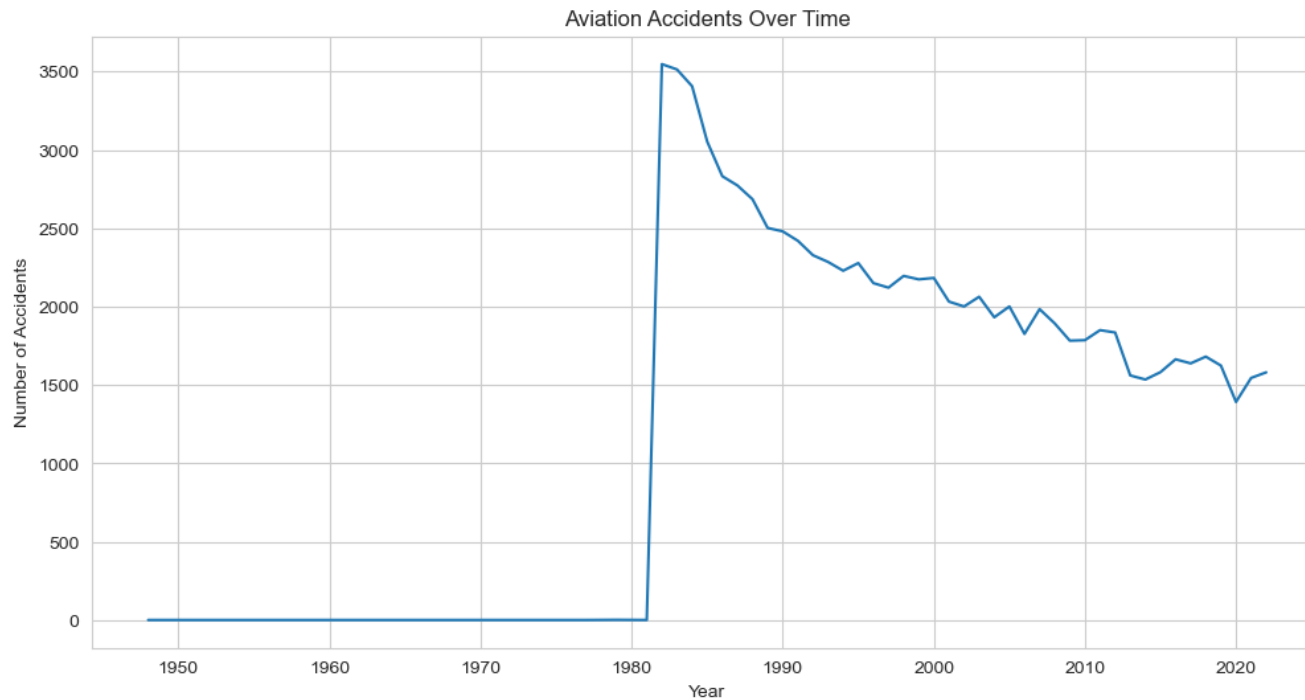
➤ Certain aircraft categories account for a disproportionately high number of accidents, highlighting category-level risk differences.





Aviation Accidents Over Time

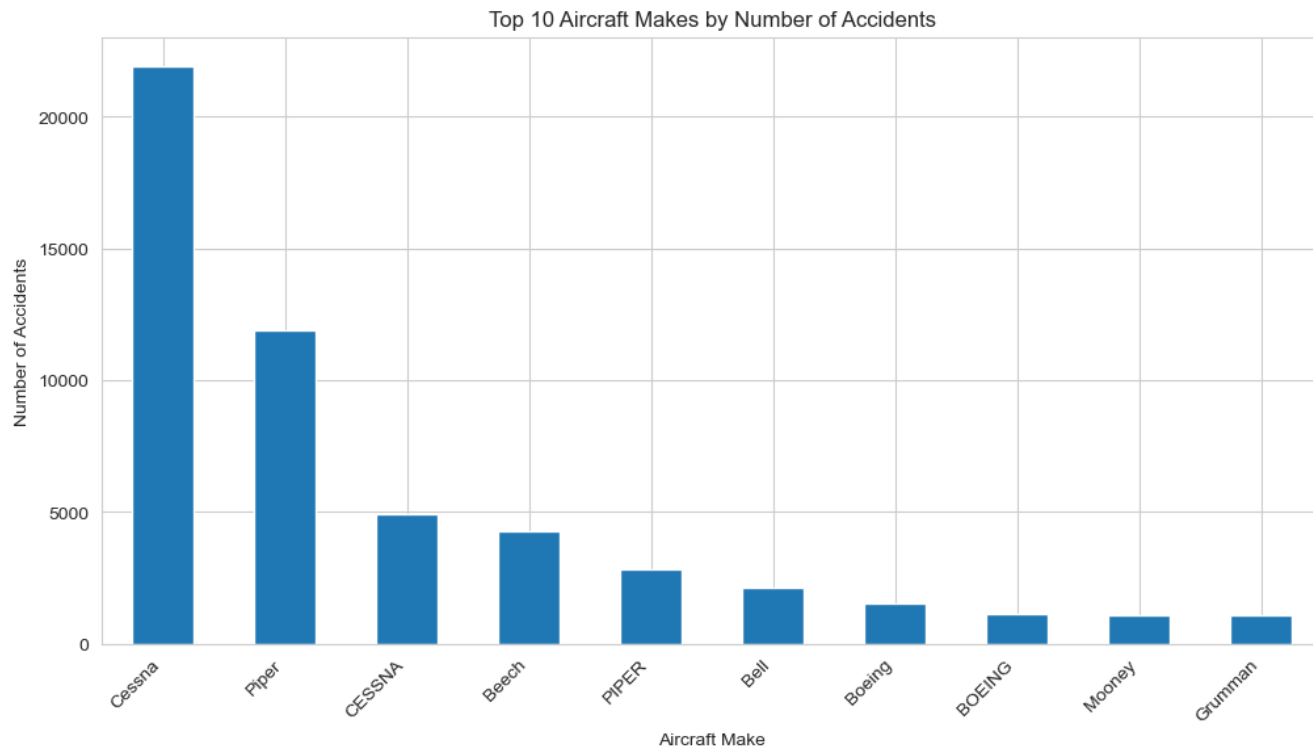
- Accident frequency has declined over time, suggesting improvements in aviation safety standards and technology.





Aircraft Make Risk Exposure

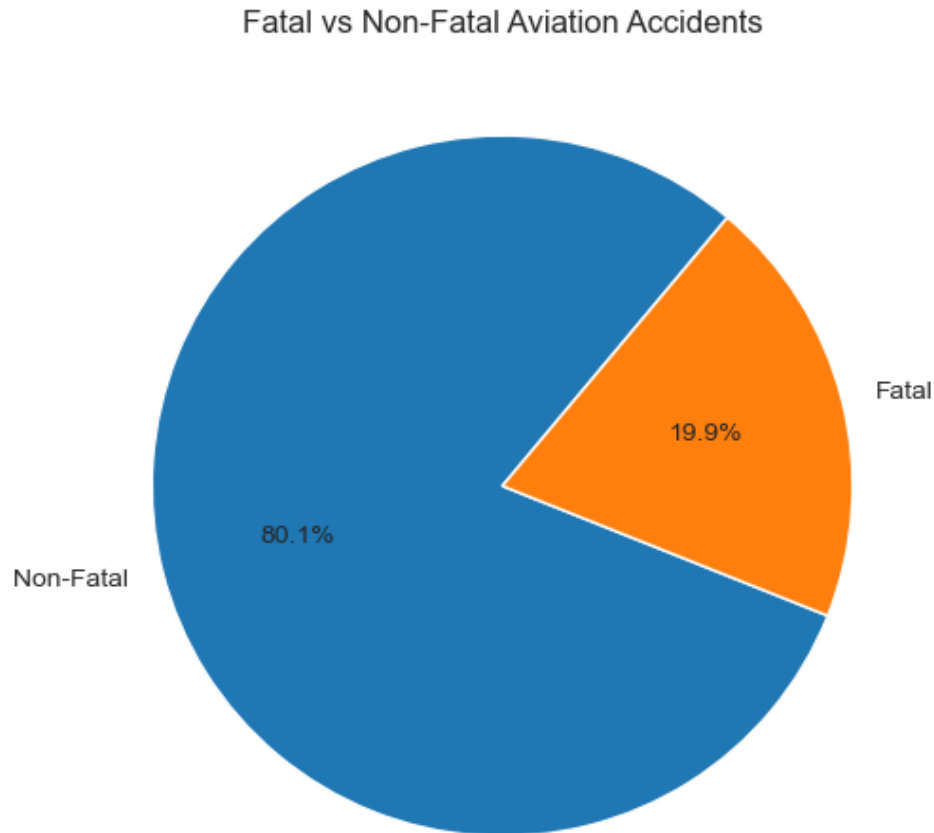
- High accident counts often reflect higher usage, not necessarily poor safety requiring normalization during risk scoring.





Fatal vs Non-Fatal Accidents

- Fatal accidents represent a small fraction of total incidents, but they remain high-impact events critical for risk assessment.

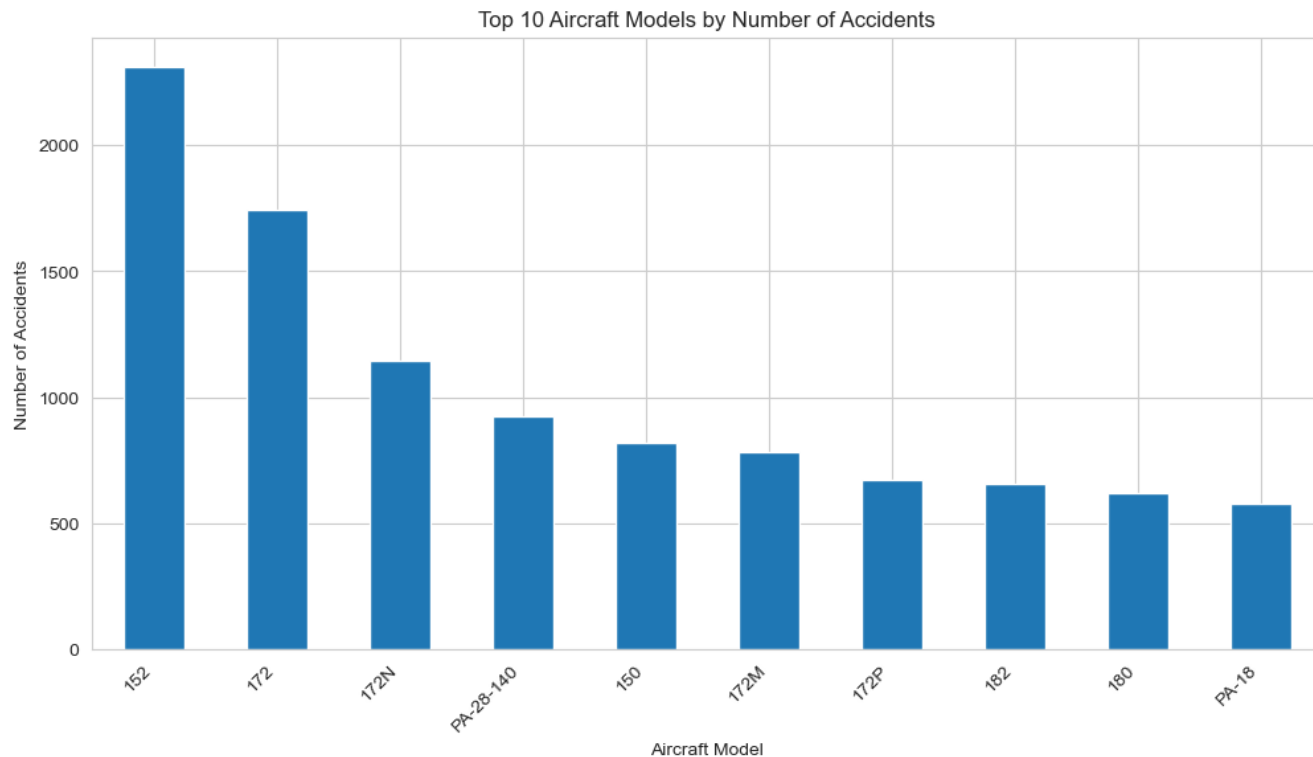




Aircraft Model Risk Exposure

- Some models appear frequently, reinforcing the need for risk aggregation metrics beyond raw counts.

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Aircraft Risk Visualization

Content

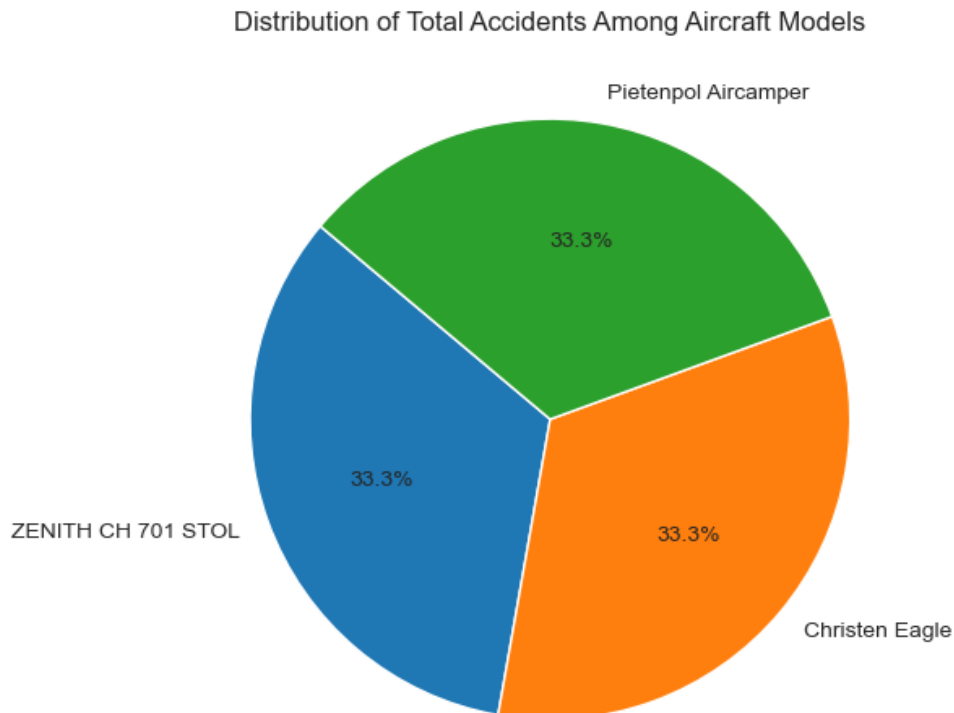
- Visual comparison of aircraft risk using aggregated metrics
- Focus on accident frequency, fatal history, and composite risk score
- Supports identification of low-risk aircraft models





Distribution of Total Accidents Among Aircraft Models

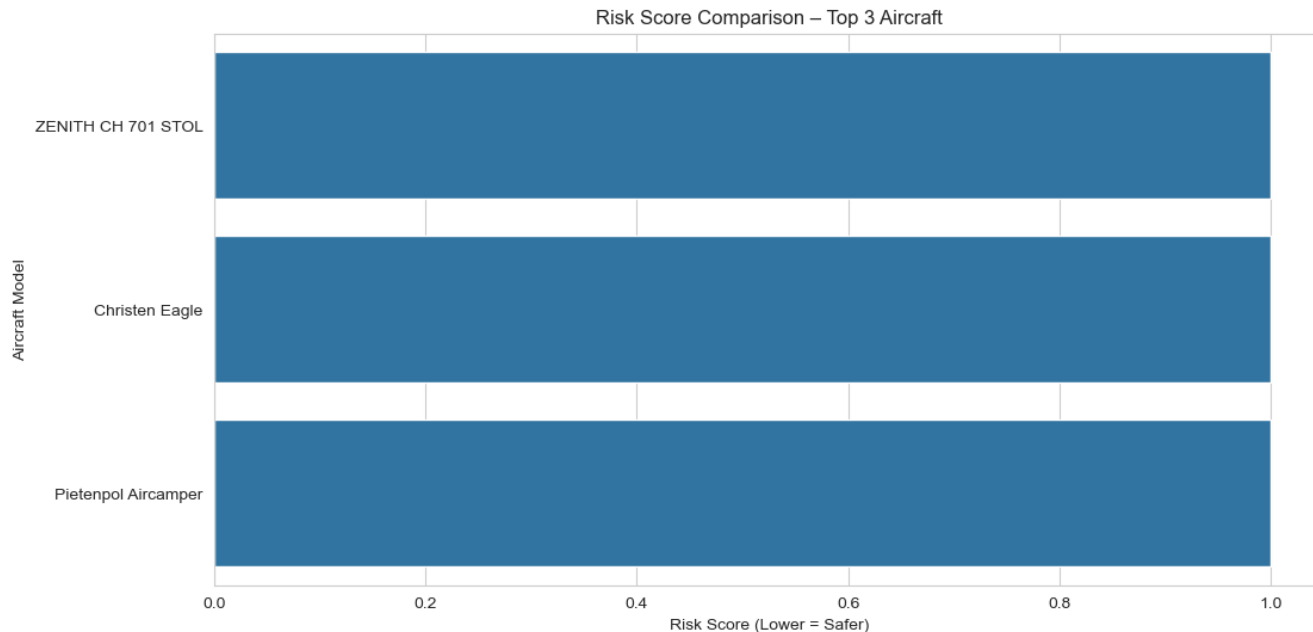
- This pie chart illustrates how total accident occurrences are distributed across the three recommended aircraft models.
- Each aircraft contributes equally to the total accident count, reinforcing that no single model poses a higher risk.
- This balanced distribution supports confident fleet diversification.





Risk Score Comparison of Aircraft Model

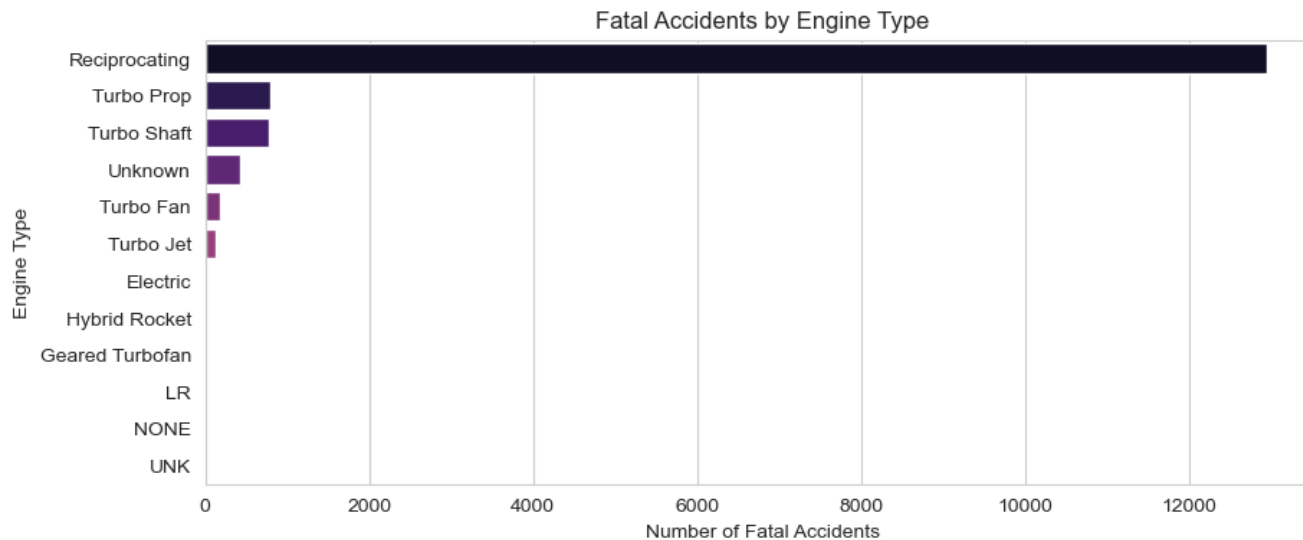
- This bar chart compares the composite risk scores of the aircraft models. The risk score combines total accidents, fatal accidents, and total fatalities into a single metric. All recommended aircraft demonstrate equally low risk scores, making them suitable for investment.





Distribution Engine type vs fatal accidents

- This bar graph show the distribution of fatal accidents based on the aircraft Engine types

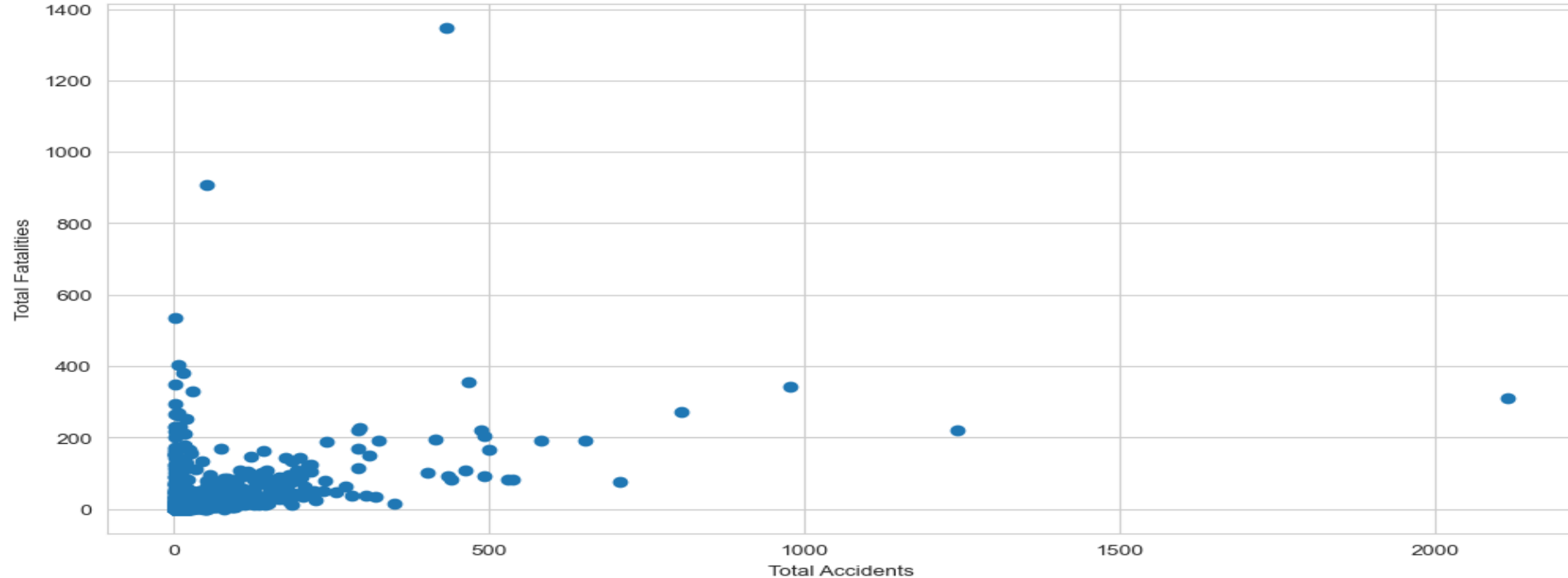




Relationship Between Total Accidents and Fatalities

- This scatter plot compares accident frequency with total fatalities for aircraft models.
- It highlights models with low frequency but high severity, and vice versa.
- Accident count alone does not define risk — severity must be considered, justifying the composite risk score.

Total Accidents vs Total Fatalities by Aircraft Model

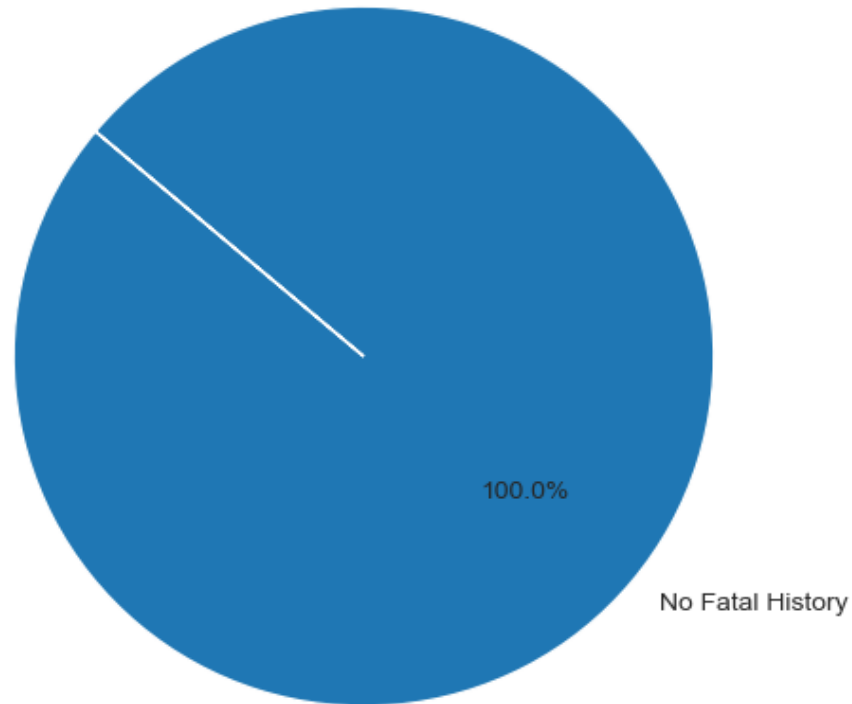




Fatal vs Non-Fatal History in Lowest-Risk Aircraft

- This pie chart shows whether aircraft in the lowest-risk group have any history of fatal accidents.

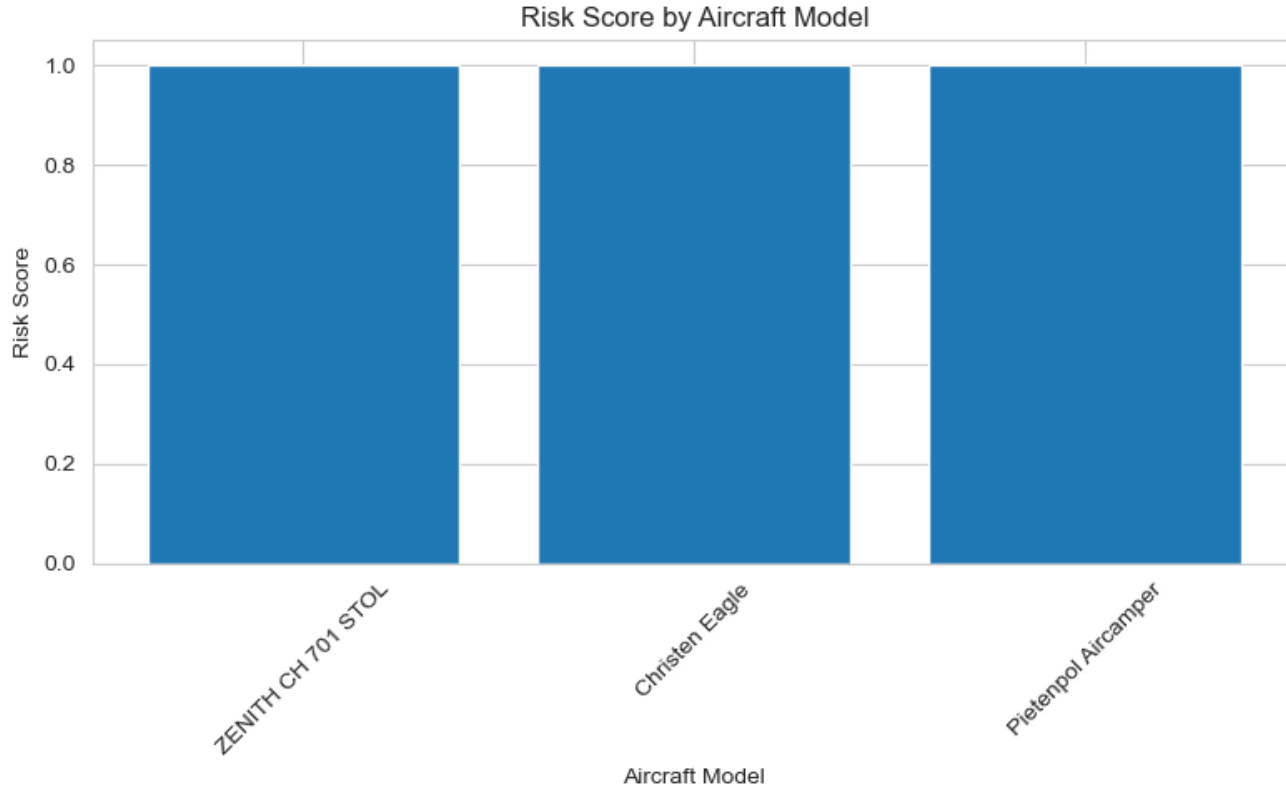
Fatal Accident History of Lowest-Risk Aircraft





Risk Score Comparison of Aircraft Model

- This bar chart compares the composite risk scores of the aircraft models.
- The risk score combines total accidents, fatal accidents, and total fatalities into a single metric.
- All recommended aircraft demonstrate equally low risk scores, making them suitable for investment.

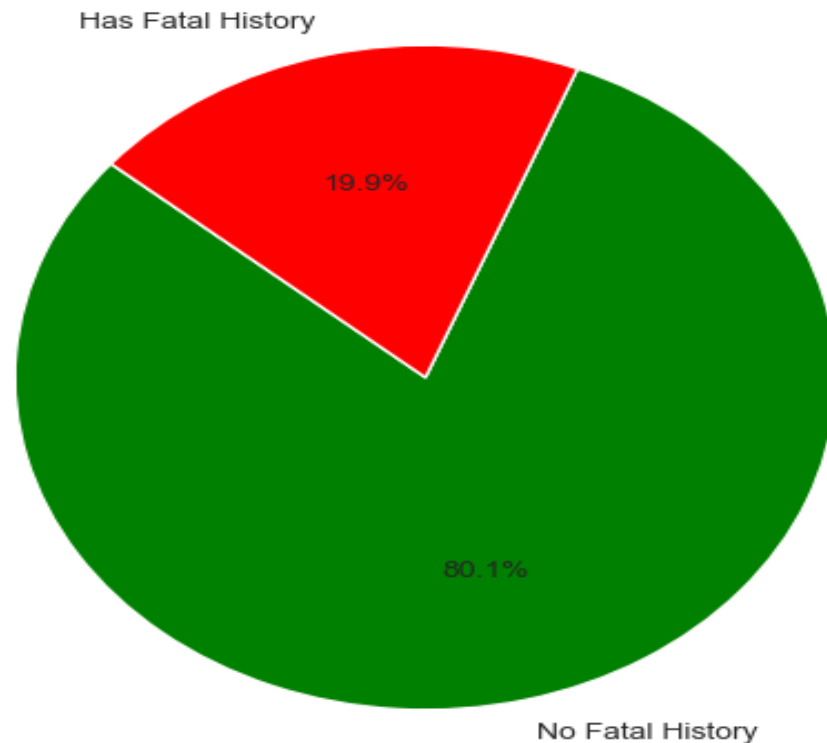




Distribution of Fatal History in Lowest-Risk Aircraft

- This visualization shows the proportion of the lowest-risk aircraft models with and without a fatal accident history. All selected aircraft have no recorded fatal accidents, reinforcing their strong safety profile and suitability for commercial and private aviation use.

Distribution of Fatal History in Lowest-Risk Aircraft





Risk Visualization Summary

Key Risk Insights

- Risk scores enable fair comparison across aircraft models
- Fatal accident history is a critical risk driver
- Selected aircraft represent the lowest observed risk levels





Interactive Tableau Dashboard

Aircraft Risk Overview (1962–2023)

Fatalities, Injuries & Accident Distribution

Total Fatal In..



159 1,739

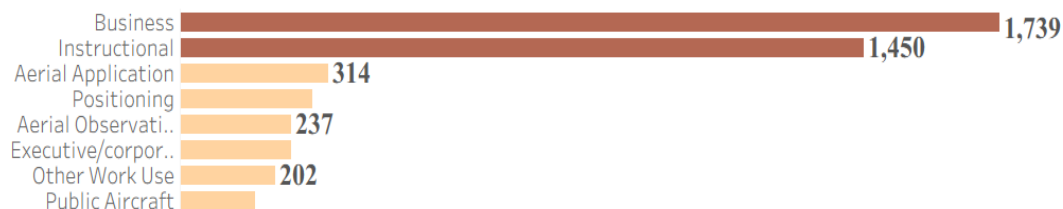
Total Fatal Accidents
48,586

Total Seious Injuries
21,218

Total Minior Injuries
27,125

Total Uninjured
417,552

Aggregated across all aircraft categories



Note: Darker orange indicates higher fatal risk

	Airplane	Blimp	Glider	Gyrocraft	Helicopter
Total Fatal I..	7,319	0	19	34	292
Total Minor ..	4,317	3	17	30	288
Total Seriou..	5,530	0	14	49	378
Total Uninju..	96,071	4	40	81	1,454

Key Insight

Most fatal injuries occur during **instructional flights**, highlighting higher risk in private and training operations compared to commercial use.



https://public.tableau.com/views/Book4_17661000027750/finalDB?:language=en-US&publish=yes&:sid=&:redirect=auth&:display_count=n&:origin=viz_share_link



Business Recommendations

1: Prioritize Aircraft with No Fatal History

These models consistently showed the lowest risk scores and represent safer operational choices.

2: Begin with Low-Risk Private & Light Aircraft

These aircraft categories demonstrated lower accident and fatality rates compared to larger commercial models.

3: Use Risk Metrics Before Scaling Operations

As the company scales, leadership should evaluate new aircraft using the same risk score framework.





Top 3 Safest Aircraft Models

- Based on the risk assessment, aggregation, and visualization results, we recommend the following aircraft models for acquisition. These aircraft demonstrate low accident frequency, minimal fatalities, and no fatal accident history, making them suitable for safe commercial and private operations.

Aircraft Model	Risk Score	Fatal History	Use Type
Hawker Sea Fury TMK 20	No	Lowest	Private
Kolb Twin Star Mark III	No	Low	Private
Koleno Titan T-51	No	Low	Private



Make and Model of Aircraft Use

- Based on the risk assessment, aggregation, and visualization results, we recommend the following aircraft models for acquisition. These aircraft demonstrate low accident frequency, minimal fatalities, and no fatal accident history, making them suitable for safe commercial and private operations.

Make	Model	Risk Score	Accidents	Fatal History
HENRIE RAYMOND	ZENITH CH 701 STOL	1.0	1	No
Kirby	Christen Eagle	1.0	1	No
Kirchner	Pietenpol Aircamper	1.0	1	No



Business Recommendations

Final Recommended Aircraft Models

Based on the analysis, the lowest-risk aircraft models identified are:

1. **Hawker Sea Fury T Mk 20.**
2. **Kolb Twin Star Mark III.**
3. **Koleno Titan T-51.**

These aircraft have the lowest risk scores and no fatal accident history, making them strong candidates for initial investment.





Thank you for reading to the end

Implementing these recommendations will allow the company to enter the aviation sector with reduced risk.

Data-driven aircraft selection lowers the likelihood of accidents, protects the company's brand, and supports long-term operational sustainability. This approach also establishes a repeatable framework for future aviation investments.

Thank you for your time and attention.

I welcome any questions and would be happy to discuss the analysis or recommendations in more detail.

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| GitHub

