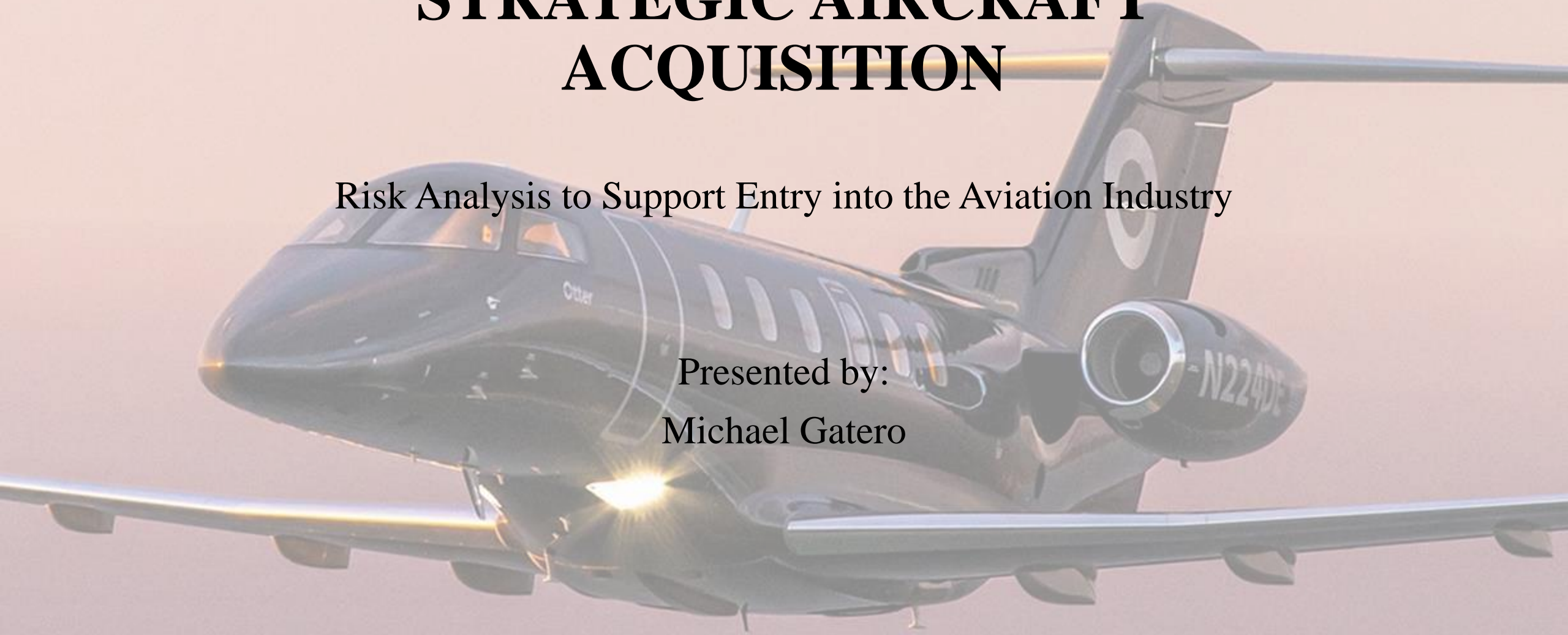


# **AVIATION DATA ANALYSIS FOR STRATEGIC AIRCRAFT ACQUISITION**

Risk Analysis to Support Entry into the Aviation Industry

Presented by:  
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# BUSINESS PROBLEM

A twin-engine turboprop aircraft is shown in flight against a hazy, light-colored sky. The aircraft is viewed from a low angle, showing its wings, engines, and tail. The registration number 'N224DE' is visible on the side of the fuselage. The aircraft's landing gear is deployed, and there is a bright light reflecting off the bottom of the fuselage.

## •Business Context:

- Expanding into aviation to diversify the portfolio.
- Focus on purchasing and operating commercial and private airplanes.
- Lack of understanding of risks associated with different aircraft types.

# OBJECTIVES

## **1. Conduct Comprehensive Data Analysis:**

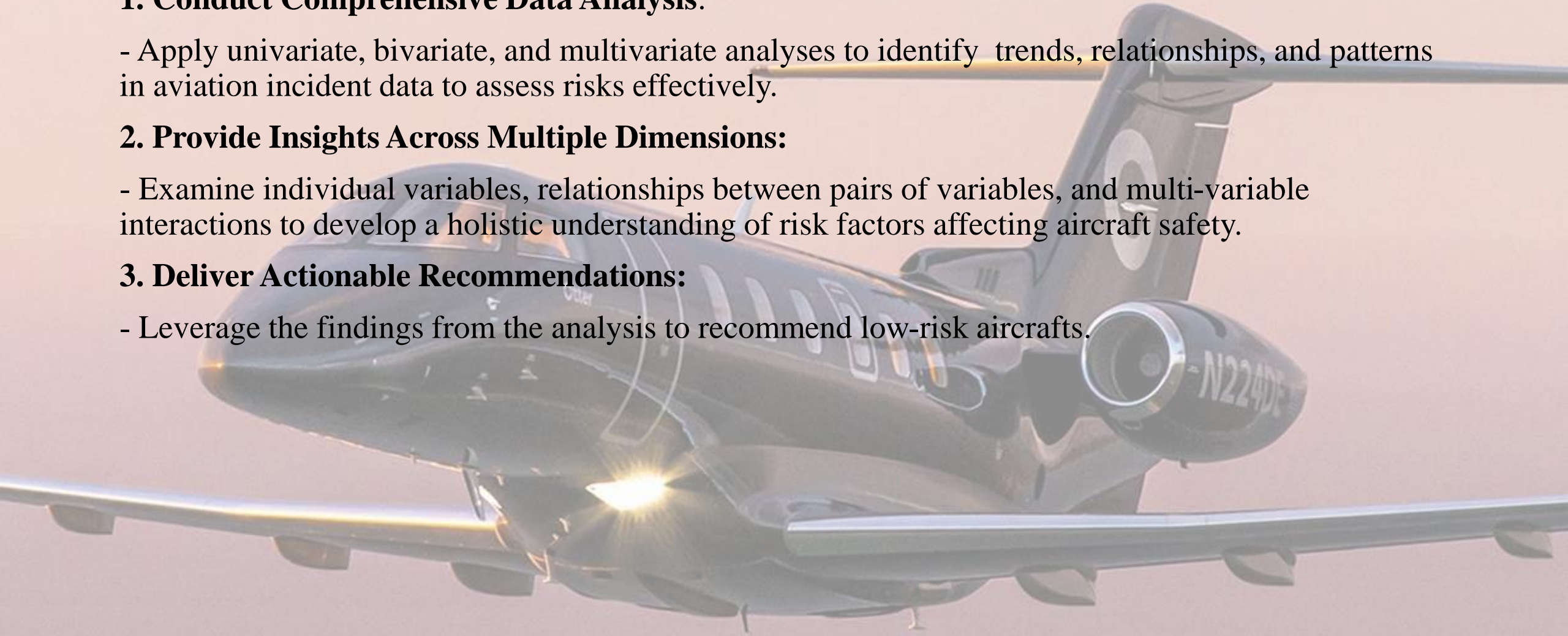
- Apply univariate, bivariate, and multivariate analyses to identify trends, relationships, and patterns in aviation incident data to assess risks effectively.

## **2. Provide Insights Across Multiple Dimensions:**

- Examine individual variables, relationships between pairs of variables, and multi-variable interactions to develop a holistic understanding of risk factors affecting aircraft safety.

## **3. Deliver Actionable Recommendations:**

- Leverage the findings from the analysis to recommend low-risk aircrafts.





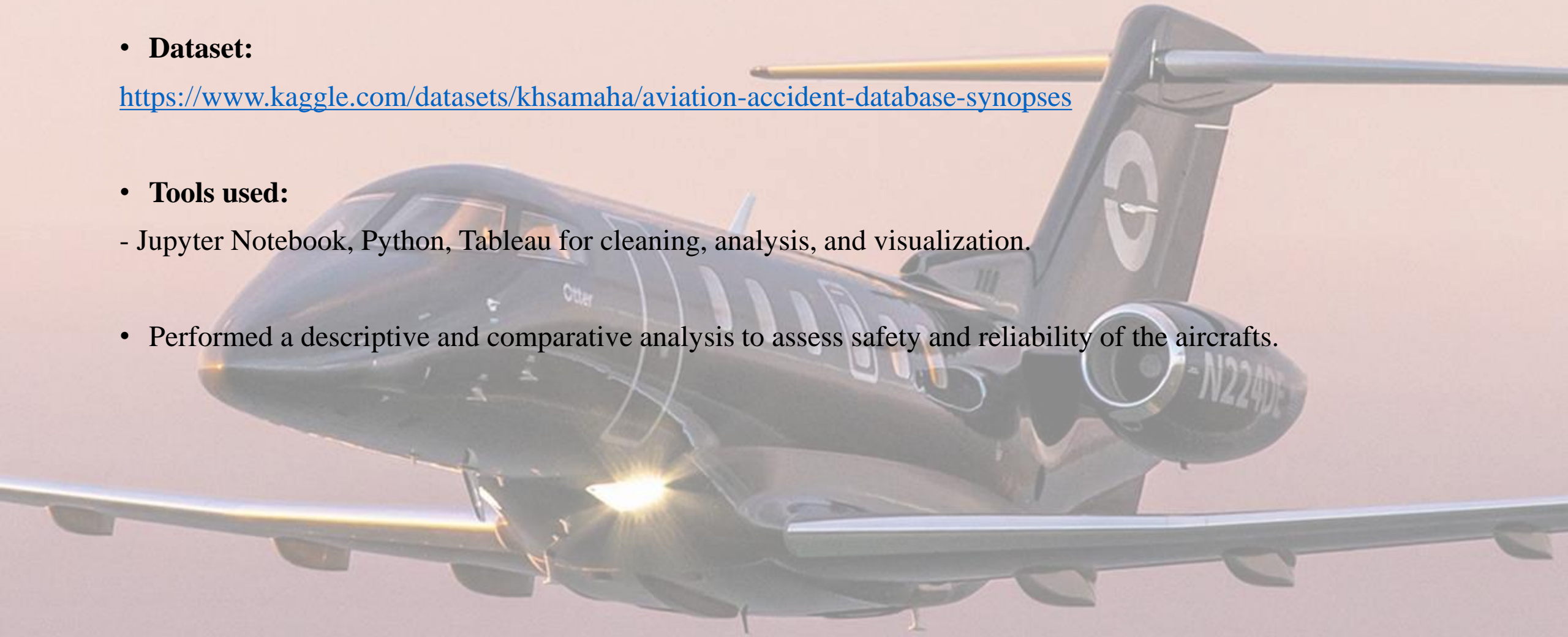
# DATA AND TOOLS USED FOR ANALYSIS

- **Dataset:**

<https://www.kaggle.com/datasets/khsamaha/aviation-accident-database-synopses>

- **Tools used:**

- Jupyter Notebook, Python, Tableau for cleaning, analysis, and visualization.
- Performed a descriptive and comparative analysis to assess safety and reliability of the aircrafts.



# AVIATION DATA OVERVIEW

- The Key variables include:

- Event.Date
- Location
- Country
- Injury Severity
- Aircraft damage
- Aircraft Category
- Make
- Model
- Amateur Built
- Number of Engines
- Engine Type
- Purpose of flight
- Total Fatal Injuries
- Total Serious Injuries
- Total Minor Injuries
- Total Uninjured
- Weather Condition
- Phase of flight

Event.Date	Location	Country	Injury.Severity	Aircraft.damage	Aircraft.Category	Make	Model	Amateur.Built	Number.of.Engines	Engine.Type	Purpose.of.fli
1948-10-24	moose creek, id	united states	fatal(2)	destroyed	unknown	stinson	108-3	no	1.0	reciprocating	perso
1962-07-19	bridgeport, ca	united states	fatal(4)	destroyed	unknown	piper	pa24-180	no	1.0	reciprocating	perso
1974-08-30	saltville, va	united states	fatal(3)	destroyed	unknown	cessna	172m	no	1.0	reciprocating	perso
1977-06-19	eureka, ca	united states	fatal(2)	destroyed	unknown	rockwell	112	no	1.0	reciprocating	perso
1979-08-02	canton, oh	united states	fatal(1)	destroyed	unknown	cessna	501	no	1.0	unknown	perso
...	...	...	...	...	...	...	...	...	...	...	...
2022-12-26	annapolis, md	united states	minor	unknown	unknown	piper	pa-28-151	no	1.0	unknown	perso
2022-12-26	hampton, nh	united states	unknown	unknown	unknown	bellanca	7eca	no	1.0	unknown	unknc
2022-12-26	payson, az	united states	non-fatal	substantial	airplane	american champion aircraft	8gcbc	no	1.0	unknown	perso
2022-12-26	morgan, ut	united states	unknown	unknown	unknown	cessna	210n	no	1.0	unknown	perso
2022-12-29	athens, ga	united states	minor	unknown	unknown	piper	pa-24-260	no	1.0	unknown	perso

These variables help with the analysis.

# METHODOLOGY

A vintage biplane is shown in flight against a soft, hazy sunset sky. The plane is a dark color, possibly black or dark blue, with white markings on the fuselage and tail. The tail features a large white letter 'G'. The aircraft has two sets of wings, with the upper wing supported by struts. The sun is low on the horizon, creating a bright glow and casting a long, horizontal light beam across the sky. The overall mood is serene and historical.

- **Understanding the Data:**

- I examined aviation incident data to identify key trends, patterns, and risk factors.
- I focused on relevant variables such as the make and model, total injuries, and engine type.

- **Analysis Process:**

- Exploring the frequency and severity of the accidents across various aircraft makes to reveal the high- and low-risk options.
- Investigating the relationship between environmental factors, like weather conditions and the injuries.

- **Insights Development:**

- Visualized and came up with meaningful insights and outcome with the help of external research on the Aviation industry.

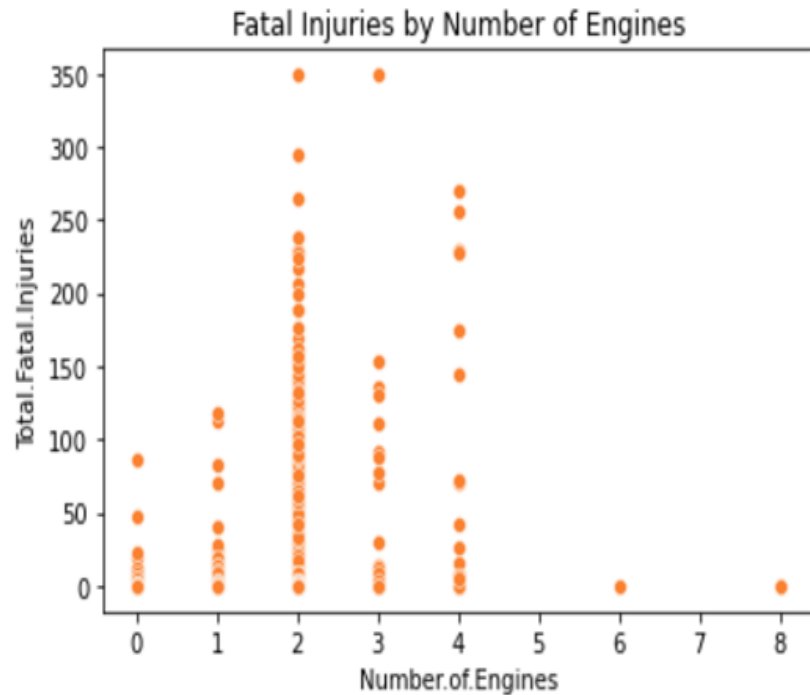


# NUMBER OF ENGINES BY FATAL INJURIES

- A scatter plot revealing the relationship between the number of engines and injury rates.

- **Insight**

- Aircrafts with more engines have minimal accidents.
- Most aircrafts used have one to four engines due to their efficiency.

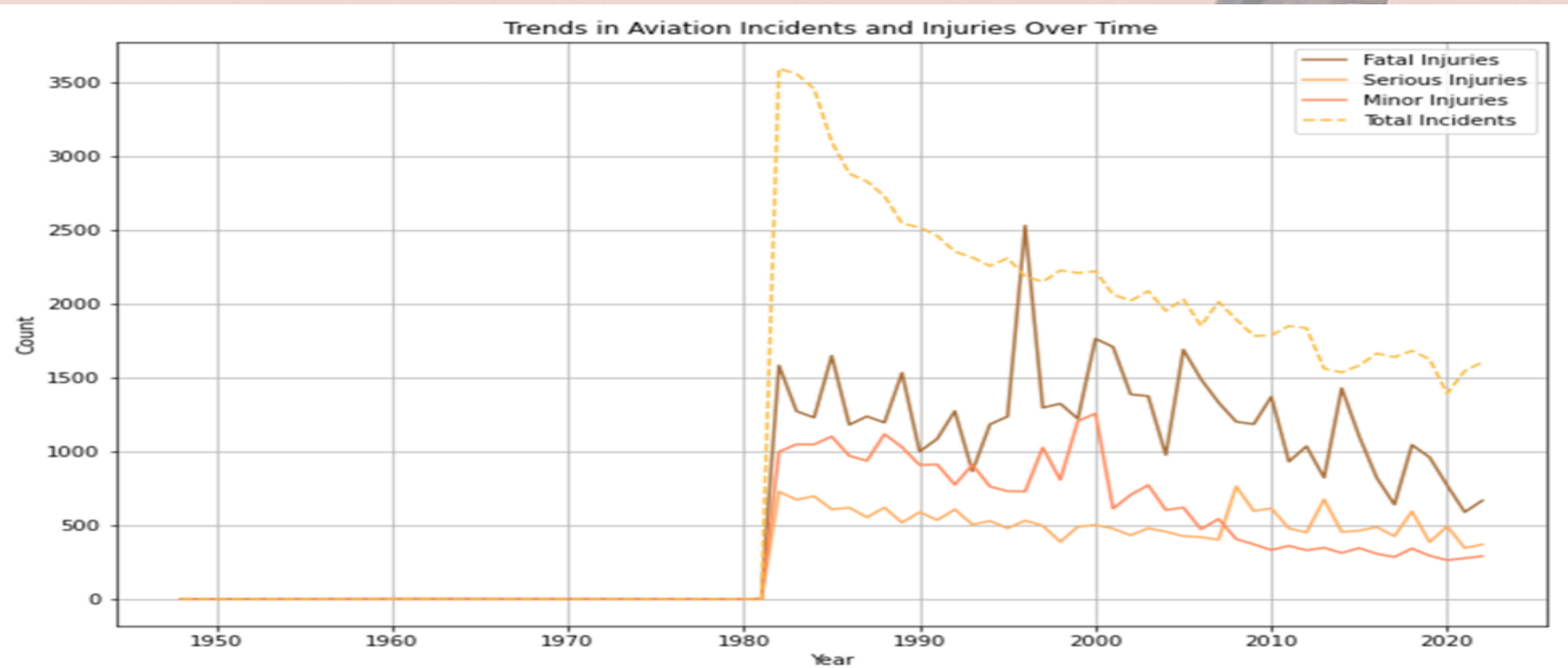


# ACCIDENTS BY YEARS

- A line graph depicting the trend of injuries over time.

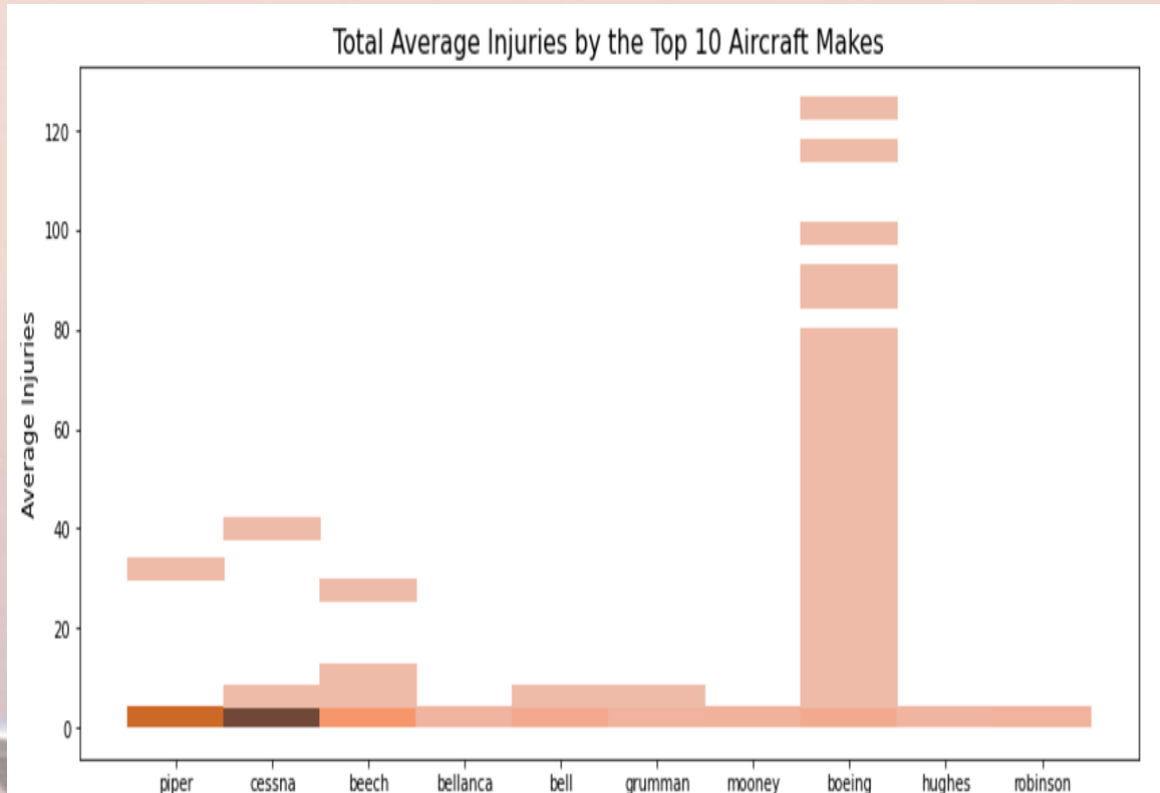
## Insight

- This shows that accidents have minimized over the years: In the next 5 years accidents will be brought down to zero.
- This means that safety is a big priority in the aviation industry starting from the manufacturing sector.
- Aircrafts are becoming more safe to operate.





# ACCIDENT BY AIRCRAFT MAKES



- This histogram shows the average number of injuries caused by the top 10 aircraft makes.

## **Insight:**

- Boeing aircrafts have accidents compared to the rest followed by Cessna then piper.
- It is advisable to avoid these aircraft brands.

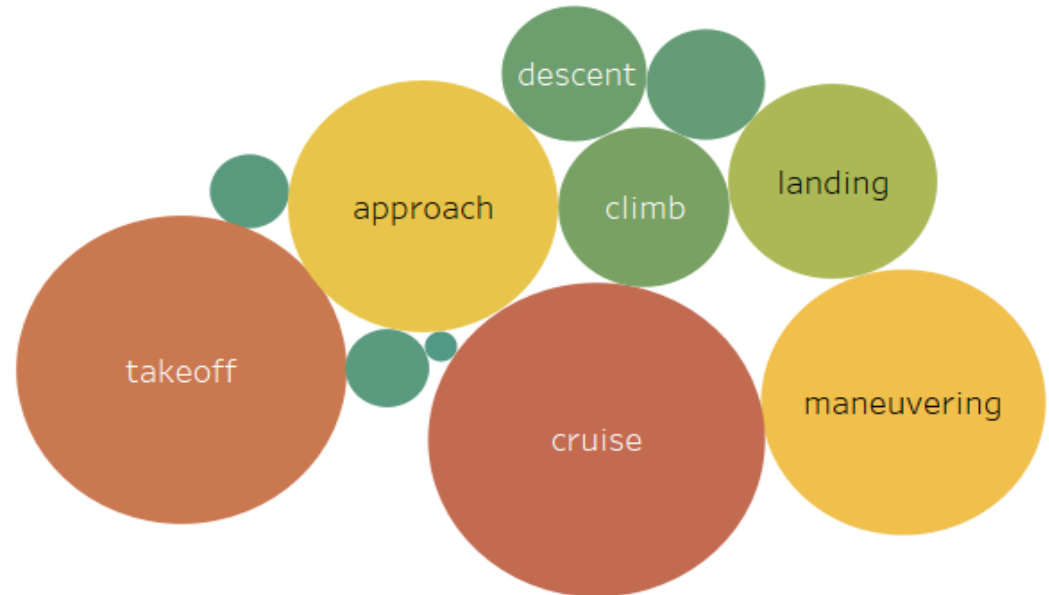
# ACCIDENTS BY PHASE OF FLIGHT

- This visualization shows which Phase of flight had the most amount of accidents.

## Insight

- During cruising and takeoff is when accidents frequently happen unlike landing.
- This indicated that after purchasing the aircraft experienced and fully certified pilots and crew members should be hired.

Amount of Fatalities during the Phase of Flight



# COMMERCIAL DASHBOARD

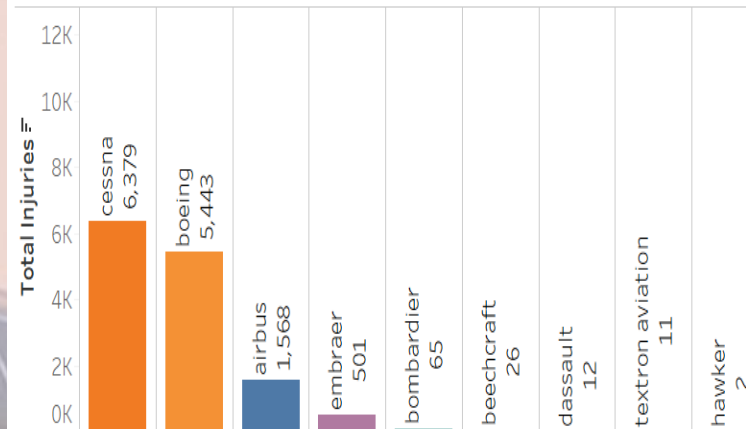
It contains the following:

- Total injuries by fixed-wing aircraft for commercial purposes.
- Helicopter accidents in commercial operations.
- Engine types and their associated risks.
- Trends in commercial aircraft accidents over the years.

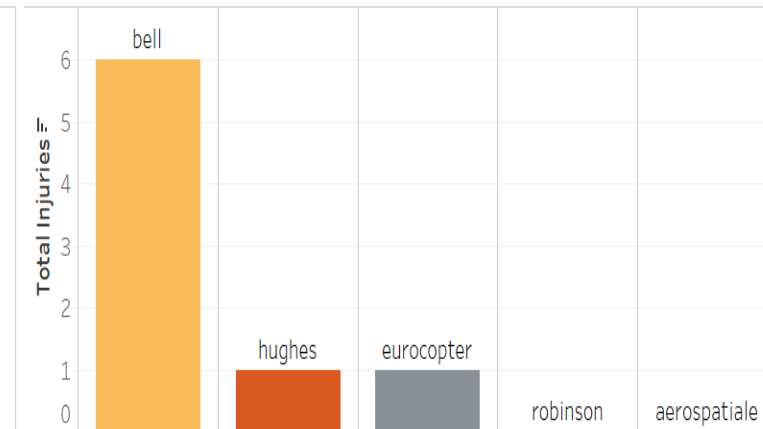
## Insight

- According to research, Turbo fan engines are more efficient at high altitudes and Turbo shaft engines at lower altitudes: From the histogram these engines are relatively safe, hence avoid the reciprocating engines. Also reciprocating consume Avgas fuel which is expensive and only operate at lower altitudes hence not suitable.
- Accidents have decreased over the years hence more safety standards.
- Out of all commercial fixed-wing aircrafts, Boeing and Cessna aircrafts have high number of accidents.
- Helicopters are not used a lot for commercial purposes.

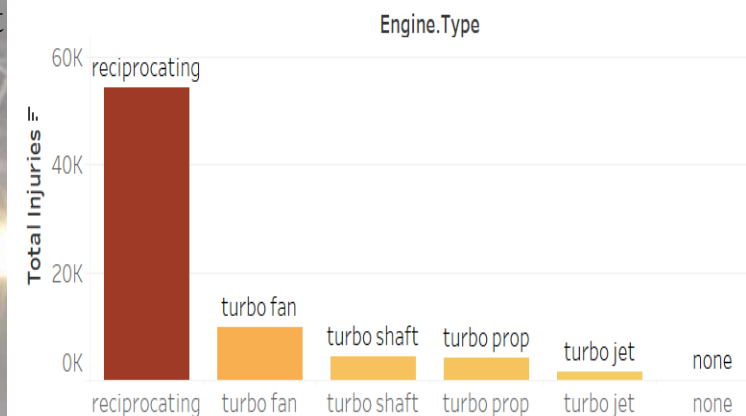
Total Injuries by Fixed-wing Aircrafts(Commercial)



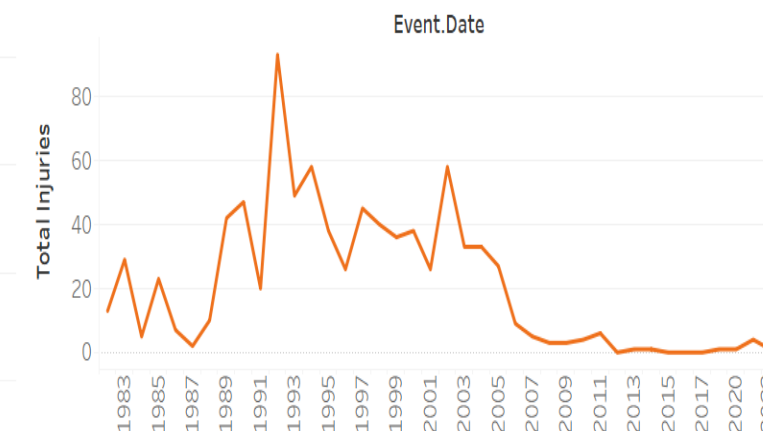
Helicopters used for Commercial Purposes



Accidents by engine types



Accidents by years for commercial Aircrafts





# CORPORATE DASHBOARD

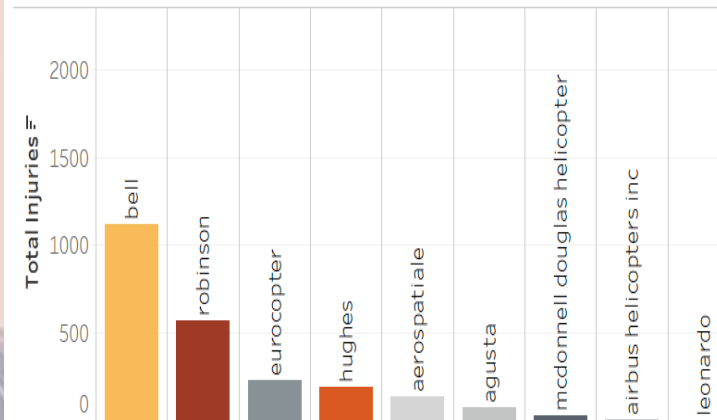
This dashboard contains the following:

- Accidents by corporate helicopter makes.
- Total injuries by fixed-wing aircraft in corporate settings.
- Engine types and their risk levels.
- Corporate aircraft accident trends over time.

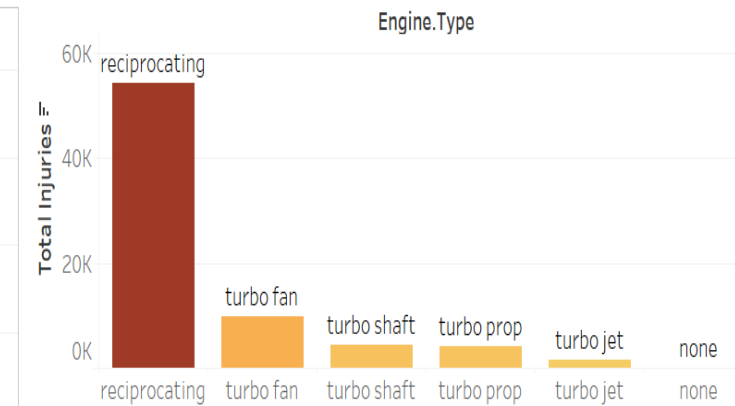
## Insight

- Helicopters are widely used for corporate matters.
- Bell, Robinson helicopters and Airbus (Eurocopter) helicopters have the most amounts of accidents but from research they are widely used for corporate purposes concluding that Eurocopter is the safest of them all.
- Under fixed-wing aircrafts, Cessna and piper have the most amount of accidents.
- It is recommended to purchase Pilatus and Quest for its versatility, ruggedness and safety, Gulfstream for its speed, Dassault and Embraer for their long range and Textron aviation aircrafts for their popularity.

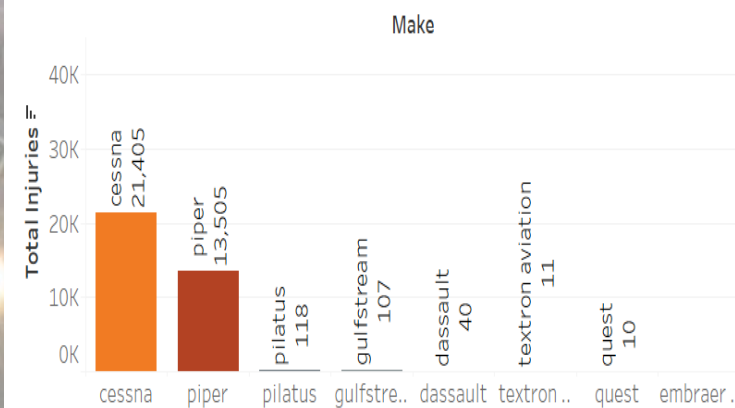
Accidents by Helicopter makes



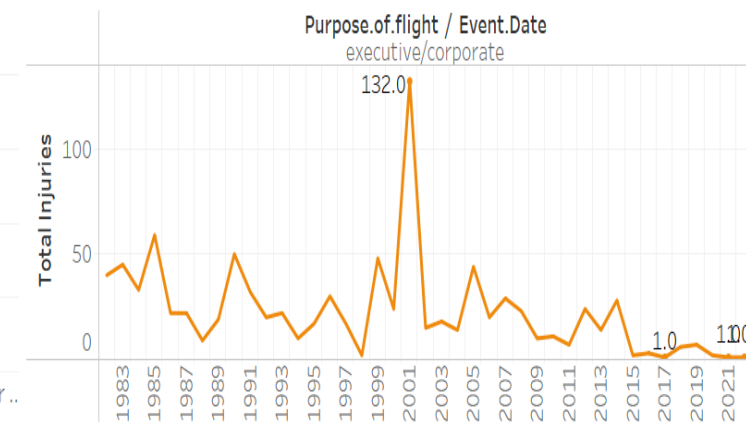
Accidents by engine types



Total Injuries by Fixed-wing Aircrafts(Corporate)

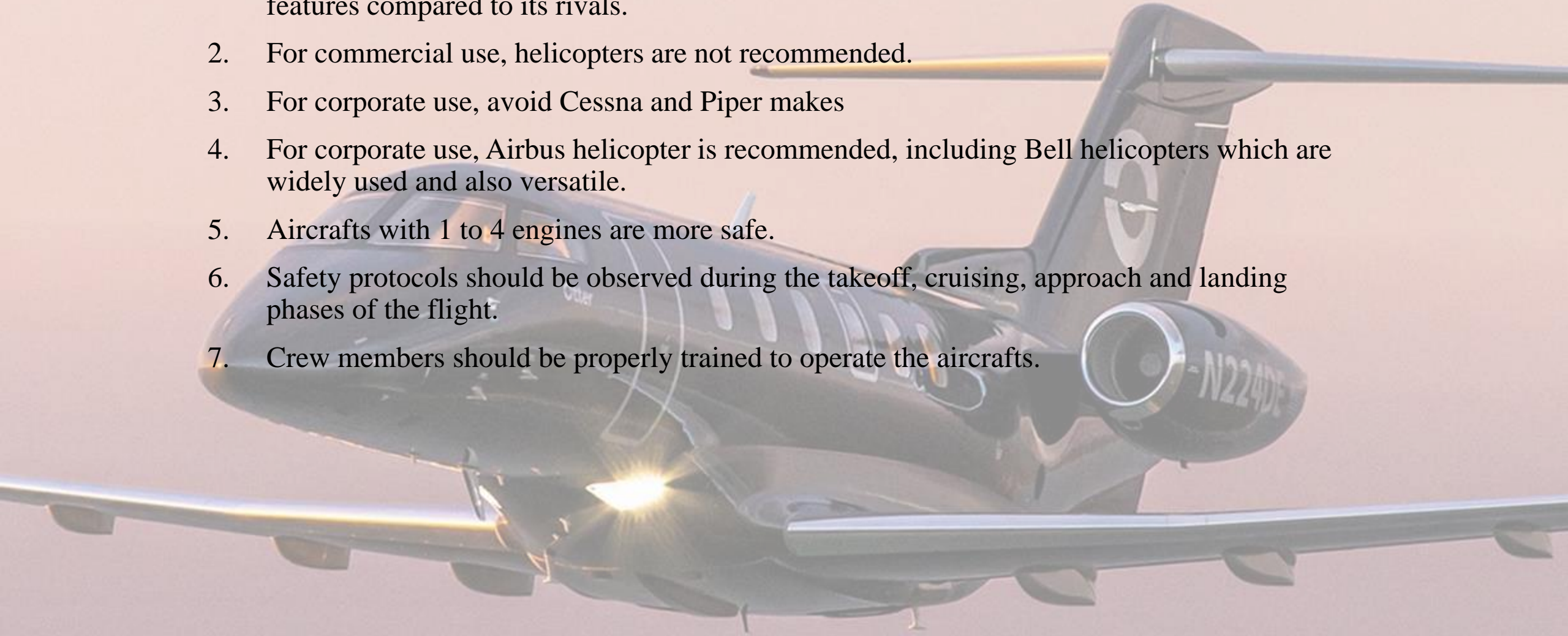


Corporate Aircraft accidents over the years



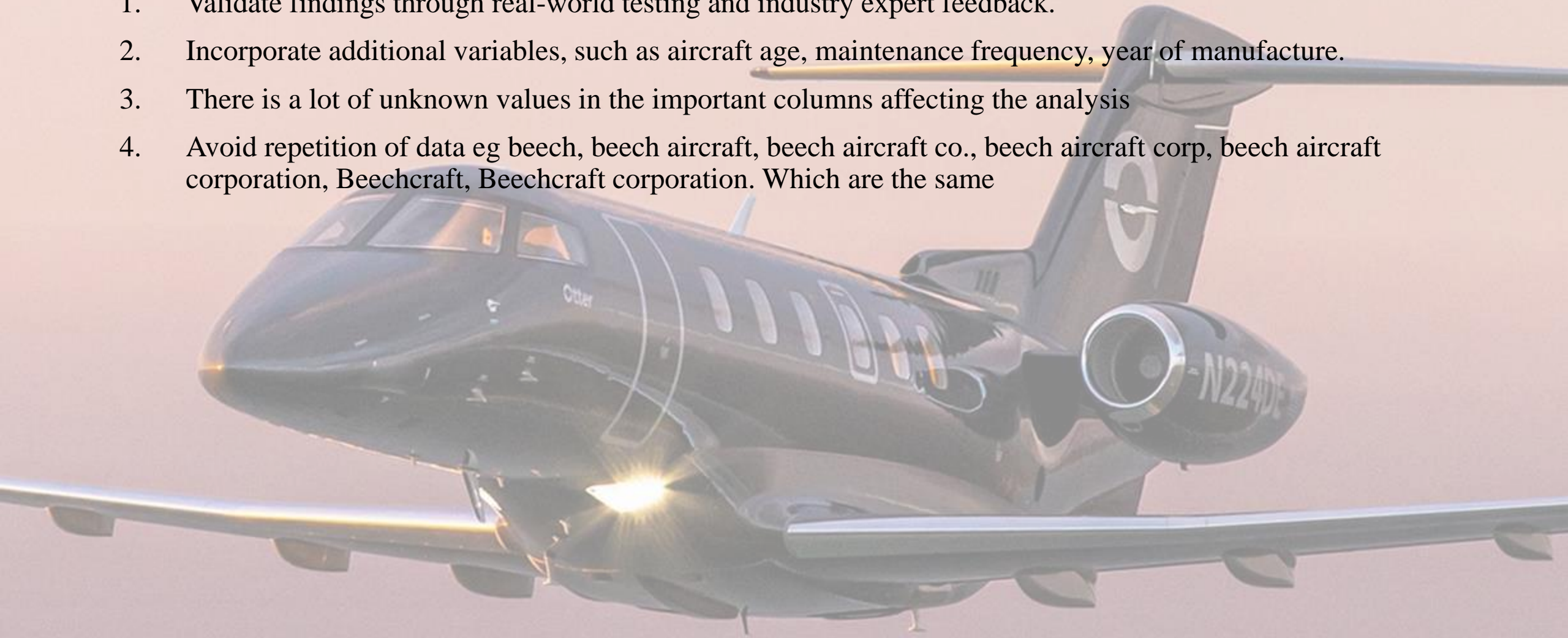
# RECOMMENDATIONS

1. For commercial use, Airbus aircrafts have a lower risk and have relatively more safety features compared to its rivals.
2. For commercial use, helicopters are not recommended.
3. For corporate use, avoid Cessna and Piper makes
4. For corporate use, Airbus helicopter is recommended, including Bell helicopters which are widely used and also versatile.
5. Aircrafts with 1 to 4 engines are more safe.
6. Safety protocols should be observed during the takeoff, cruising, approach and landing phases of the flight.
7. Crew members should be properly trained to operate the aircrafts.



# NEXT STEPS

1. Validate findings through real-world testing and industry expert feedback.
2. Incorporate additional variables, such as aircraft age, maintenance frequency, year of manufacture.
3. There is a lot of unknown values in the important columns affecting the analysis
4. Avoid repetition of data eg beech, beech aircraft, beech aircraft co., beech aircraft corp, beech aircraft corporation, Beechcraft, Beechcraft corporation. Which are the same





# Thank you

## Questions?

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