

# Aircraft Risk Analysis: Identifying Low- Risk Aircraft for Business Expansion

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Data-Driven Safety Insights  
for Aviation Investment  
Decisions



# Overview

Goal: To determine which aircraft makes and models pose the lowest operational risk for the company's new aviation venture.

Summary: Data was analyzed from historical aviation accident records to identify safety patterns using Python and Tableau.

Outcome: Actionable recommendations on safe aircraft investment priorities and risk mitigation.

# Business Understanding

## **Problem Statement:**

“Our company is expanding into the aviation sector but lacks insights on which aircraft are safest to operate.”

## **Key Business Questions:**

1. Which aircraft makes/models have the fewest and least severe accidents?
2. How do flight purposes (commercial, private, instructional) affect risk?
3. What patterns can guide safer purchasing decisions?

# Data Understanding

The dataset (Aviation\_Data.csv) includes extensive historical aviation accident records with fields such as:

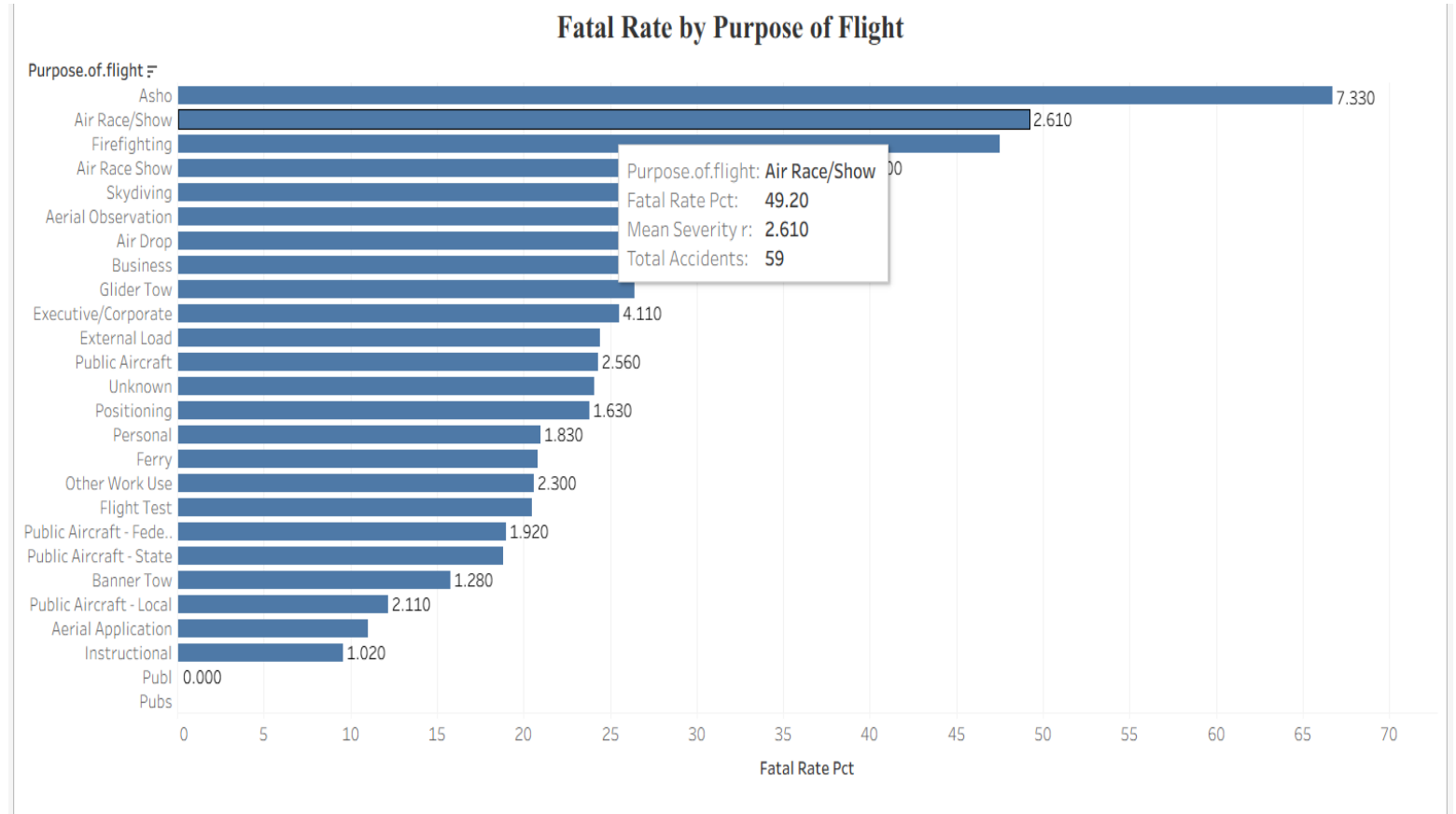
- Categorical: Event.Id, Investigation.Type, Accident.Number, Location, Country, Latitude, Longitude, Airport.Code, Airport.Name, Injury.Severity, Aircraft.damage, Aircraft.Category, Registration.Number, Make, Model, Amateur.Built, Engine.Type, FAR.Description, Schedule, Purpose.of.flight, Air.carrier, Weather.Condition, Broad.phase.of.flight, Report.Status, Publication.Date
- Numerical: Fatal, Serious, Minor Injuries, Number of Engines
- Datetime: Event.Date

## **Data Preparation Highlights:**

- Cleaned missing data
- Standardized manufacturer and model names
- Calculated new indicators for risk severity

# Data Analysis:

## Finding 1: Purpose of Flight Drives Fatal Risk



**Evidence:**

Asho flights have a fatal rate of 66.7% and the highest mean severity (7.3), far exceeding any other purpose category. In contrast, Instructional and Public Aircraft flights record fatal rates below 2%.

**Insight:**

Flight purpose heavily influences safety outcomes. Recreational and performance-based flights (e.g., Air Race/Show, Skydiving) are high-risk; instructional and government operations are lower risk.

**Recommendation 1:**

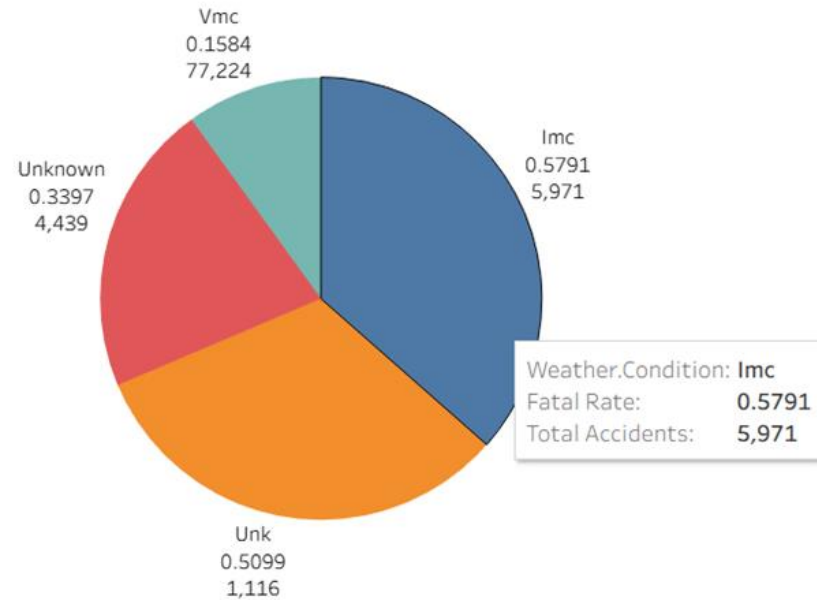
Focus initial investments on instructional, corporate, or public-use flight services, avoiding high-risk recreational segments. This minimizes exposure to fatal incidents while maintaining operational efficiency.

# Data Analysis:

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Finding 2: Weather  
Conditions Significantly  
Impact Fatality Rates

Weather Severity Vs Fatal Rate



Evidence (from Chart 2):

Flights under Instrument Meteorological Conditions (IMC) show the highest fatal rate (0.5791), whereas Visual Meteorological Conditions (VMC) report lower fatality proportions.

Insight:

Weather-related visibility is a major safety determinant. Operating under poor visibility (IMC) sharply increases fatal risks.

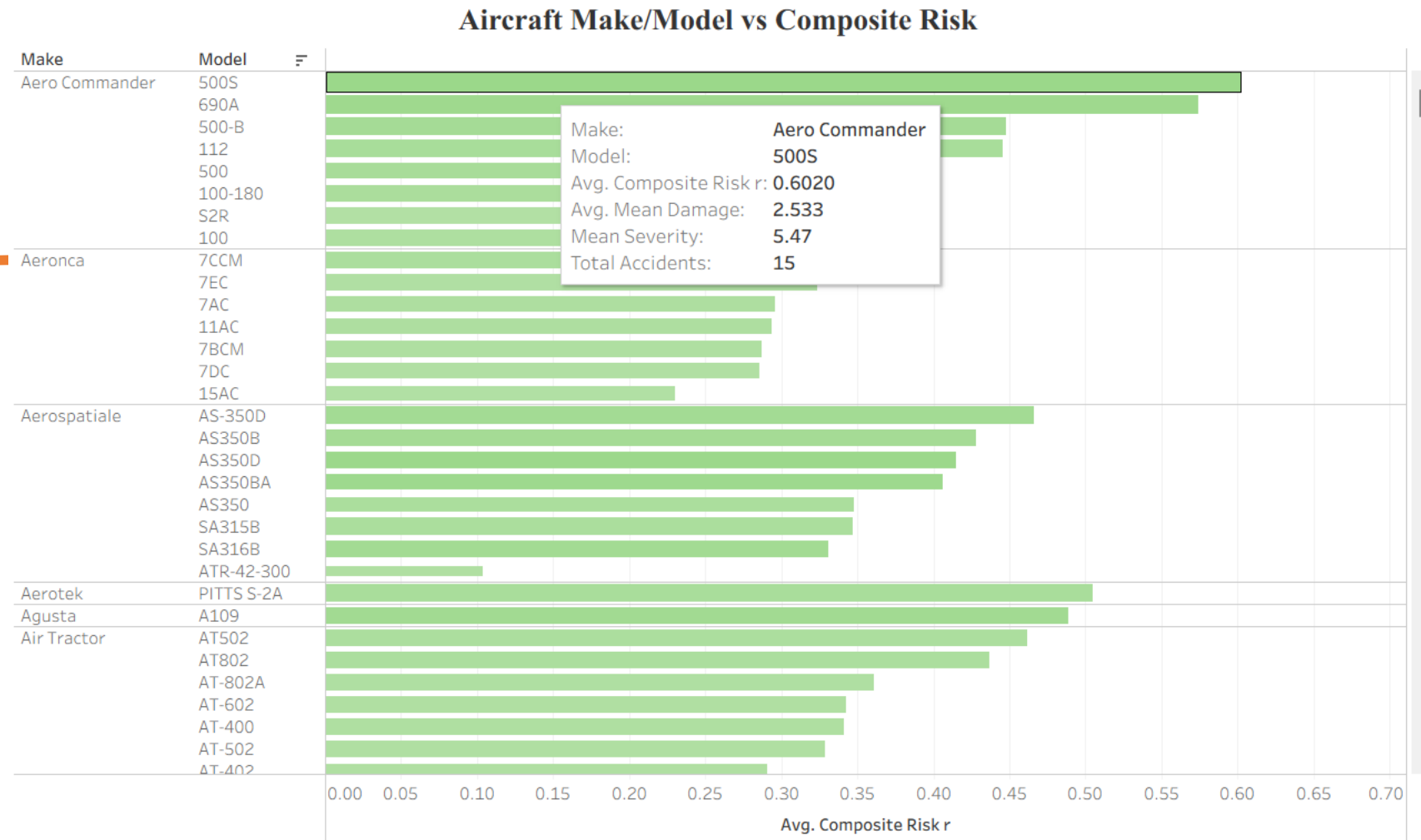
Recommendation 2:

Invest in aircraft with advanced weather navigation systems (e.g., autopilot, de-icing, IFR capabilities) and ensure pilots are IFR-certified. Limit operations in regions with frequent IMC unless weather-adaptive infrastructure exists.



# Data Analysis:

## Finding 2: Weather Conditions Significantly Impact Fatality Rates



#### Evidence:

Models like Aero Commander 500s have composite risk scores above 0.5, indicating high combined damage and severity rates.

Aircrafts such as Aerospatiale ATR-42-300 show lower average risk and higher survivability.

#### Insight:

Manufacturer reliability differs markedly. Composite risk blends damage, severity, and fatality data, making it an excellent guide for acquisition safety assessment.

#### Recommendation 4:

Choose low composite-risk aircraft (Aerospatiale ATR-42-300) for initial fleet purchases. Maintain a dynamic risk register to continually assess aircraft safety performance.

# Recommendations

## **Top Recommendations:**

- **Invest** in aircraft makes/models with the lowest Severity Index.
- **Prioritize** commercial over private or instructional operations.
- **Establish** a safety review system using data dashboards for ongoing fleet monitoring.

## **Actionable Use:**

- Supports strategic acquisition planning
- Reduces insurance and maintenance costs
- Enhances brand reputation for safety