AIRCRAFT SAFETY RISK ANALYSIS FOR NEW AVIATION VENTURES

SUPPORTING DATA-DRIVEN DECISIONS IN AIRCRAFT ACQUISITION

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PROJECT OVERVIEW

Objective: Identify the safest aircraft models based on historical accident data to guide investment decisions.

Stakeholders:

- Head of Aviation Division
- Procurement Team
- Risk Management Team

BUSINESS UNDERSTANDING

- **Company Goal:** Expand into aviation while minimizing operational and safety risk.
- **My Role:** Provide insights on which aircraft models present the lowest safety risks using accident data.
- **Key Metric:** Average injuries per accident for each aircraft model.

DATA UNDERSTANDING

- **Source:** National Transportation Safety Board (NTSB), covering accidents from 1962–2023.
- **Data Size:** 88,889 records, 31 features.
- Key Features Used:

➢ Make,Model.

➢ Injury.severity, Aircraft.damage

➢ Injury columns: Total.fatal/serious/minor.injuries, Total_uninjured.

DATA PREPARATION

- Filtered to **only accidents**, not incidents or investigations.
- Focused on **commercial and private flight purposes**.
- Created **Total Injuries** column to aggregate injury severity.
- Dropped rows missing **make/model** or injury data.
- Converted date fields for time-based filtering.

DATA ANALYSIS APPROACH

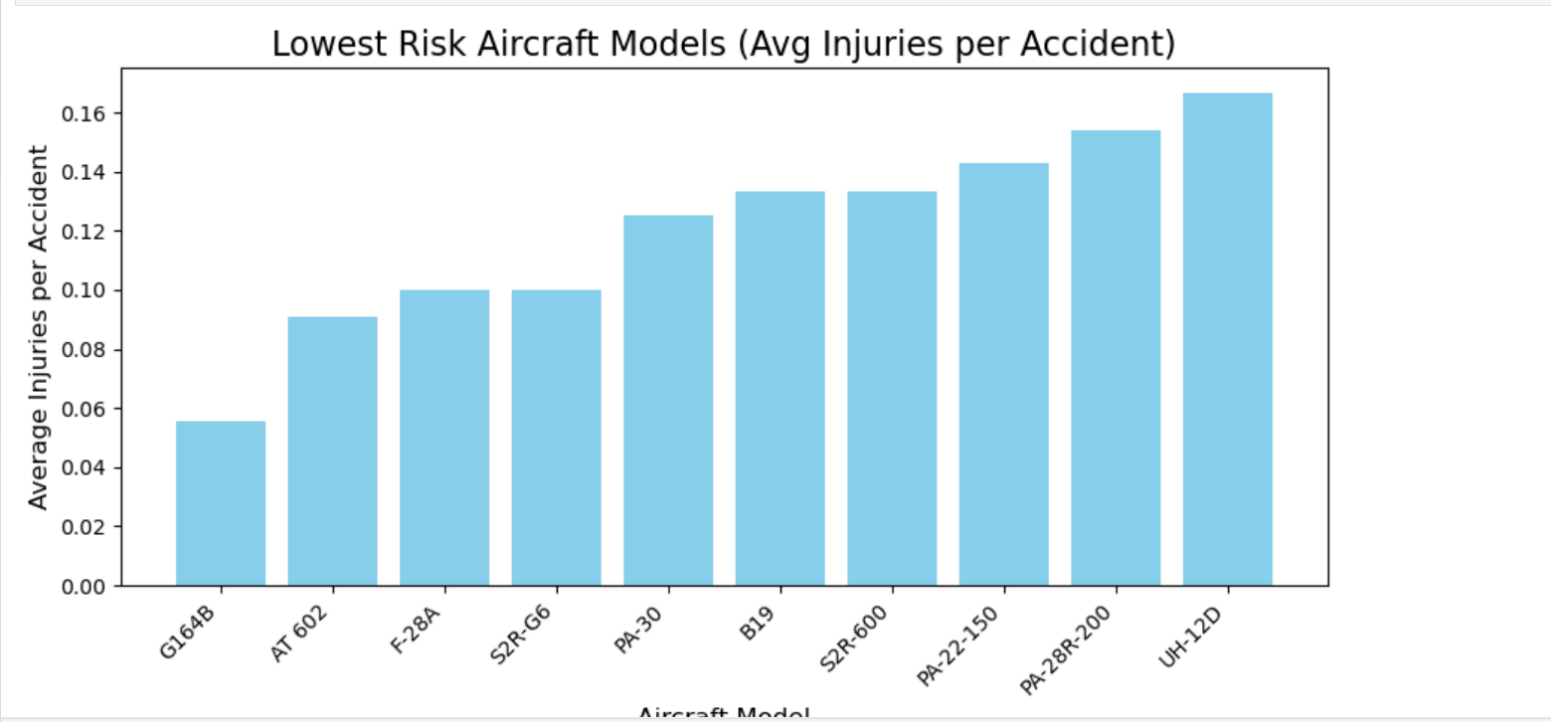
- Aggregated injury data by aircraft model.
- Calculated:
  - Total injuries per model
  - Average injuries per accident
  - Number of recorded accidents per model
- Only included models with ≥**10 accidents** for statistical reliability.

DATA ANALYSIS RESULTS

[32]:

	Make	Model	Total_injuries_sum	Total_injuries_mean	Total_injuries_count
2158	Grumman	G164B	1.0	0.055556	18
330	Air Tractor	AT 602	1.0	0.090909	11
1918	Enstrom	F-28A	1.0	0.100000	10
463	Ayres	S2R-G6	1.0	0.100000	10
3004	Piper	PA-30	2.0	0.125000	16
755	Beech	B19	2.0	0.133333	15
459	Ayres	S2R-600	2.0	0.133333	15
2938	Piper	PA-22-150	3.0	0.142857	21
2791	PIPER	PA-28R-200	2.0	0.153846	13
2304	Hiller	UH-12D	2.0	0.166667	12

VISUALIZATION 1 – TOP 10 SAFEST AIRCRAFT MODELS

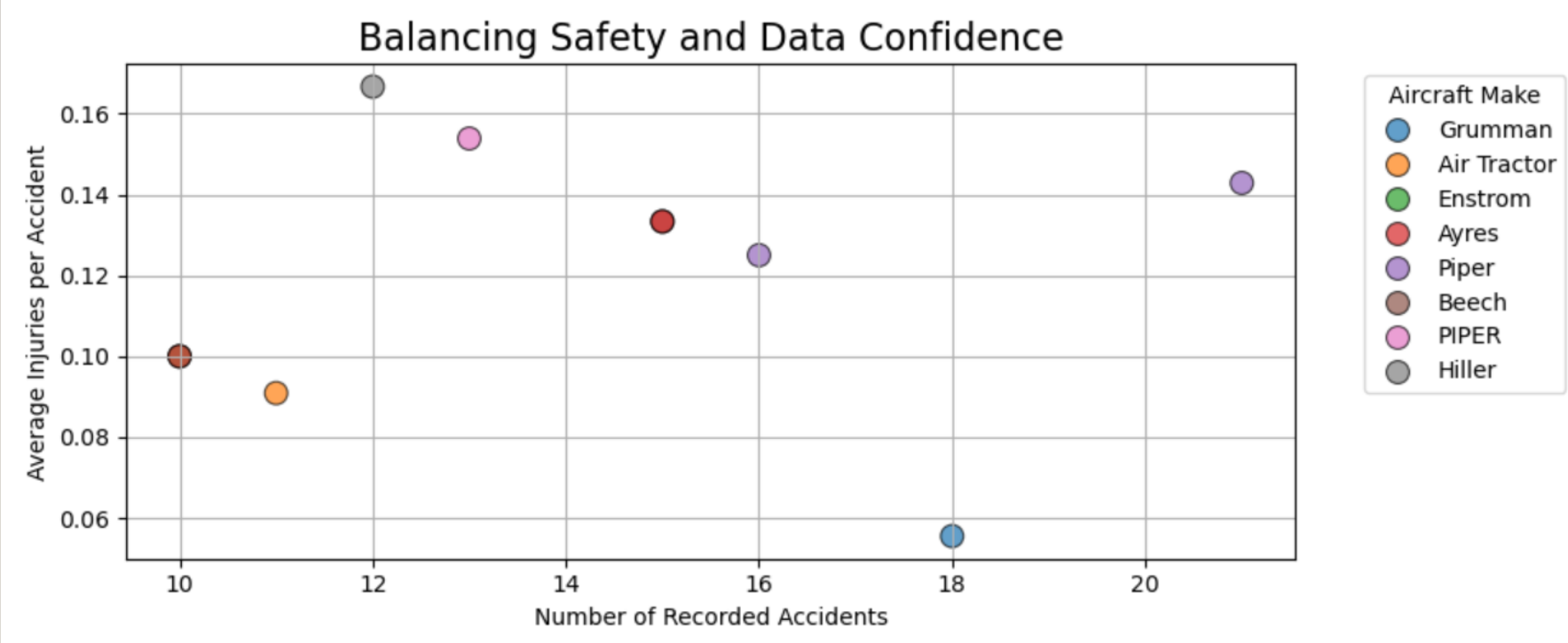


Insights Based on the Top 10 Safest Aircraft Models :

With the above analysis, the Grumman G164B appears to be the safest and most reliable model based on the following criteria:

- Lowest average injuries per accident (0.0556).
- A decent number of accidents (18) for statistical reliability.
- It strikes a good balance between safety and data confidence. And for second option, I would consider Air Tractor AT 602.

VISUALIZATION 2 – TOTAL INJURIES VS. ACCIDENT COUNT



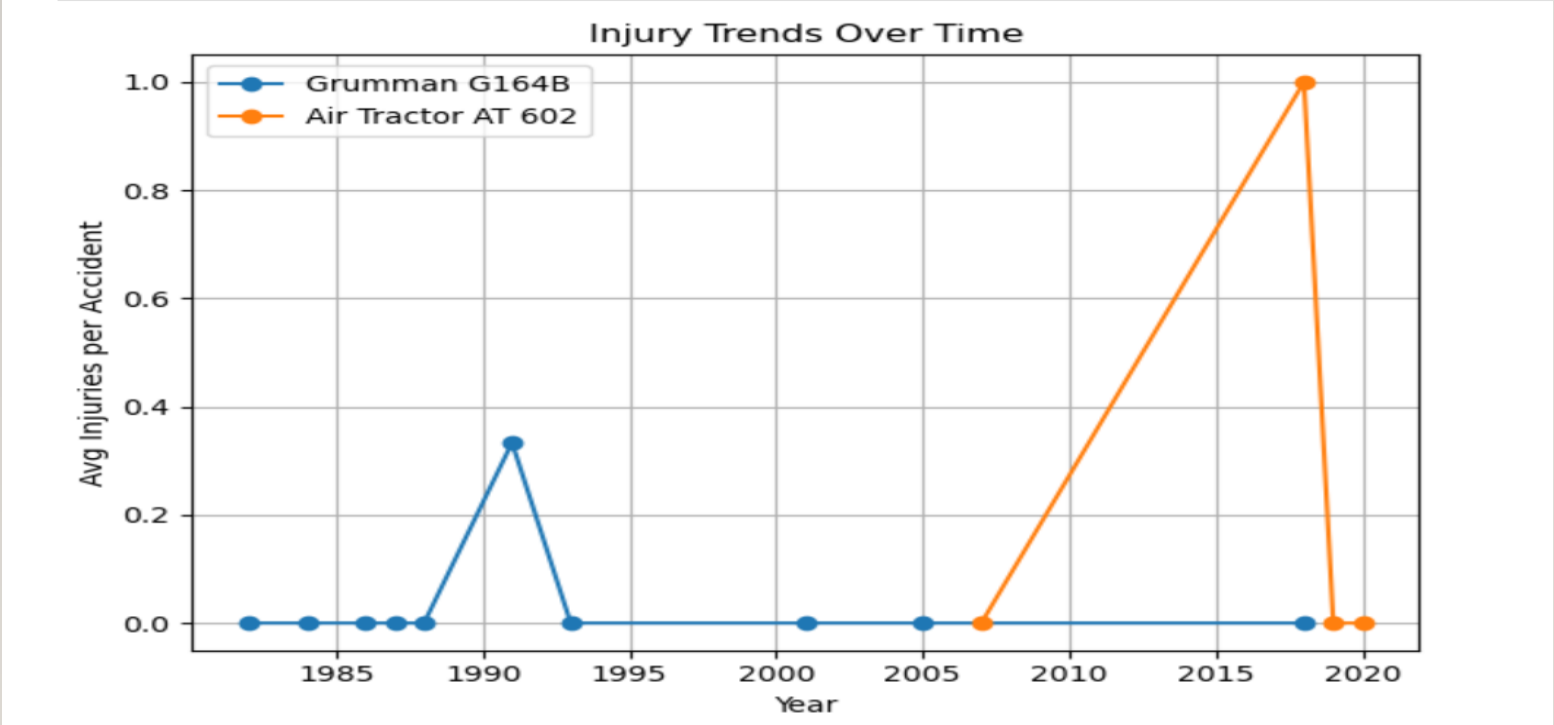
Insights based on Total Injuries vs. Accident Count:

Grumman G164B appears in the bottom-right quadrant and this means:

- Low average injuries per accident
- Relatively high number of incidents (18) – enough for statistical confidence

The aircraft offers the best balance of safety (low injuries) and data reliability (18 accidents), outperforming others.

VISUALIZATION 3 – INJURY TREND OVER TIME



Insights based on Injury Trend Over Time:

- Models like Grumman G164B shows flat or consistently low injury averages over decades.
- Flat or declining lines for models like Grumman G164B suggests consistent safety.
- This supports long-term operational safety—ideal for a company planning multi-year investment.

RECOMMENDATION

- **Invest in Grumman G164B** – Lowest average injuries per incident; 18 cases provide solid backing.
- **Consider Air Tractor AT 602 as Second Choice** – Similar safety profile with slightly fewer records.

THANK YOU

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