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.

Event.Id	Investiga	Accident.I	Event.Dat	Location	Country	Latitude	Longitude	Airport.Co	Airport.Na	Injury.Sev	Aircraft.d	Aircraft.C	Registrati	Make	Model	Amateur.I	Number.o	Engine.Ty	FAR.Descr	Schedule	Purpose.o	Air.carrie	Total.Fata	Total.Seri	Total.Min	Total.Uni	Weather.I	Broad.pha	Report.Sta	Publication.Date
2000121i	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
2000121i	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
2006102i	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
2001121i	Accident	LAX96LA3	########	EUREKA, C	United States					Fatal(2)	Destroyed		N1168J	Rockwell	112	No	1	Reciprocating			Personal		2	0	0	0	VMC	Cruise	Probable	########
2004110i	Accident	CHI79FA0	########	Canton, C	United States					Fatal(1)	Destroyed		N15NY	Cessna	501	No					Personal		1	2		0	VMC	Approach	Probable	16-04-1980
2017071(	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
2001121i	Accident	CHI81LA1	########	COTTON,	United States					Fatal(4)	Destroyed		N4988E	Cessna	180	No	1	Reciprocating			Personal		4	0	0	0	IMC	Unknown	Probable	########
2002090i	Accident	SEA82DAC	########	PULLMAN	United States				BLACKBUF	Non-Fata	Substanti	Airplane	N2482N	Cessna	140	No	1	Reciproca	Part 91: General Avi		Personal		0	0	0	2	VMC	Takeoff	Probable	########
2002090i	Accident	NYC82DAi	########	EAST HAN	United States			N58	HANOVER	Non-Fata	Substanti	Airplane	N7967Q	Cessna	401B	No	2	Reciproca	Part 91: General Avi		Business		0	0	0	2	IMC	Landing	Probable	########
2002090i	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	########
2002090i	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	########
2002090i	Accident	ATL82DKJ	########	TUSKEGEE	United States				TUSKEGEE	Non-Fata	Substantial		N4275S	Beech	V35B	No	1	Reciprocating			Personal		0	0	0	1	VMC	Landing	Probable	########
2002091i	Accident	FTW82FR.	########	HOMER, L	United States					Non-Fata	Substantial	Airplane	N14779	Bellanca	17-30A	No	1	Reciproca	Part 91: General Avi		Personal		0	0	1	0	IMC	Cruise	Probable	########
2002091i	Accident	FTW82FR.	########	HEARNE, T	United States			T72	HEARNE N	Fatal(1)	Destroyed	Airplane	N758SK	Cessna	R172K	No	1	Reciproca	Part 91: General Avi		Personal		1	0	0	0	IMC	Takeoff	Probable	########

How Can We Determine Risk?

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

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
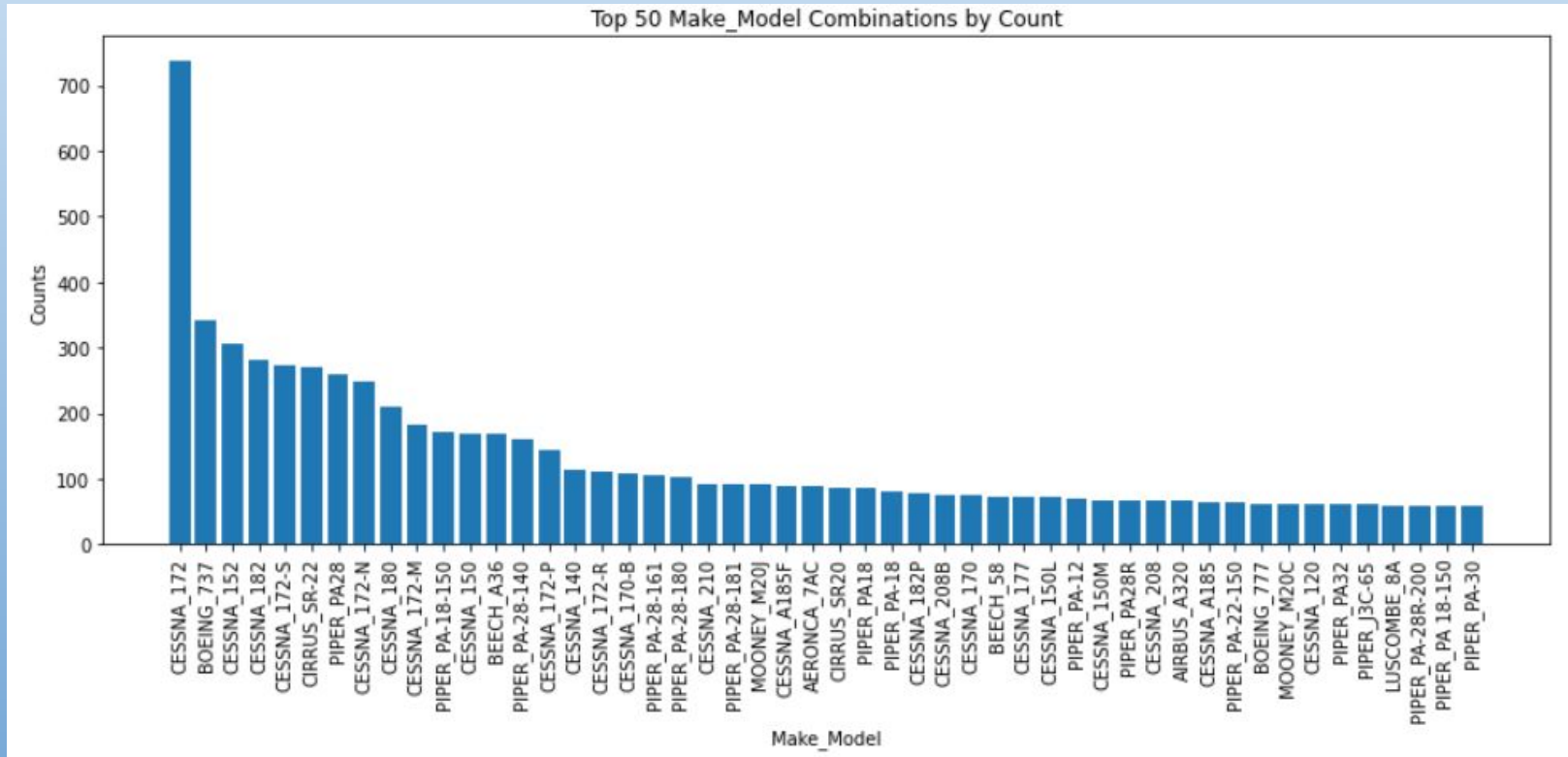
Fatal Injuries by Model

Total Fatal Injuries by Make and Model
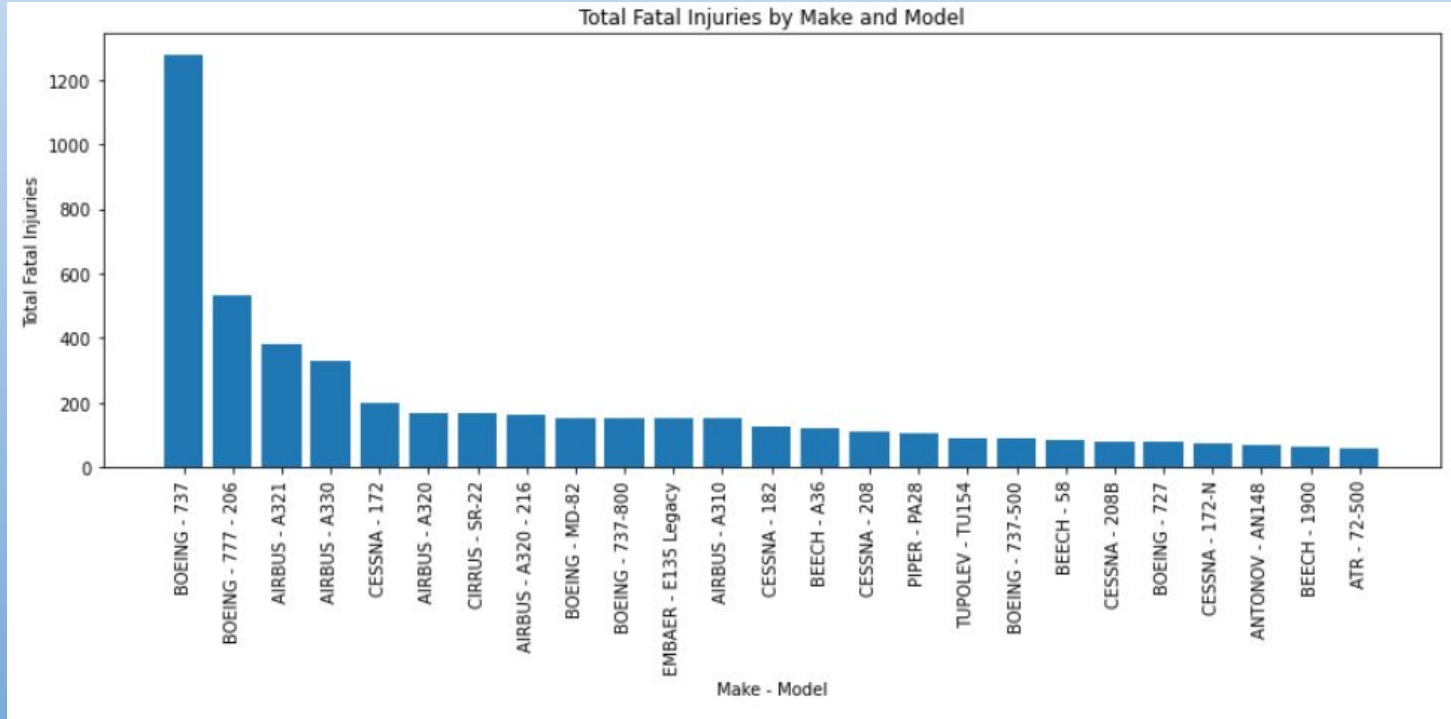
Top 25 Uninjured

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
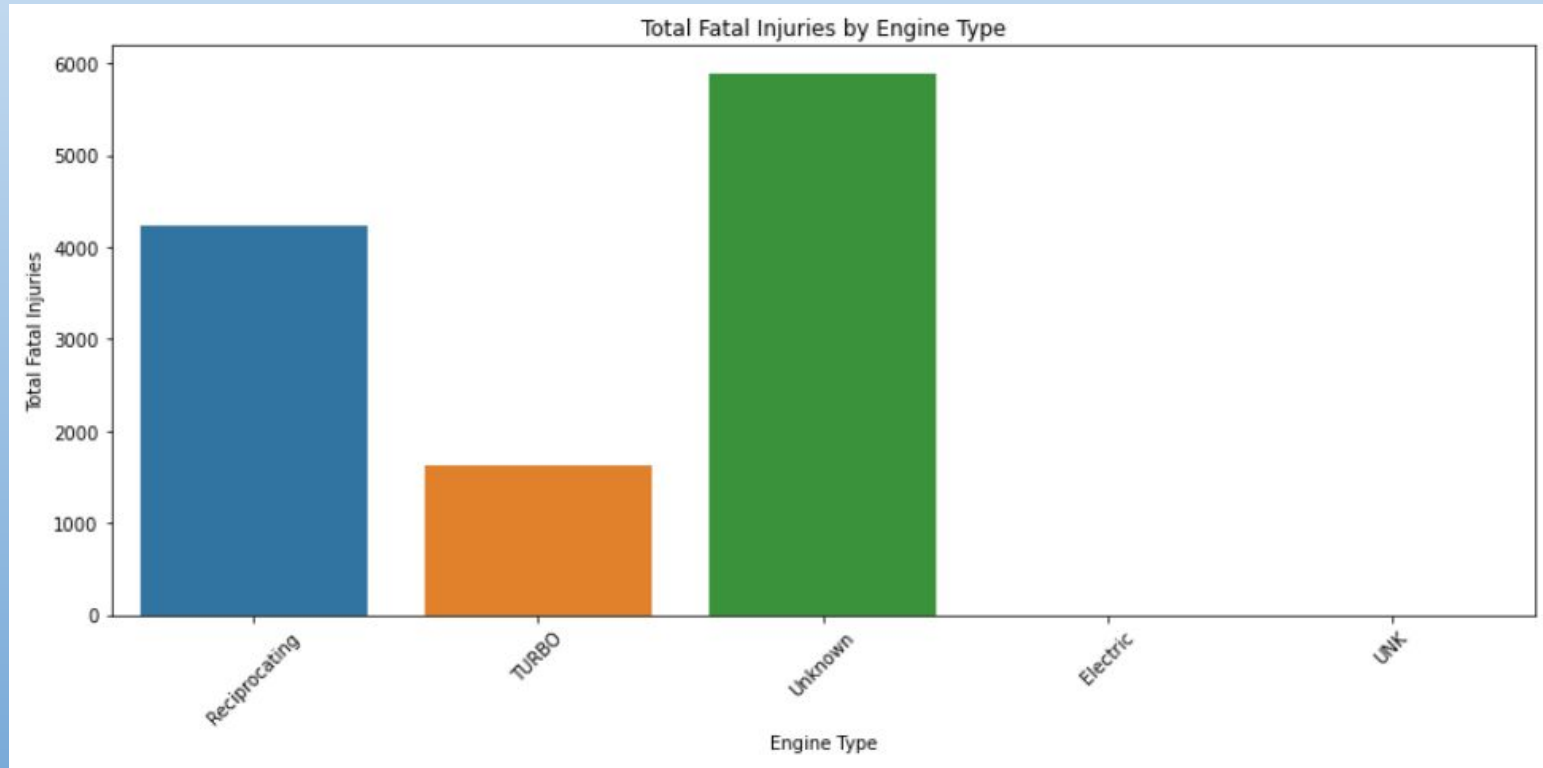
Number of Engines Analysis
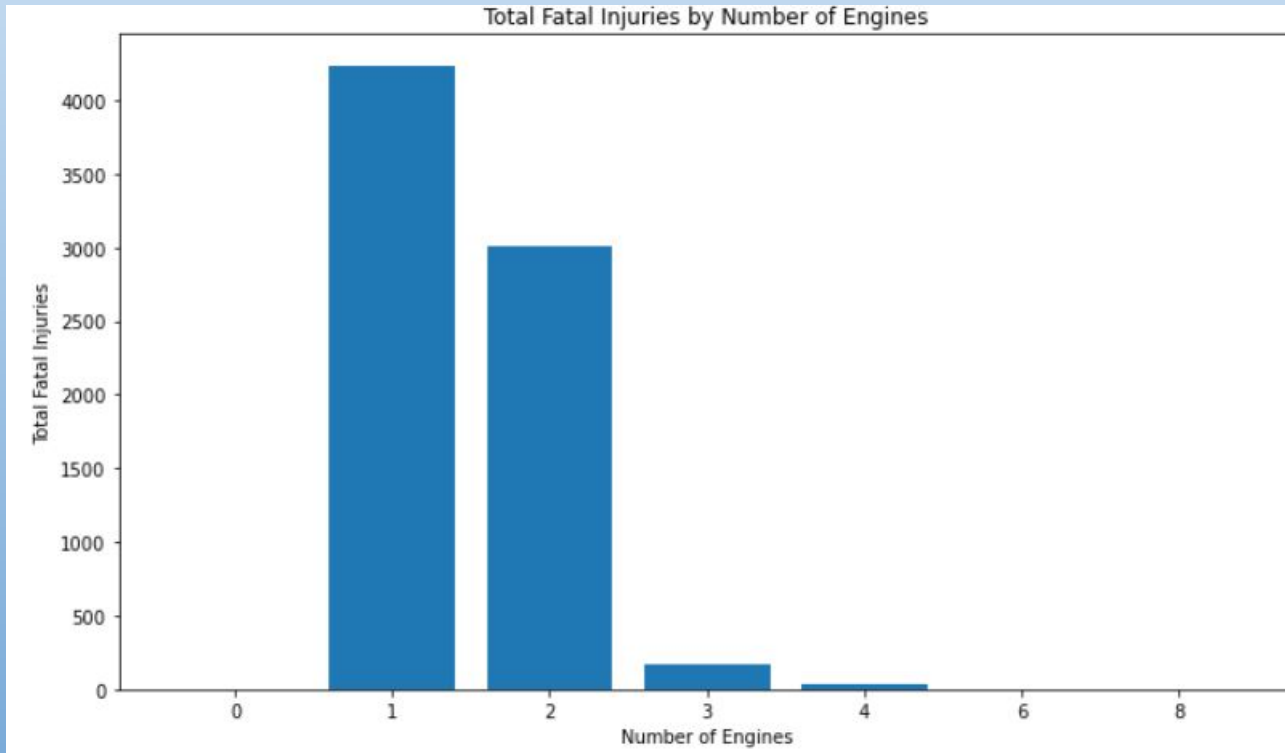
Limitations

- 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

- We should target Models with more engines as the more engines on a plane, the less likely Fatal Injuries are to occur. We can tell by the frequency of crashes with the BOEING 737 and the amount of 'Total.Uninjured' and 'Total.Fatal.Injuries' that the **BOEING 737 is one of the largest planes in our dataset.

- There is a **negative correlation between Turbo engines and Fatal Injuries** as well, indicating that Turbo Engines are safer than Reciprocating. BOEING and AIRBUS largely use Turbo fans and CESSNA uses Reciprocating.

- The **Cessna 172 has one of the best safety record of planes in this dataset.** It ranks 25th in most uninjured passengers of all planes while being the most frequently appearing plane in our dataset.

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?
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