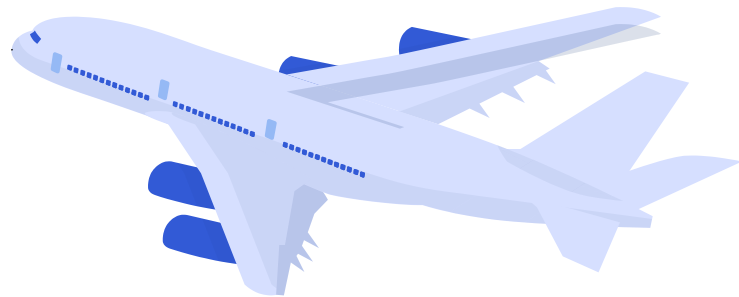


Aircraft Safety Intelligence



A Strategic Safety Report for Aviation Investment
Client: U.S.-based Aviation Expansion Initiative





Table of contents

1

Introduction

Overview and Business Understanding

2

Methodology

Data summary, Data Cleaning, Feature Engineering, Tools

3

Results

Trends, Statistics and Key Insights

4

Business Recommendations

Fleet, Safety zones and use cases recommendations





1

INTRODUCTION





Project Overview



Objective: Recommend the safest aircraft for commercial expansion based on incident history.

Data: NTSB aviation dataset (1962–2022), covering 88,000+ civil aviation incidents.

Audience: U.S.-based firm launching commercial and private aviation services.

Top-line Recommendation: Use Airbus fleet for commercial operations (domestic & international).

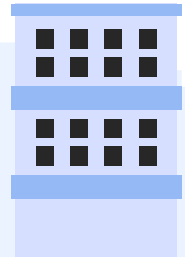
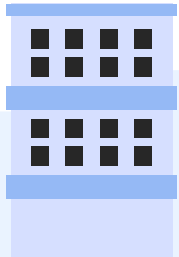




Business Understanding



- **Stakeholder Need:** Safe, reliable aircraft to launch passenger and private jet services.
- **Business Questions:**
 - Which aircraft manufacturers and types have the lowest incident risk?
 - Which operational zones and weather are ideal for lowest incident risk?
- **Success Outcome:** Evidence-based acquisition strategy minimizing operational and liability risks





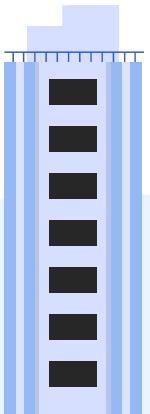
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METHODOLOGY



Data Source

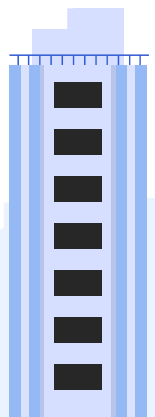
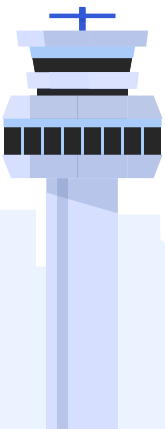
- The dataset used in this analysis is sourced from the National Transportation Safety Board (NTSB) Aviation Accident Database.
- It contains detailed records from **1962** onwards involving:
 - Civil aviation accidents and selected incidents.
 - Events that occurred within the United States, its territories, international waters and other countries
- This dataset includes variables related to aircraft type, damage severity, injury outcomes, weather conditions, flight phases, geographic locations, and more enabling robust analysis of aviation safety trends over time.





Data Summary

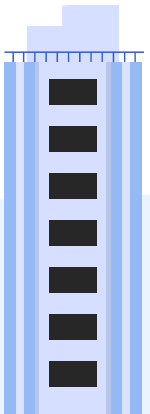
- The dataset consists of **88,889** records and **31** attributes, covering civil aviation accidents and incidents from **1962** to **2022**.
- Most flights involved a *single-engine aircraft*, and the average number of fatal injuries per event is **0.65**, though extreme cases reached up to **349 fatalities**.
- Several fields contain high proportions of **missing values** with some missing rates exceeding **60%**.
- These data quality issues were addressed during the cleaning process to ensure meaningful and unbiased analysis, without distorting patterns or misrepresenting risk.



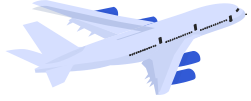


Data Cleaning

- **Data Cleaning:** Dropped high-null columns, standardized categories, and imputed missing values.
- **Key Analysis Fields:** Aircraft make/model, injury severity, weather, phase of flight, and state; created custom Severity class and state.
- **Outlier Handling:** Retained extreme values to preserve meaningful safety insights, as filtering removed over **50%** of critical records.



Tools



Python

Core Programming
Language



Pandas & Numpy

Numerical Analysis & Data
processing



Seaborn & Matplotlib

Visualization



Jupyter Notebook

Interactive analysis and
Documentation

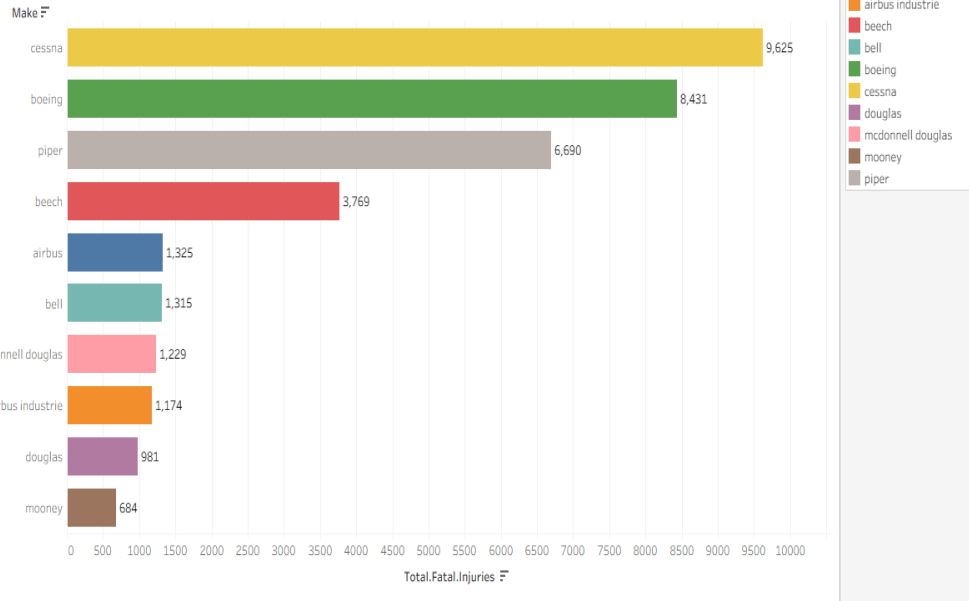
An illustration of an airport scene. In the center, a large orange circle contains the white number '3'. Below it, the word 'RESULTS' is written in a bold, blue, italicized sans-serif font. The background is white with three stylized blue clouds at the top. On the left, a light blue airplane flies towards the right. At the bottom, there is a light blue silhouette of an airport terminal and two air traffic control towers, one on the left and one on the right.

3

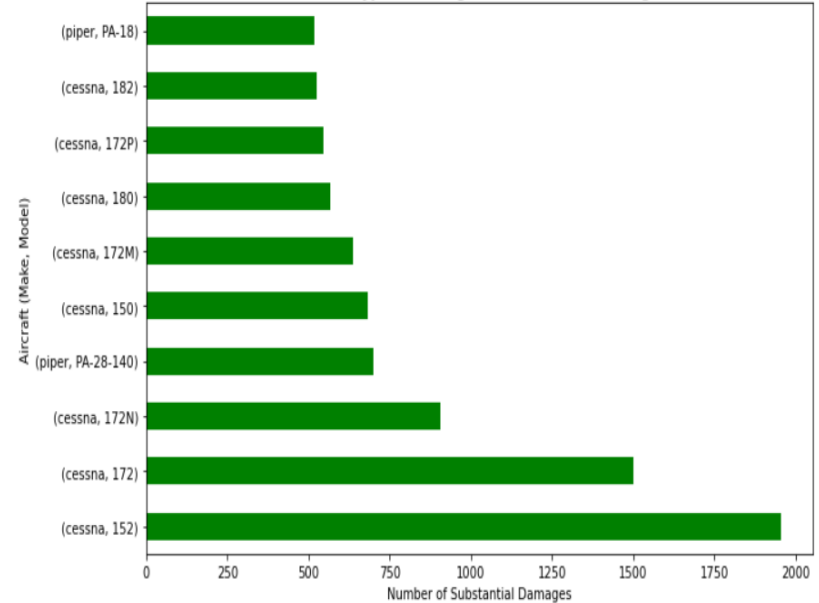
RESULTS

Aircraft Risk Profile

Top 10 Aircraft Models by Fatalities



Aircraft Types with Highest Substantial Damages

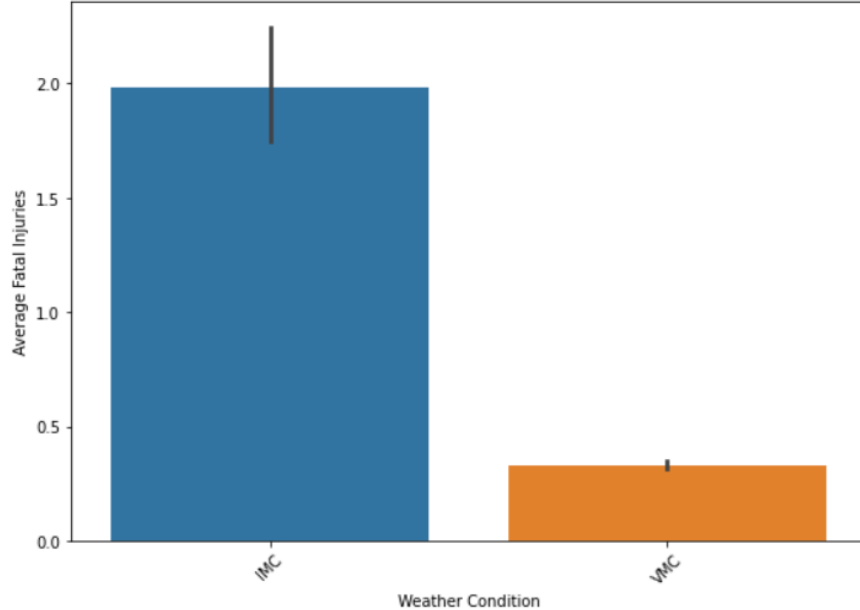


Insight: Cessna, Piper, and Boeing aircrafts account for over 50% of all incidents. High-risk aircraft consistently show up in charts for fatal injuries and substantial damage. General aviation types (e.g., Cessna 172, PA-28) dominate fatality counts.

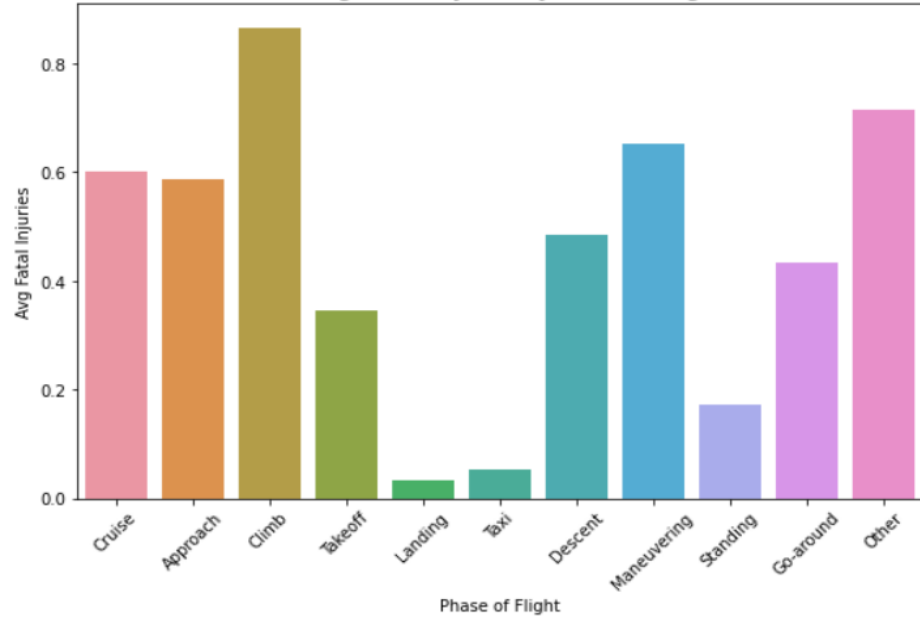
Recommendation: Avoid Cessna, Piper, and Boeing for new fleet acquisition.

Weather & Phase of Flight Risk

Average Fatal Injuries by Weather



Average Fatal Injuries by Phase of Flight



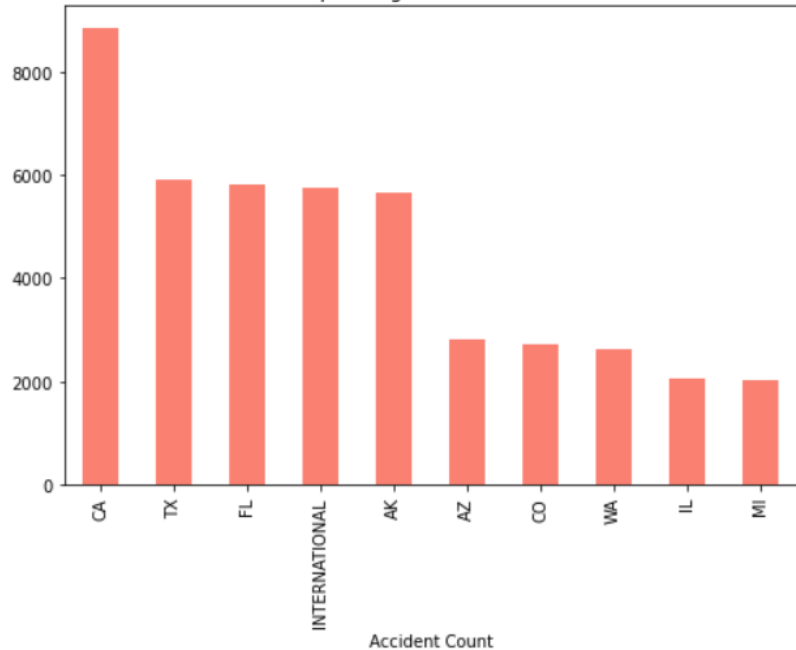
IMC conditions lead to **8x** more fatalities compared to VMC.

High-risk phases: include Climb, Cruise, Maneuvering, and Approach.

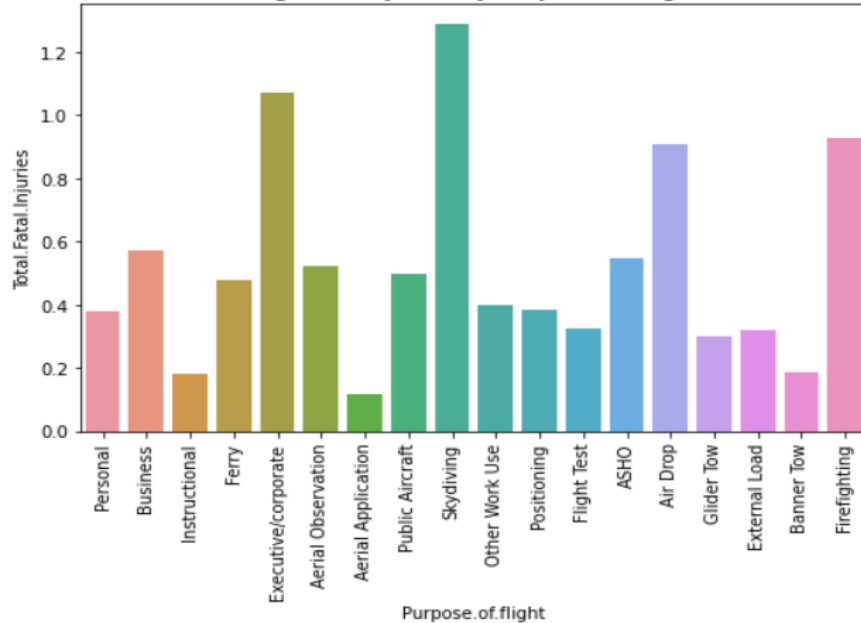
Recommendation: Invest in avionics and pilot training tailored to weather adaptability and critical phase control and emphasize standard operating procedures (SOPs) around weather-based Go/No-Go decision .

Geographic & Use Case Risk

Top 10 High-Risk Locations



Avg Fatal Injuries by Purpose of Flight

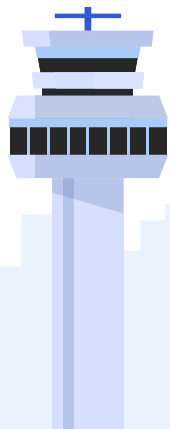


- **Skydiving, Executive, Firefighting, and Air Drop** flights have the highest average fatal injuries.
- **California, Texas, and Florida** show the highest aviation incident rates.
- **Recommendation:** Focus on commercial, corporate, and public operations, limiting exposure in high-risk states.



4

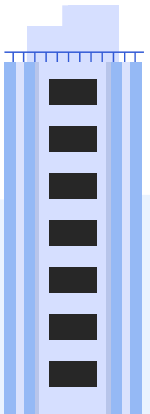
RECOMMENDATIONS





Overview

- ❑ Avoid investing in Cessna, Piper, and Boeing aircraft due to high fatality rates.
- ✈️ Adopt Airbus as the primary manufacturer across commercial, cargo, and private aviation to reduce exposure to high-risk incidents.
- ☁️ Enhance weather and flight phase safety through training and avionics investment.
- 🌐 Strategically base operations in lower-risk states with stronger aviation safety records.



Airbus Fleet Review



•Airbus A321XLR



•Airbus A320neo



Modern, fuel-efficient, high safety rating.



Passenger (100+ seats)

Airbus Fleet Review



•Airbus ACJ319neo

- ✓ **Luxury, Reliability.**
- ✓ **Long Range.**
- ✓ **Executive Travel.**

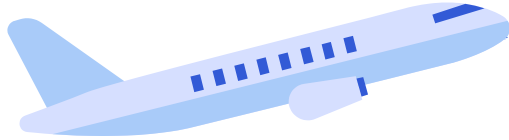


•Airbus H145

- ✓ **Versatile.**
- ✓ **VIP Seats**
- ✓ **EMS Capability**



THANK YOU



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Questions? I'm available for dashboard walkthroughs or further data analysis sessions.

