Flying Forward

Adding Aviation To The Business Portfolio

Goals

- To determine which planes the company should purchase
- Understanding risk of owning each Airplane Make and Model
- Analyze the Aviation Accident Database from the National Transportation Safety Board
  - Accident data from 1962-2023.

How Can We Determine Risk?

- # of Crashes
- # of Fatal Injuries and Uninjured from crashes
- Type and # of Engines
- Type of Plane

| Event.Id | Investigat | Accident. | Event.Dat | Location | Country | Latitude | Longitude | Airport.Co | Airport.N | Injury.Sev | Aircraft.d | Aircraft.C | Registrati | Make | Model | Amateur.E | Number.o | Engine.Ty | FAR.Descr | Schedule | Purpose.o | Air.carrie | Total.Fata | Total.Seri | Total.Min | Total.Uni | Weather.E | Broad.ph | Report.Sta | Publication.Date |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20001218 | Accident | SEA87LA0 | ######## | MOOSE C | United States | | | | | Fatal(2) | Destroyed | | NC6404 | Stinson | 108-3 | No | 1 | Reciprocating | | | Personal | | 2 | 0 | 0 | 0 | UNK | Cruise | Probable | Cause |
| 20001218 | Accident | LAX94LA3 | ######## | BRIDGEPC | United States | | | | | Fatal(4) | Destroyed | | N5069P | Piper | PA24-180 | No | 1 | Reciprocating | | | Personal | | 4 | 0 | 0 | 0 | UNK | Unknown | Probable | 19-09-1996 |
| 20061025 | Accident | NYC07LAC | ######## | Saltville, | United Sta | 36.9222 | -81.878 | | | Fatal(3) | Destroyed | | N5142R | Cessna | 172M | No | 1 | Reciprocating | | | Personal | | 3 | | | | IMC | Cruise | Probable | 26-02-2007 |
| 20001218 | Accident | LAX96LA3 | ######## | EUREKA, L | United States | | | | | Fatal(2) | Destroyed | | N1168J | Rockwell | 112 | No | 1 | Reciprocating | | | Personal | | 2 | 0 | 0 | 0 | IMC | Cruise | Probable | ######## |
| 20041105 | Accident | CHI79FA0 | ######## | Canton, C | United States | | | | | Fatal(1) | Destroyed | | N15NY | Cessna | 501 | No | | | | | Personal | | 1 | 2 | | 0 | VMC | Approach | Probable | 16-04-1980 |
| 20170710 | Accident | NYC79AA: | ######## | BOSTON, | United Sta | 42.4453 | -70.758 | | N/A | Non-Fata | Substanti | Airplane | CF-TLU | Mcdonne | DC9 | No | 2 | Turbo Far | Part 129: | SCHD | | Air Canada | | | 1 | 44 | VMC | Climb | Probable | 19-09-2017 |
| 20001218 | Accident | CHI81LA1 | ######## | COTTON, | United States | | | | | Fatal(4) | Destroyed | | N4988E | Cessna | 180 | No | 1 | Reciprocating | | | Personal | | 4 | 0 | 0 | 0 | IMC | Unknown | Probable | ######## |
| 20020909 | Accident | SEA82DA(| ######## | PULLMAN | United States | | | | BLACKBUF | Non-Fata | Substanti | Airplane | N2482N | Cessna | 140 | No | 1 | Reciproca | Part 91: General Av | | Personal | | 0 | 0 | 0 | 2 | VMC | Takeoff | Probable | ######## |
| 20020909 | Accident | NYC82DA(| ######## | EAST HAN | United States | | | N58 | HANOVER | Non-Fata | Substanti | Airplane | N7967Q | Cessna | 401B | No | 2 | Reciproca | Part 91: General Av | | Business | | 0 | 0 | 0 | 2 | IMC | Landing | Probable | ######## |
| 20020909 | Accident | MIA82DA | ######## | JACKSON\ | United States | | | JAX | JACKSON\ | Non-Fata | Substantial | | N3906K | North Am | NAVION L | No | 1 | Reciprocating | | | Personal | | 0 | 0 | 3 | 0 | IMC | Cruise | Probable | ######## |
| 20020909 | Accident | FTW82DA | ######## | HOBBS, N | United States | | | | | Non-Fata | Substantial | | N44832 | Piper | PA-28-16 | No | 1 | Reciprocating | | | Personal | | 0 | 0 | 0 | 1 | VMC | Approach | Probable | ######## |
| 20020909 | Accident | ATL82DKJ | ######## | TUSKEGEE | United States | | | | TUSKEGEE | Non-Fata | Substantial | | N4275S | Beech | V35B | No | 1 | Reciprocating | | | Personal | | 0 | 0 | 0 | 1 | VMC | Landing | Probable | ######## |
| 20020909 | Accident | FTW82FR | ######## | HOMER, L | United States | | | | | Non-Fata | Substantial | | N14779 | Bellanca | 17-30A | No | 1 | Reciproca | Part 91: General Av | | Personal | | 0 | 0 | 1 | 0 | IMC | Cruise | Probable | ######## |
| 20020917 | Accident | FTW82FR | ######## | HEARNE, T | United States | | | T72 | HEARNE N | Fatal(1) | Destroyed | Airplane | N758SK | Cessna | R172K | No | 1 | Reciproca | Part 91: General Av | | Personal | | 1 | 0 | 0 | 0 | IMC | Takeoff | Probable | ######## |

Data Prep

- Modernize Dataset of 88,889 crashes to include crashes within the last 40 years
- Consolidating all duplicates in 'Make' and 'Model' columns
- Removing Null values and rows with irrelevant/incomplete data
  - Aircraft.Category
  - Amatuer.Built
  - Total.Fatal.Injuries
  - Publication.Date
- Imputing Values
  - Total.Fatal.Injuries from Injury.Severity
  - Aircraft Damage from Total.Fatal.Injuries
- Resulting Dataset includes 20,399 crashes

Data Analysis

- Most popular Models
  - Cessna 172-private
  - Boeing 737-commercial
- Total.Fatal.Injuries
- Total.Uninjured
- Safest Engine Types
  - Turbo > Reciprocating
- Safest Engine #
  - Multiple engines resulted in safer crash metrics

	Crashes	Total.Fatal.Injuries	Average.Fatal.Injuries
CESSNA_172	738	197	0.266938
BOEING_737	343	1279	3.728863

Frequency of Plane

Top 50 Make_Model Combinations by Count
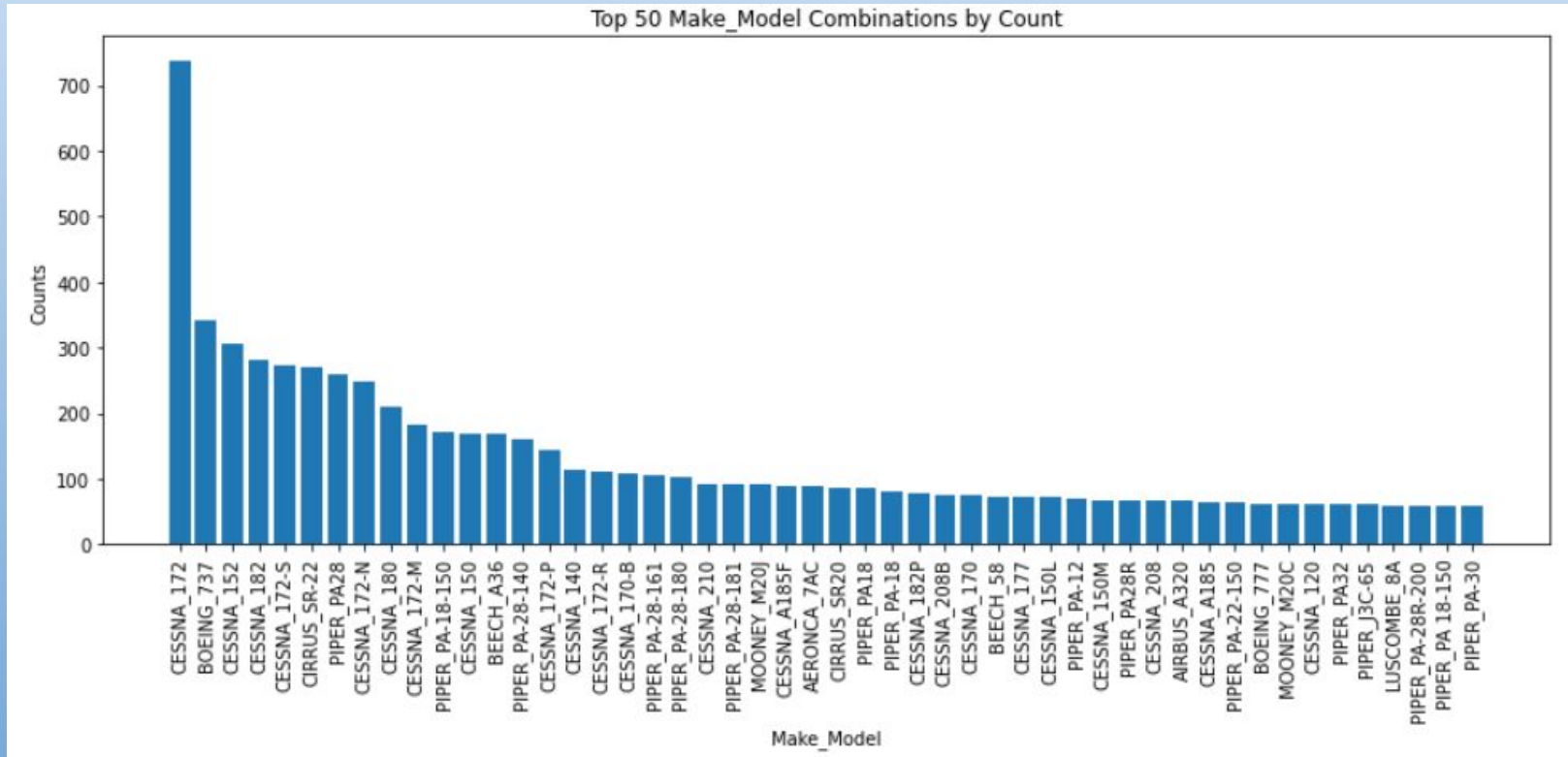
Fatal Injuries by Model

Total Fatal Injuries by Make and Model
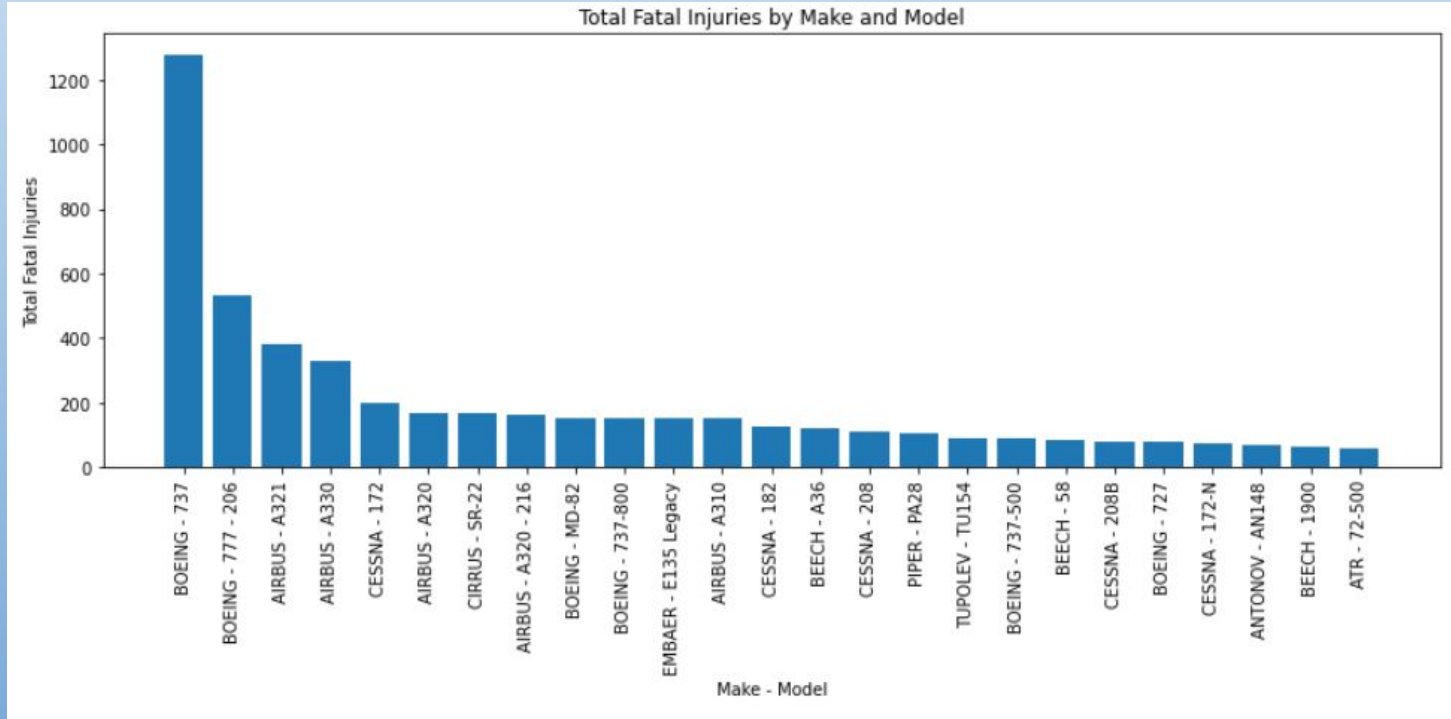
Top 25 Uninjured

Make_Model	
BOEING_737	18988.0
BOEING_777	7743.0
BOEING_767	4889.0
BOEING_757	3039.0
AIRBUS_A320	2788.0
AIRBUS_A330	2770.0
BOEING_747	2320.0
BOEING_787	2290.0
BOEING_747-400	1712.0
BOEING_737 7H4	1704.0
BOEING_737-7H4	1584.0
BOEING_777-222	1523.0
AIRBUS_A330-323	1395.0
AIRBUS_A321	1349.0
BOEING_737-800	1229.0
AIRBUS_A380	1097.0
EMBAER_EMB-145LR	955.0
BOEING_757-222	908.0
BOEING_767 332	898.0
MCDONNELL DOUGLAS_MD80	894.0
AIRBUS_A321 231	848.0
AIRBUS_A330 323	847.0
BOEING_737-300	846.0
BOEING_747-422	846.0
CESSNA_172	815.0

Engine Type Analysis

Total Fatal Injuries by Engine Type
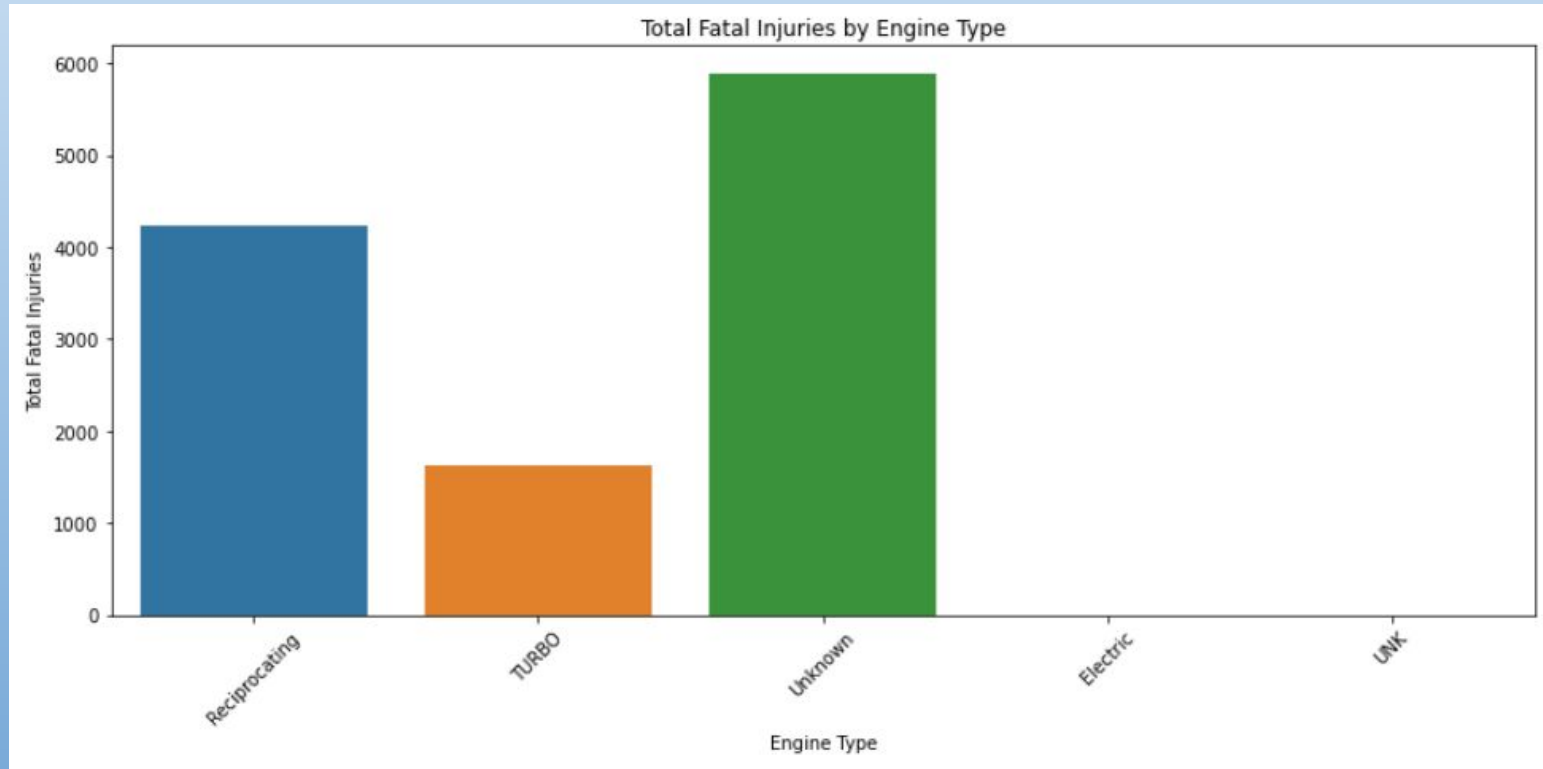
Number of Engines Analysis

Total Fatal Injuries by Number of Engines
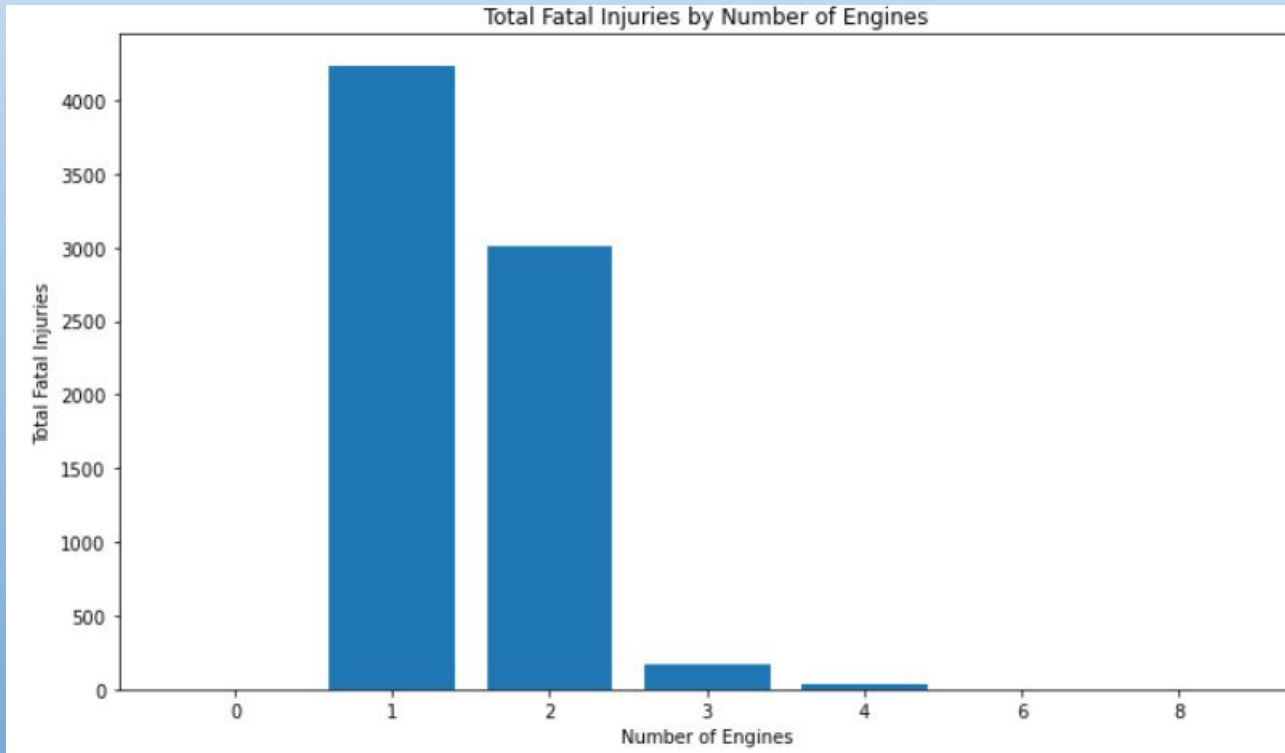
Limitations

- This is only crash data, so if a plane theoretically has never crashed before, it would not be in this dataset.
- The majority of the rows were not used in final calculations due to so many NaN/missing values.
- This data is US based which limits international analysis.

Conclusions

- CESSNA 172-25th in most uninjured
- BOEING 737-1st in most injured and Uninjured
- More Engines are safer
- Negative correlation between Turbo engines and Fatal Injuries

Next Steps

- Make a deeper analysis of Boeing 737 and Cessna 172.
- Analyze cost of maintenance for these 2 planes

Thank you for your time

- Additional Questions?
- https://www.linkedin.com/in/will-byrd-40323863