Aviation Safety

Finding the Safest Planes in Multiple Sectors

chimAIRa

Danayt Aman, Heath Jones,
David Hartsman

Methodology

We used over 30,000 accident reports from the last 20 years of flying

We considered these factors:

- Injury Data
- Aircraft Damage
- Weather Conditions
- Purpose of Flight

Fatality Rate:

- When a plane does crash, what is the chance that a death occurs?

Injury Data:

Average injury counts per crash:

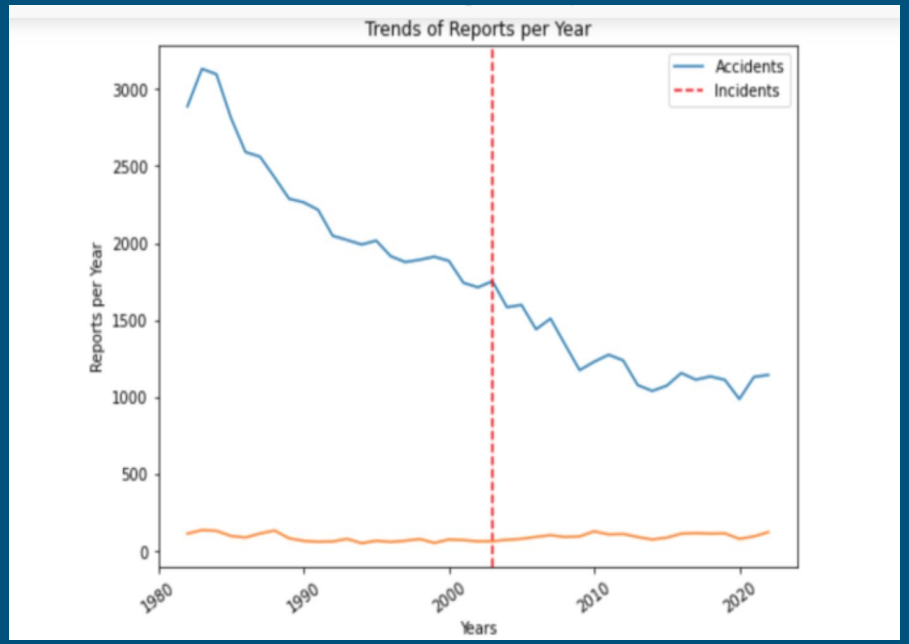
- Fatal
- Serious
- Minor

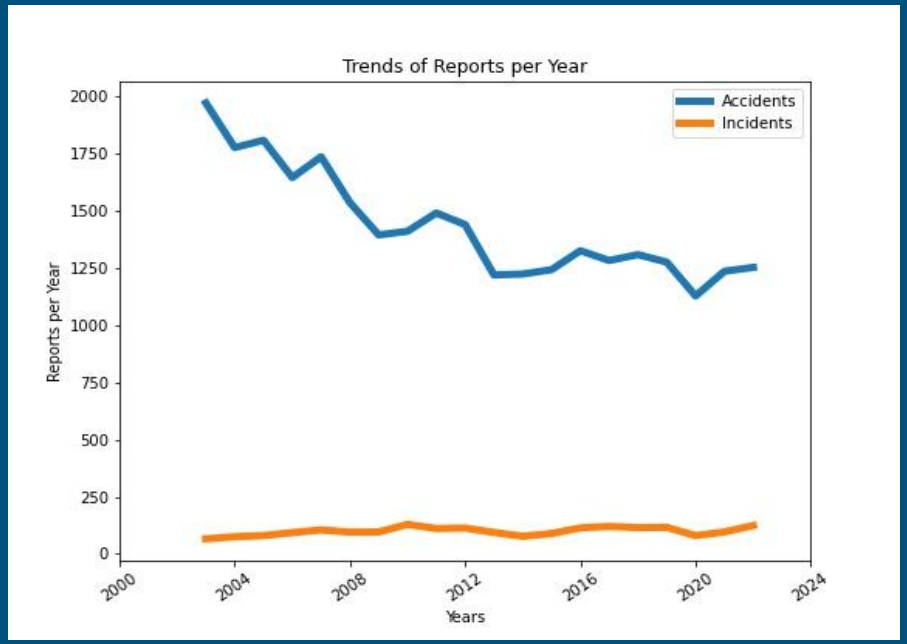
Weather Conditions

- **VMC** -> "Visual Meteorological Conditions". Weather is generally clear (**good visibility**). These reports were caused by something other than weather conditions.

- **IMC** -> "Instrument Meteorological Conditions". **Reduced visibility** (cloud, fog). Pilot must use instruments outside of just visual reference. Worse outcomes are likely in poor weather.

Limiting our Range of Dates



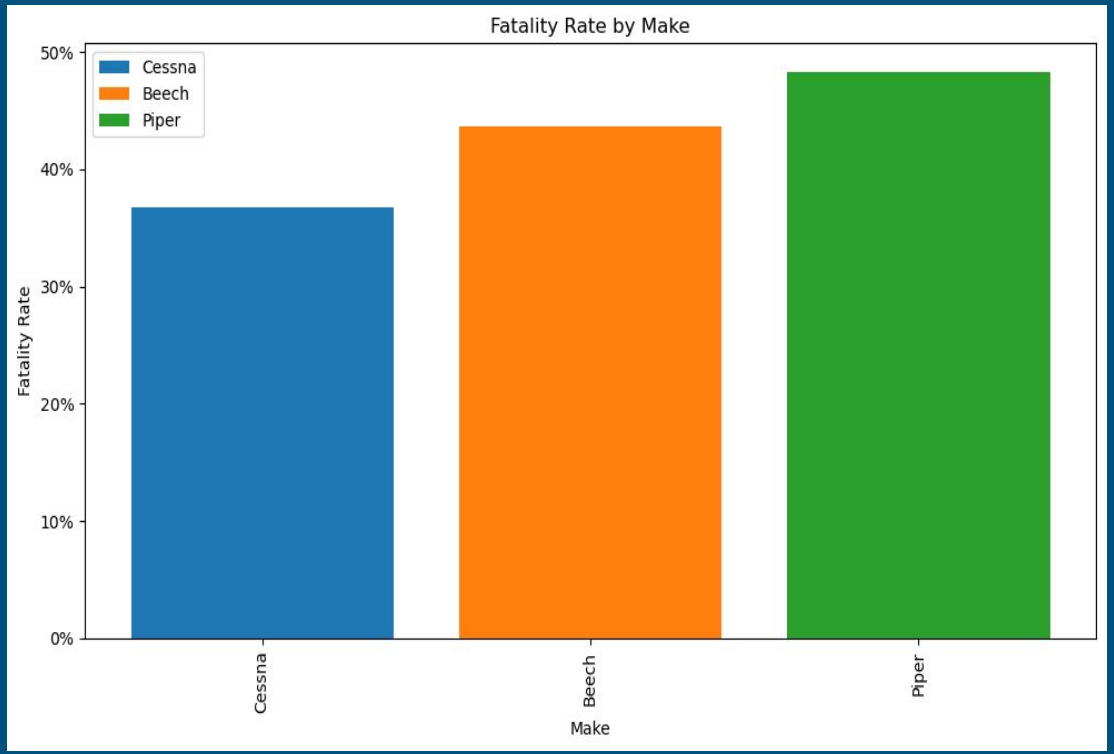


Long-term downtrend in accidents still in place, finding a bit of support around 1200 Accidents/Year
Incidents/Year remain suppressed at comparatively low levels

Recommendations

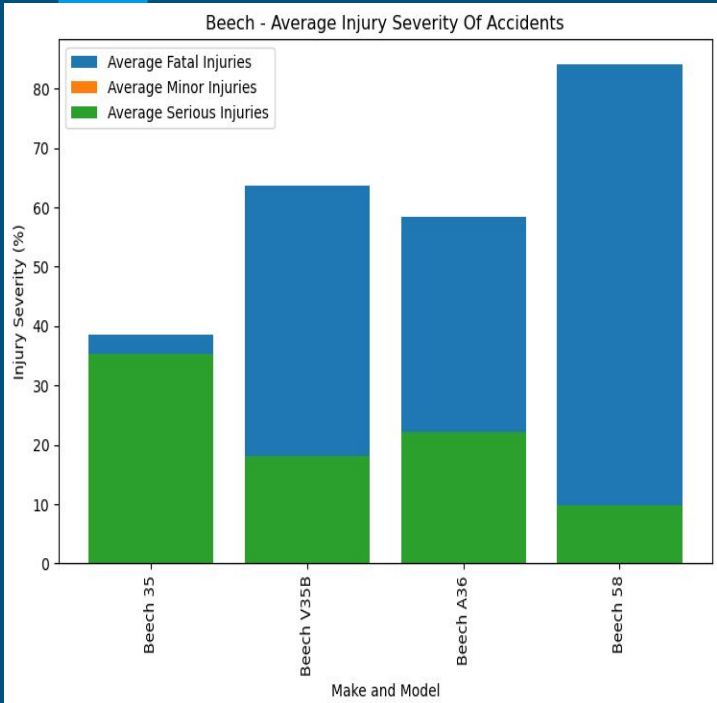
Private →
Commercial →
Aerial Applications →

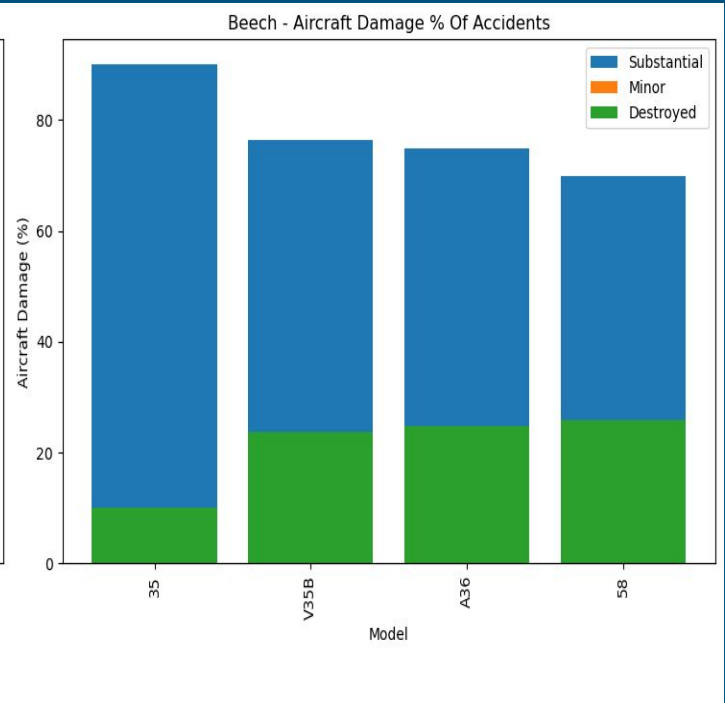
Private Aviation



- 3 top-reported makes:
  - Cessna
  - Beech
  - Piper

Beech Injury Severity & Aircraft Damage





Best Beech Aircraft:

Beech 35

Injury data:

- 35.4% “fatal”
- 38.5% “serious”

Aircraft damage :

- 10% “substantial”
- 90% “destroyed”

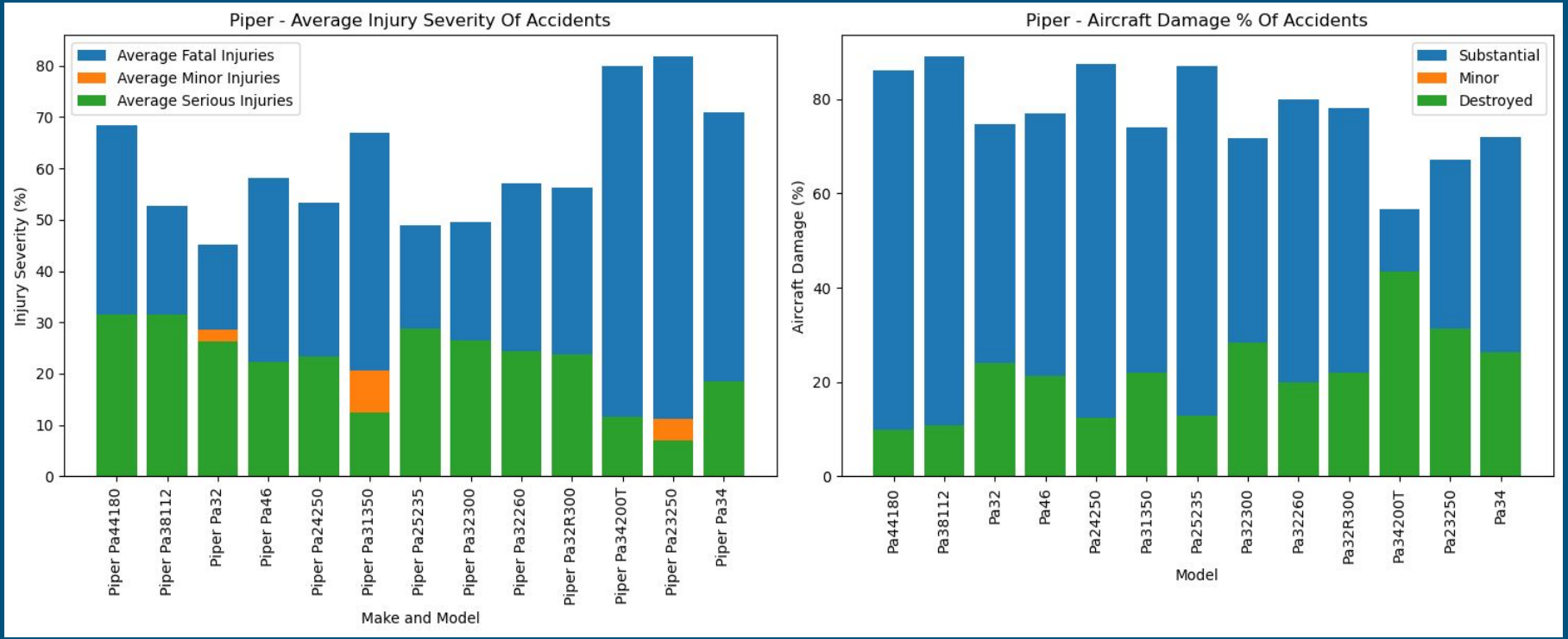
Piper Injury Severity & Aircraft Damage

Best Piper Aircraft:

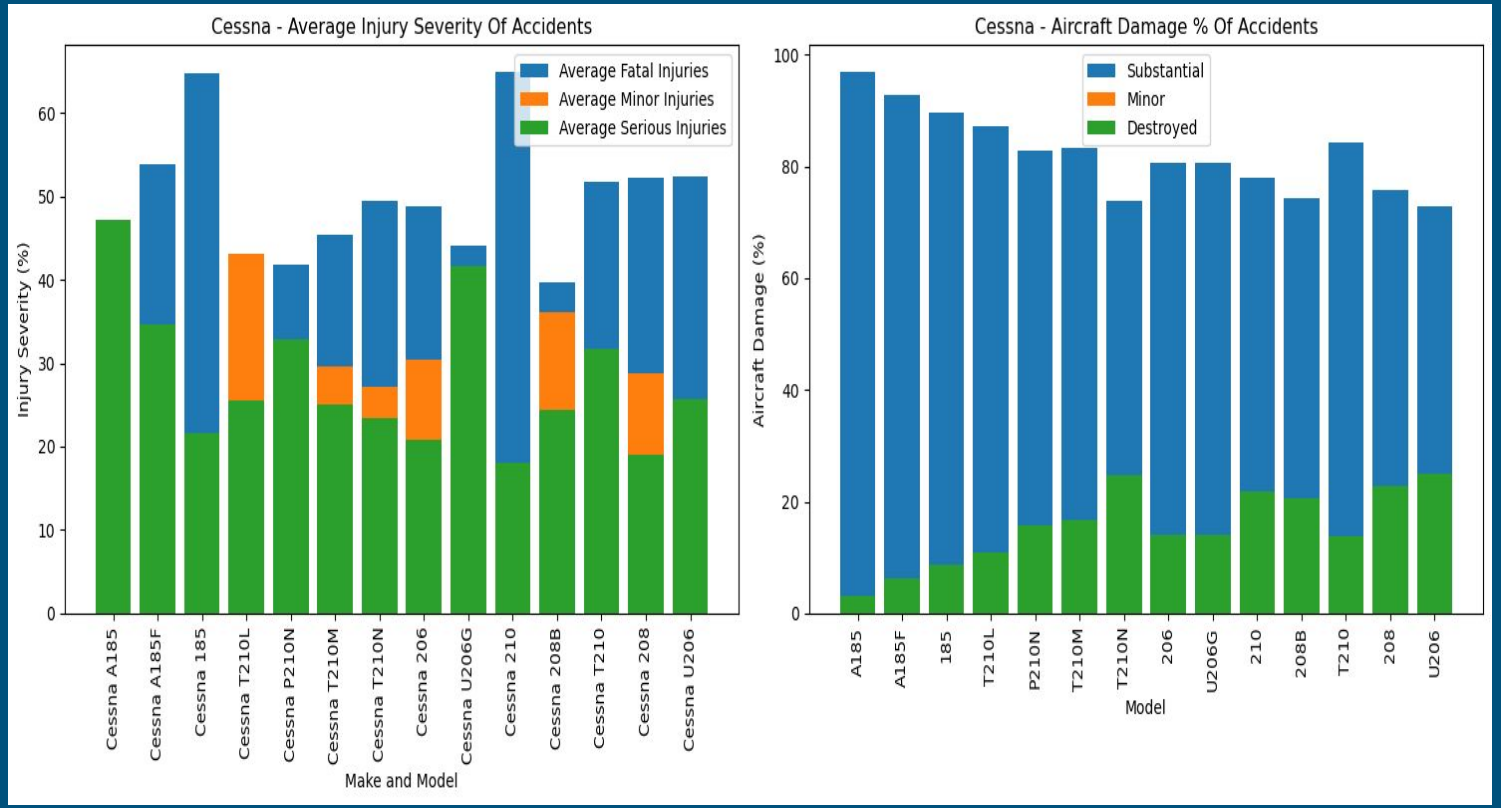
Piper PA-32-300

Injury data:
- 49.6% fatal
- 26.5% serious

Aircraft damage:
- 78.0% “substantial”
- 28.4% “destroyed”



Cessna Injury Severity & Aircraft Damage



Best Cessna Aircraft:

Cessna 208B

Injury data:

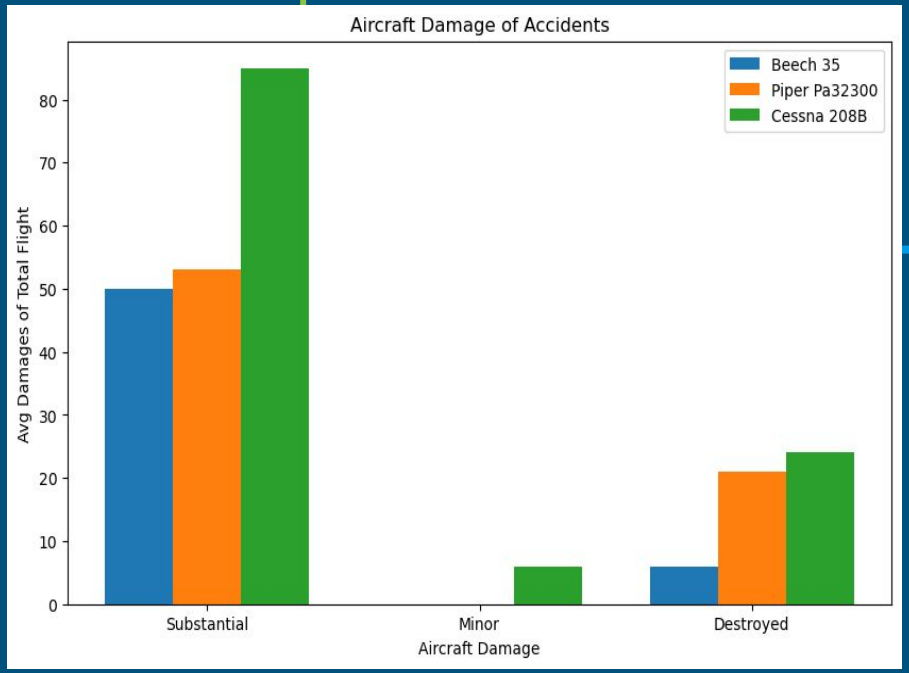
- 24.4% of severe
- 36.0% minor
- 39.6% fatal

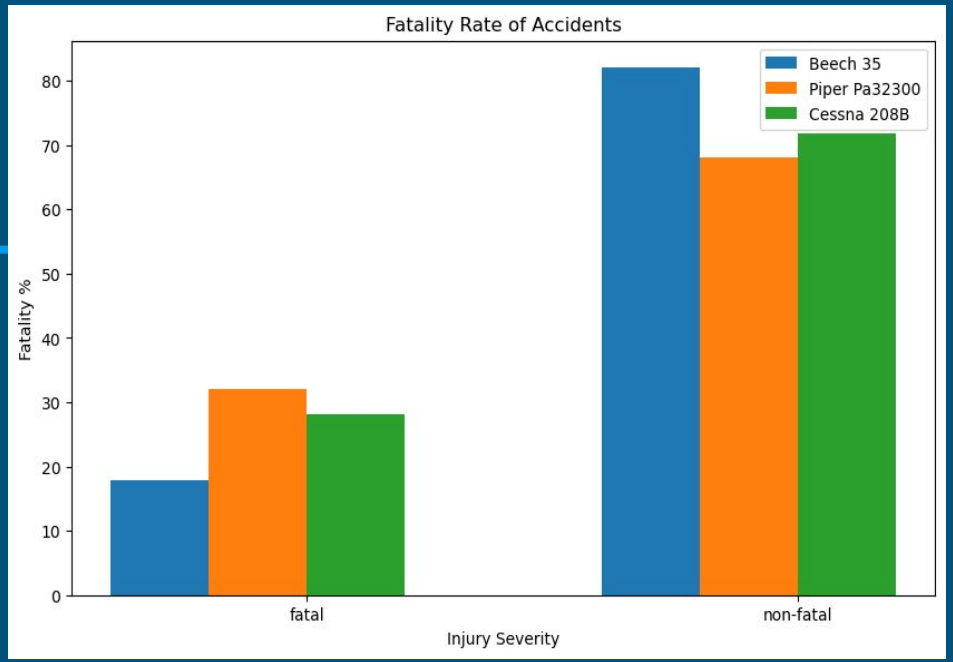
Aircraft damage:

- 20.5% Destroyed
- 74.4% Substantial

Fatality Rate and Aircraft Damage

- **Beech 35** And **Cessna 208B** have relatively smaller percentage of fatality, 17% and 28% respectively





Safest recommendations

Our recommendation:

Beech 35

- Fatality rate of 17%
- 6 passengers

Honorable mention:

Cessna 208B

- Fatality rate of 28%
- 14 passengers

Commercial Aviation

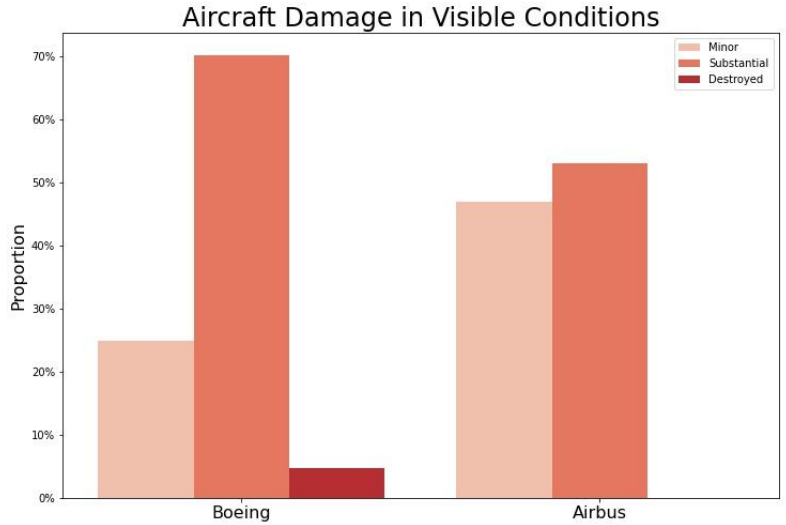
Large-Scale Public Use

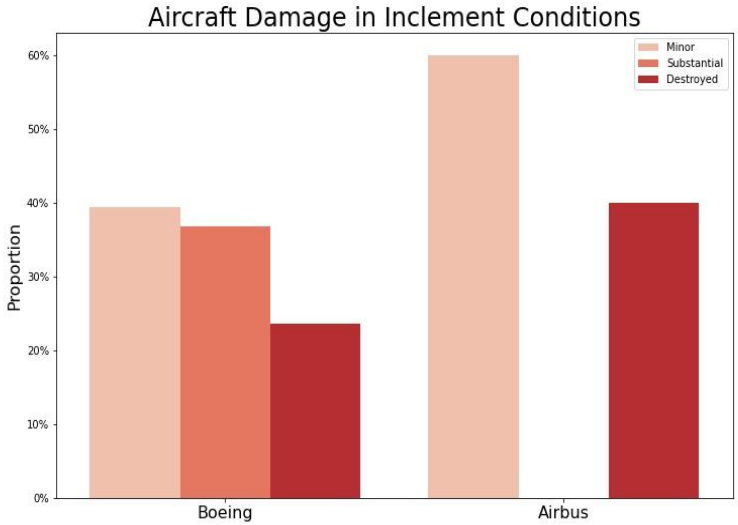
Commercial Comparison: Boeing vs. Airbus

1548 accident reports

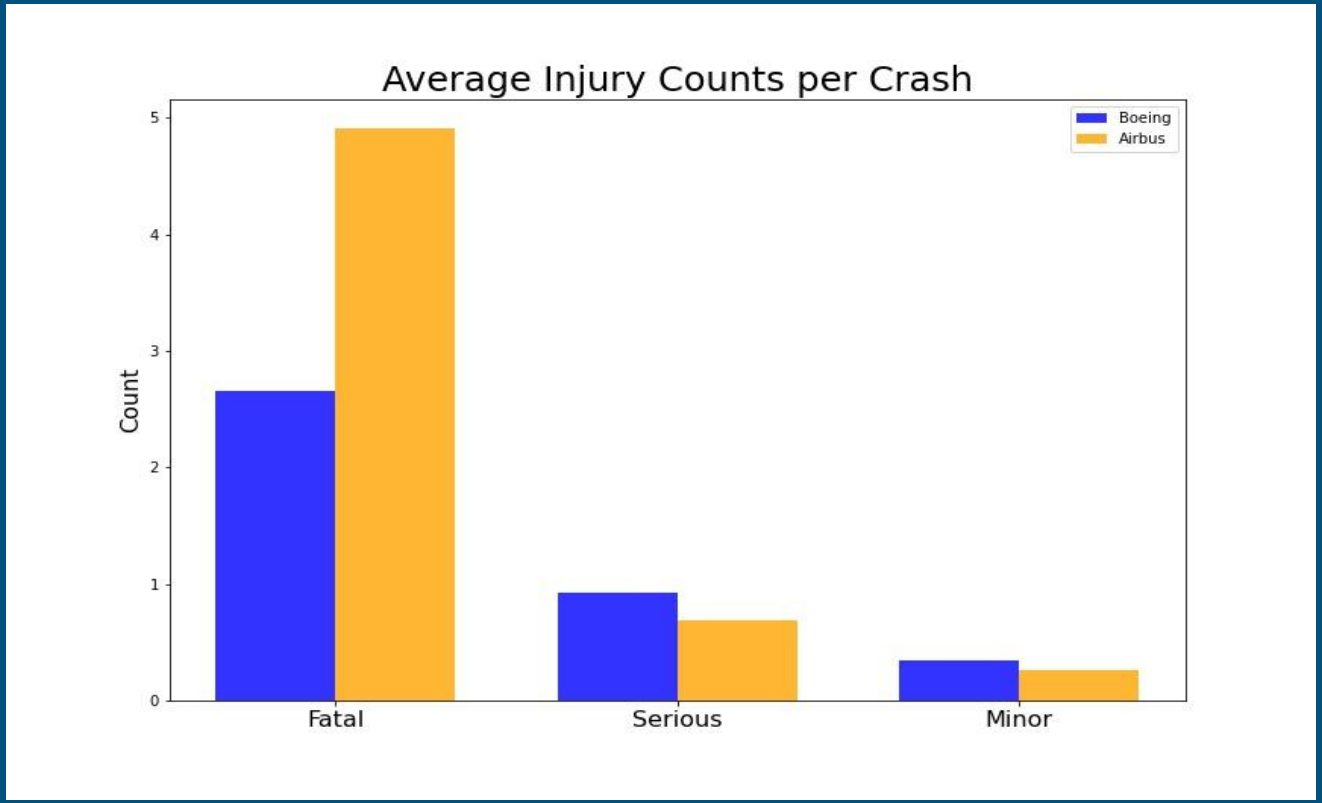
268 accident reports

Comparable Performance: VMC vs IMC

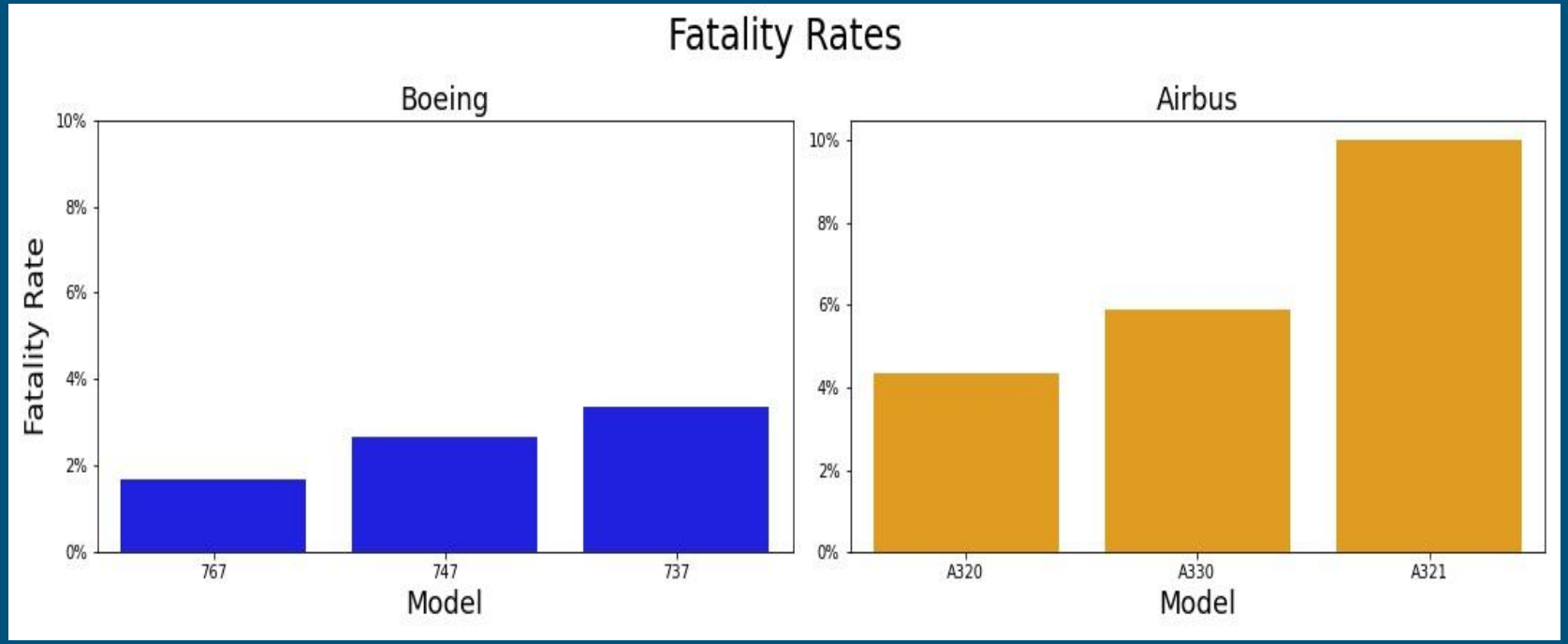




Injury Counts per Accident



Top 3: Boeing vs Airbus



Bye Bye Airbus!

Sick animation of this plane flying into airbus logo

Commercial Vessels with < 4% Fatality Rate

Boeing 737

- Made in 1967
- 2 engines
- 138-230 passengers

Boeing 747

- Made in 1968
- 4 engines
- 416-524 passengers

Boeing 767

- Made in 1978
- 2 engines
- 181-375 passengers

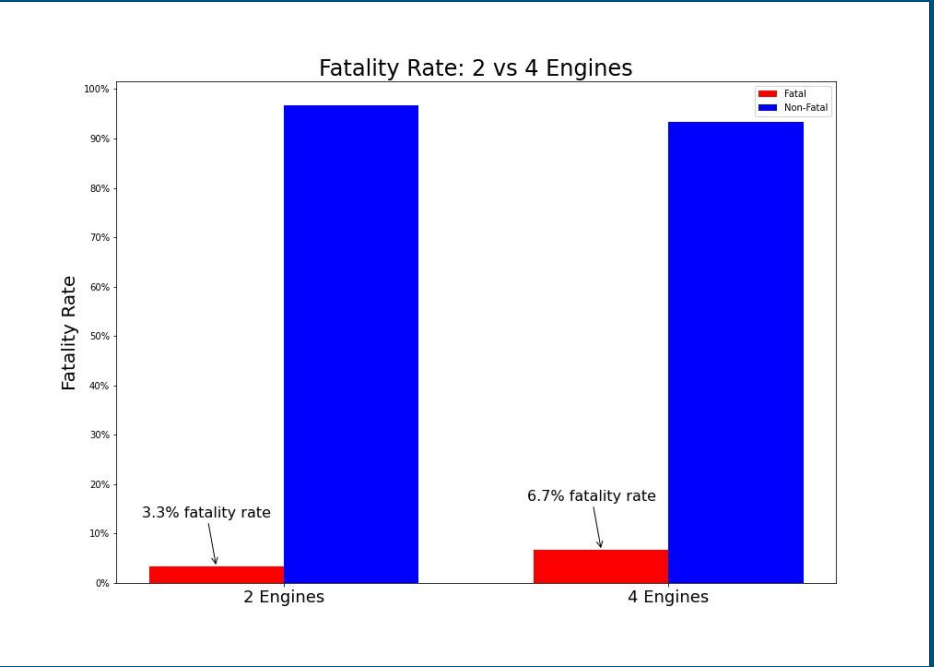
2 Engine vs. 4 Engine

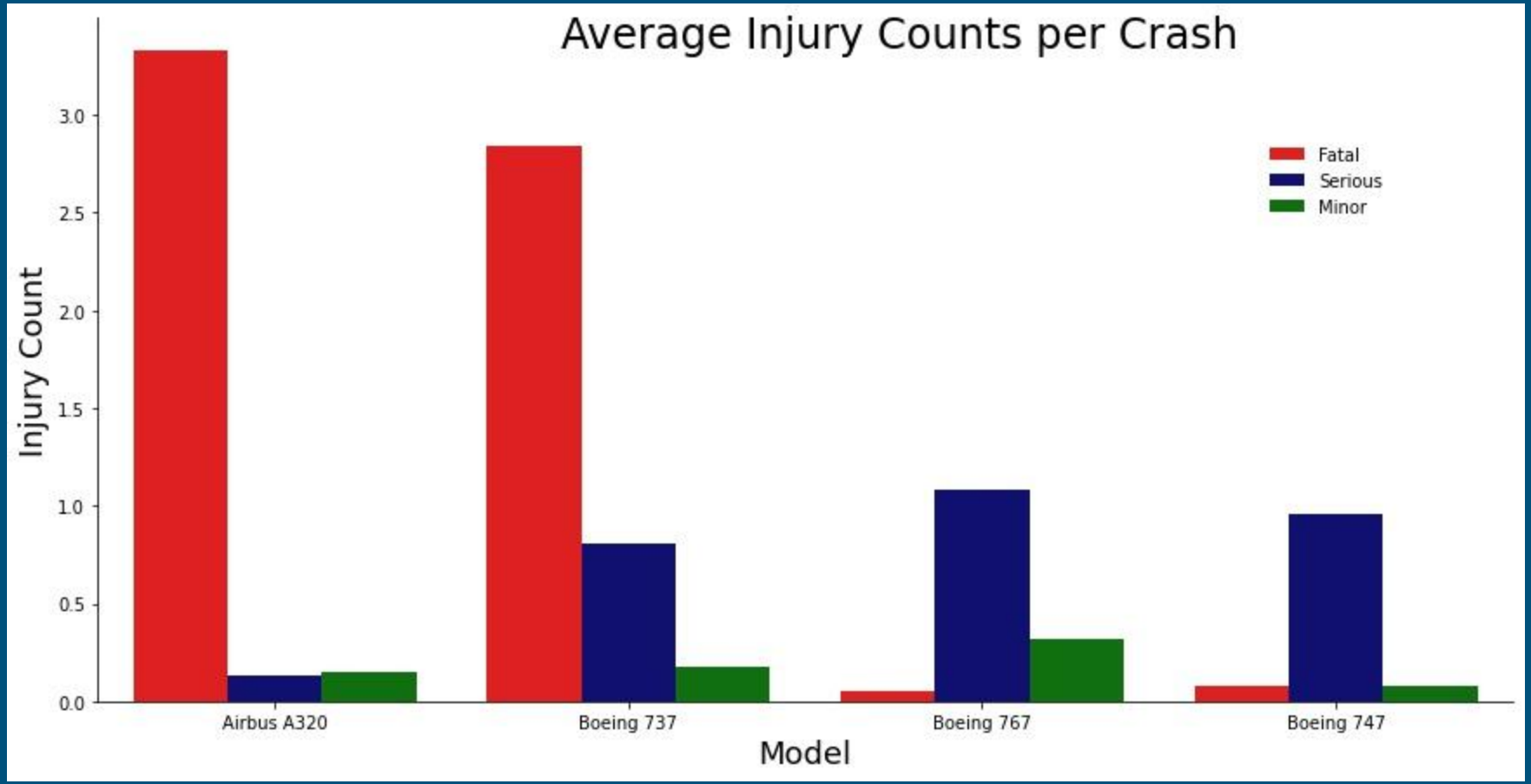
2-Engine Aircraft (1397 reports):

- Fuel-efficient
- Lower operational cost

4-Engine Aircraft (135 reports):

- Very long-range flights
- Larger capacity




Average Injury Counts per Crash
Injury Count
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Fatal
Serious
Minor
Airbus A320
Boeing 737
Boeing 767
Boeing 747
Model

Good Choice:
Boeing 747

- Safest of 4-engine models (2.7% fatality rate)
- Very low fatalities per accident
- 4-engine versatility allows for longer distance flights and larger passenger count.

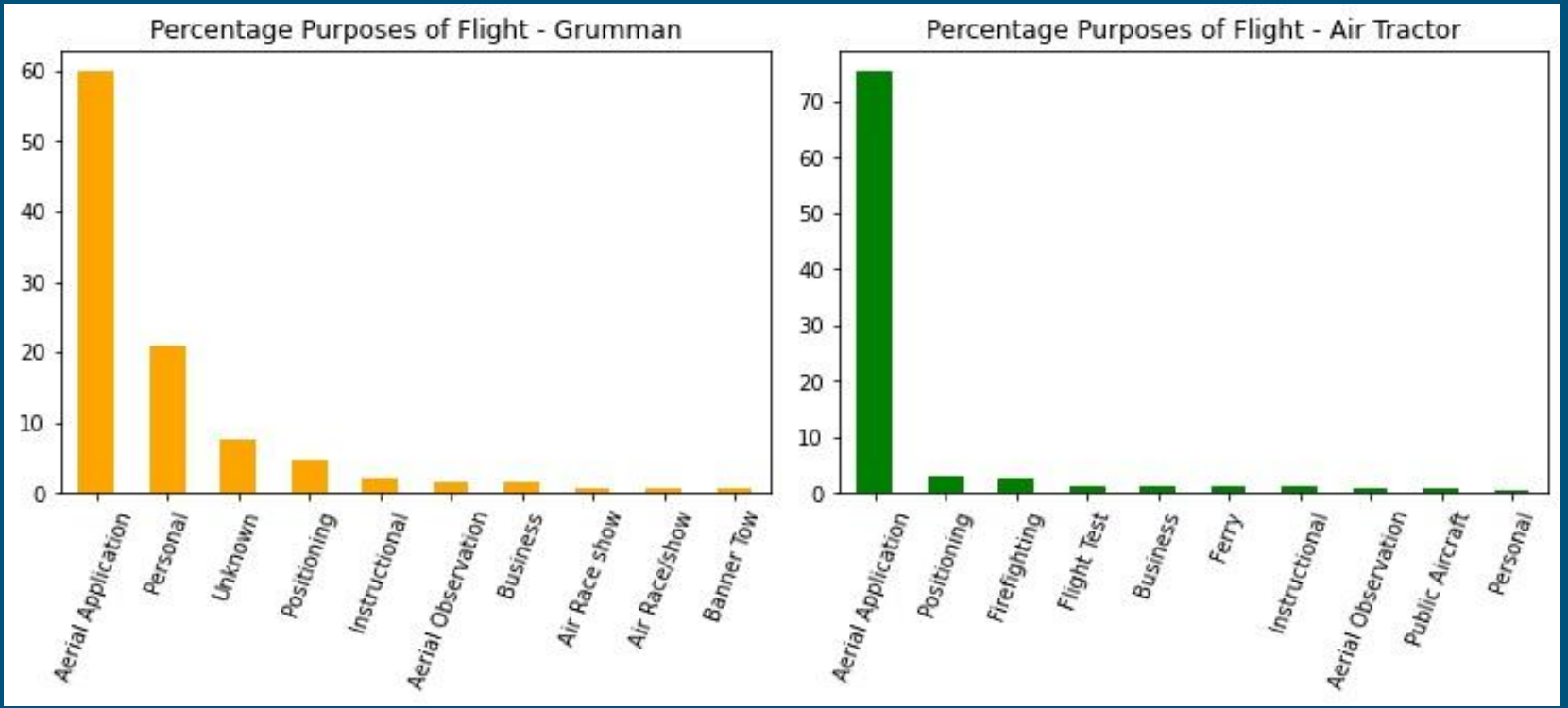
Our Recommendation: Boeing 767

- Lowest fatality-rate (1.7%)
- Data pool much larger for 2-engine planes.

Aerial Application

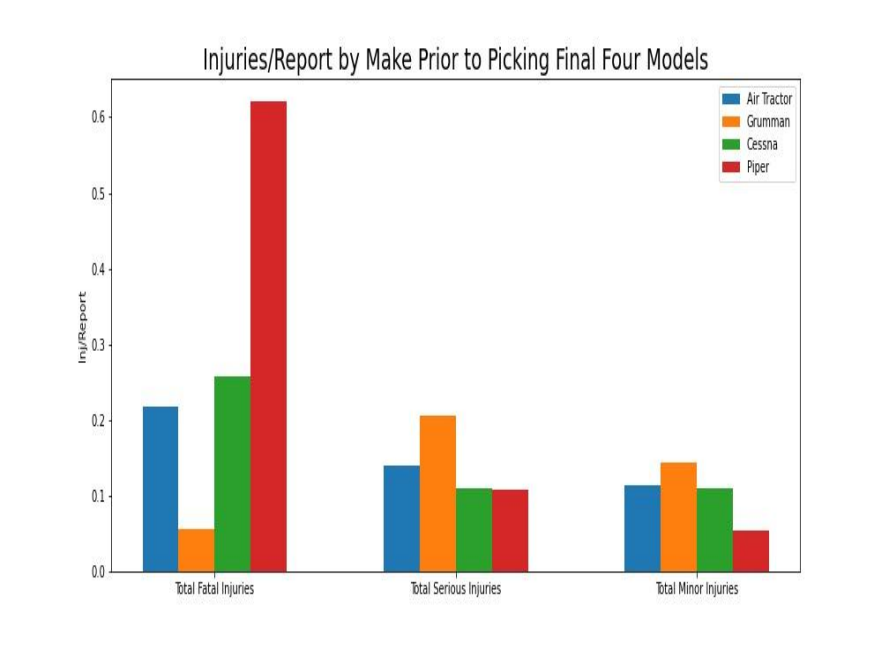
Primary Purpose of Serving the Agricultural World

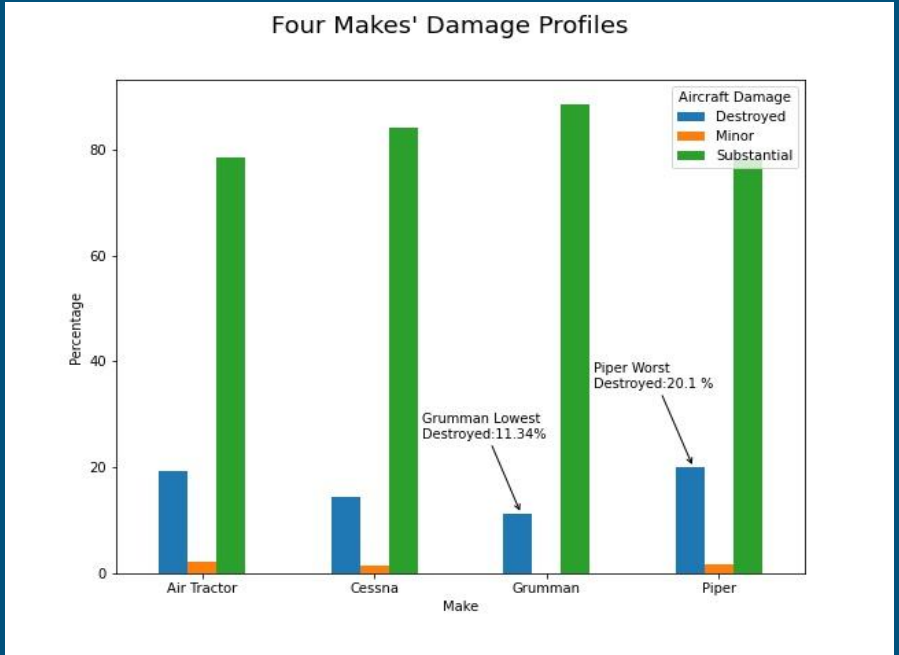
Assessing the Top Manufacturers by Purpose



We found 4 manufacturers with the highest usage in aerial application:

Air Tractor, Grumman, Cessna, and Piper





We filtered those records by purpose of flight, and added records that matched the plane models that were used for aerial application.

Comparing Models from Top 4 Manufacturers

We determined which manufacturers had the highest utilization for aerial application, and then analyzed data on their respective top models.

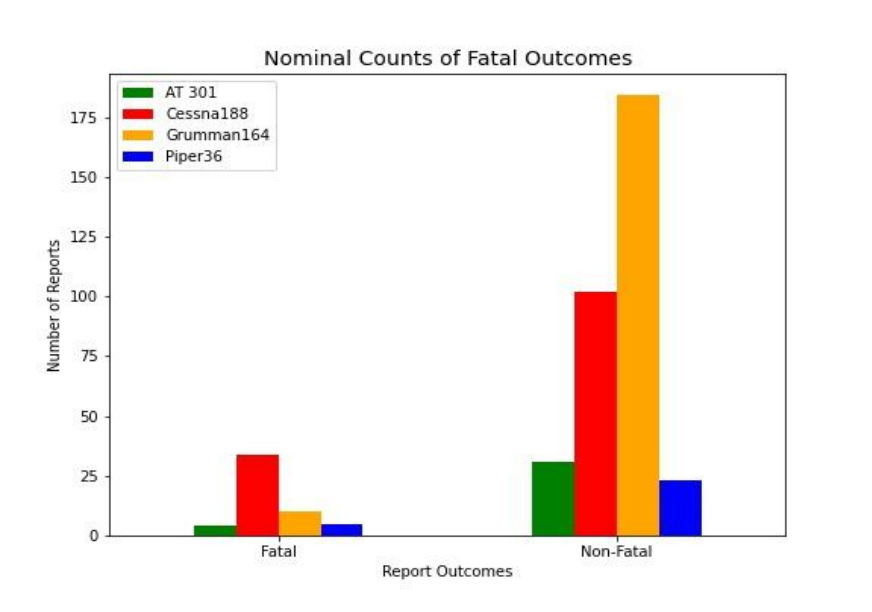
Air Tractor 301

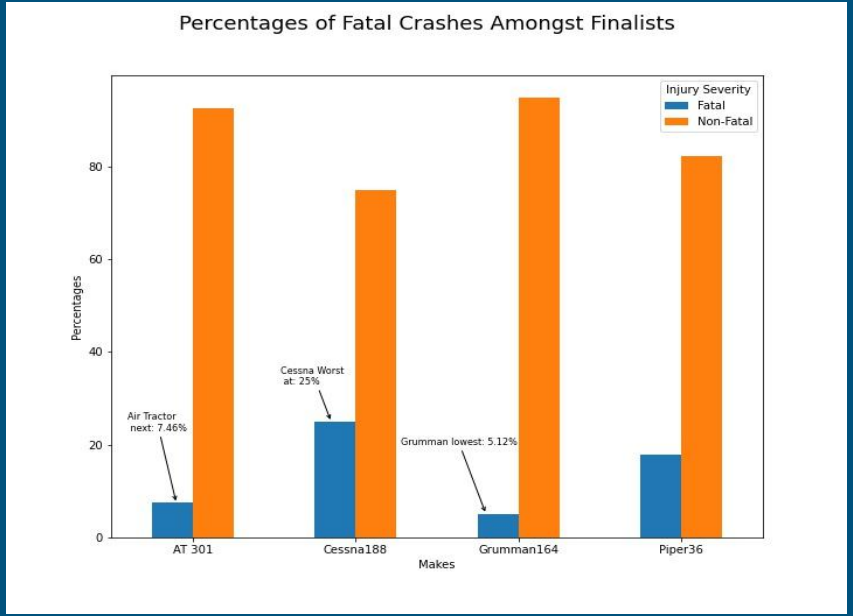
Cessna 188

Grumman 164

Piper 36

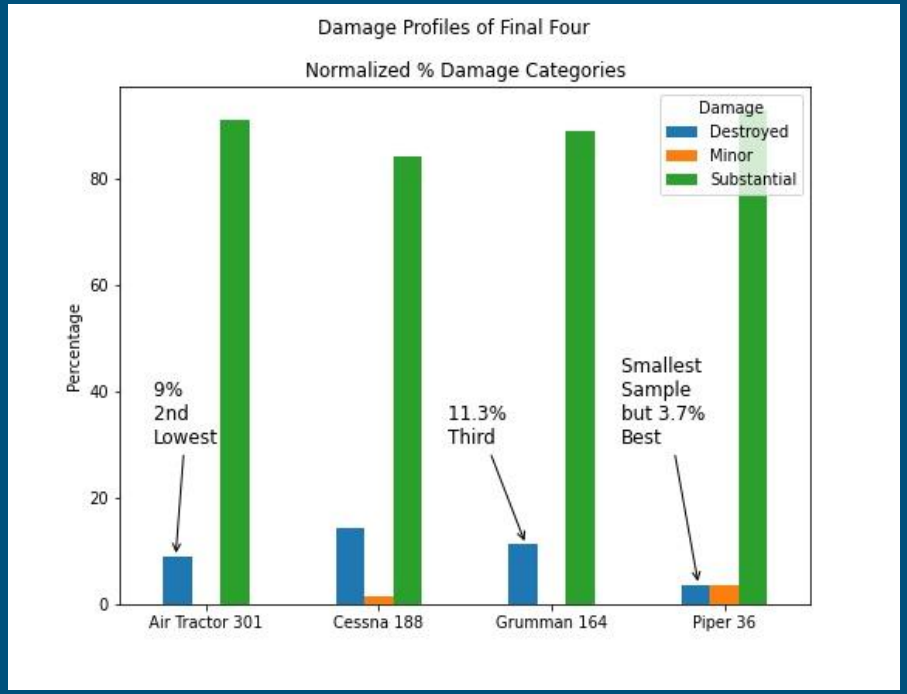
Nominal Fatality Counts vs Normalized Rates

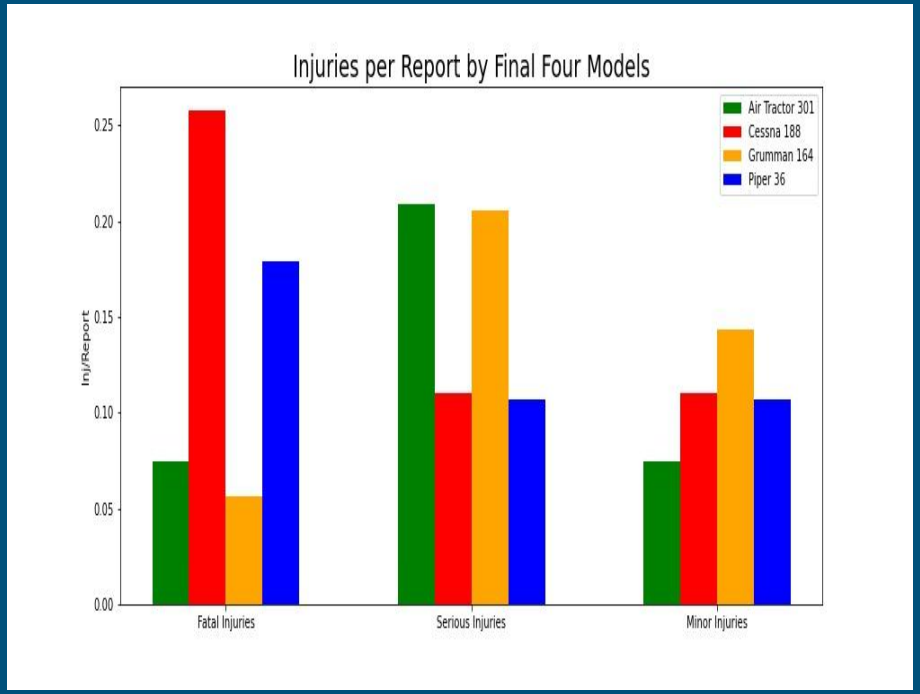




Comparison of Fatal Crash Rates Amongst Finalists

Comparison of Damage Profiles and Injuries





Grumman and Air Tractor continue to exhibit good all-around performance
Cessna and Piper profile worse with smaller samples

We confidently recommend both Air Tractor 301 and Grumman 164

The Air Tractor 301 showed to be extremely durable, and had competitive statistics in injury related categories.

The Grumman 164 Ag Cat exhibited continued outperformance when evaluated against its competitors. We have a high degree of confidence in this recommendation for any future endeavors in aerial application.

Put safety first…. And you'll be on a glidepath to success

Next Steps:

- Look at more robust data - i.e. plane records of non-accidents
- Research on the cost of purchase & maintenance of various aircraft