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Data Visualization Final Project

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Bird strikes data visualizations in the United states from 2000-2011

Introduction:

A bird strike is a collision between an aircraft and a bird while the flight is on a take-off or landing roll. Other wildlife strikes, such as those involving bats or ground animals, are frequently included in the definition. Bird strikes are prevalent and can pose a serious threat to plane safety. Smaller aircraft may sustain considerable structural damage, while other aircrafts, particularly jet-engine aircraft, are susceptible to the loss of performance caused by birds ingesting engine air intakes. Several deadly accidents have occurred as a result of this. Bird strikes can happen at any time during flight, but they're more likely to happen during takeoff, early ascent, approach, and landing because there are more birds in the air at lower altitudes. The following document visually illustrates the data collected by the Federal Aviation Administration FAA on Bird Strikes between 2000 and 2011.

My initial thought was to work with "bird strikes with plane" as I was surfing the internet for ideas and this seemed like an interesting one. Some of the visualizations that I'm looking to find insights and do some research on are:

- Yearly trends on the accidents, both with respect to actual number and financial losses.
- State and airline wise representation of the accidents to know which areas are the most prone to these accidents.
- To know what other factors such as phases, speed, altitude of flight etc are responsible for the strikes.

The visualizations created help us understand the patterns and various factors responsible for the accidents. Moreover it would also lead to contemplate various solutions to avoid these problems.

Methodology:

I got the 2 data sets from data world and Kaggle. This project's web-scraped data was gathered from the following sources:

1. https://data.world/shihzy/2000-2011-birds-strikes-planes/activity

2. https://www.kaggle.com/datasets/breana/bird-strikes

Each data set comprises around 25000 and 65000 rows respectively. Both have basic features such as Record ID, date and time, state, airport name, Airline Company, altitude, phase of flight, wildlife struck, cost, and so on, but the second dataset has additional attributes such as aircraft type, wildlife species, flight speed, and weather conditions. The 2 data sets were joined and all the Visualizations and Dashboards were made in Tableau.

Analysis:

Visuals showcasing the number of bird strikes:

**Yearly Analysis of bird strikes from 2000- 2011:**

The trend of count of Wildlife: Number Struck Actual for Flight Date Year. The marks are labeled by count of Wildlife: Number Struck Actual.

The above line graph depicts a yearly analysis of bird accidents along with the total number of accidents that occurred during that year. It is apparent that the number of bird accidents increased from 2000 to 2009, peaking at around 3200 accidents in 2009. Henceforth, from 2009 to 2011, we can see a slight decrease in the number of accidents from 3200 to 2900.

**Bird strikes in US (represented by each state):**
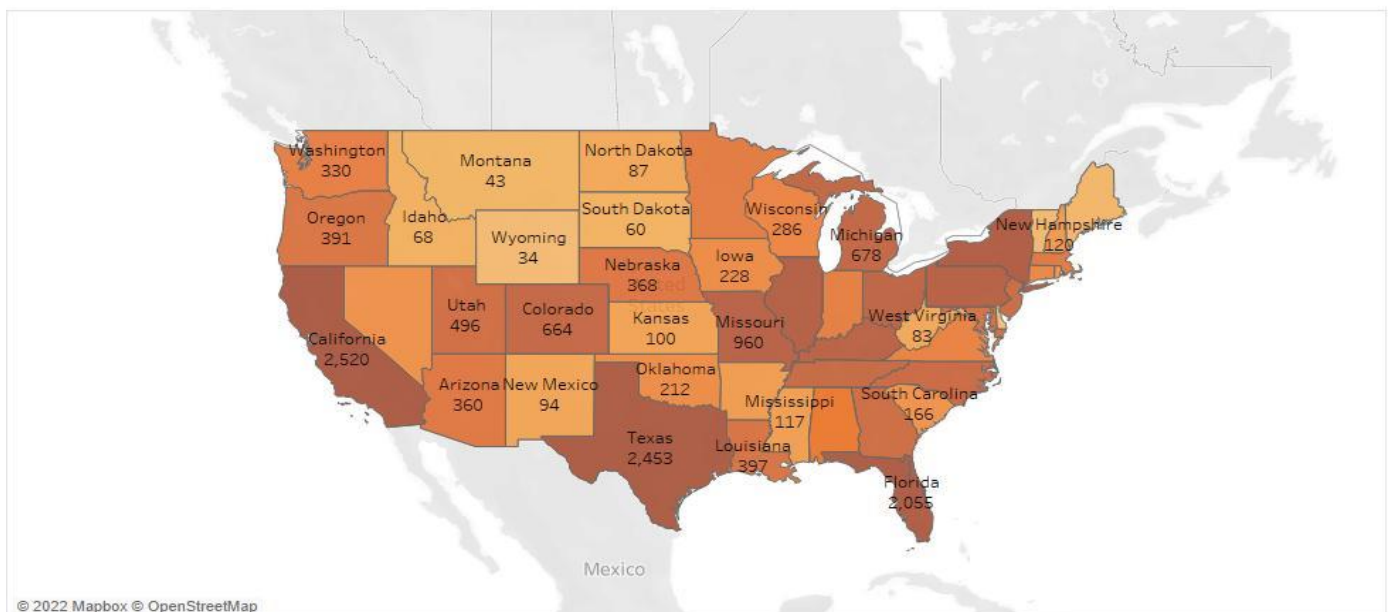
Map based on Longitude (generated) and Latitude (generated). Color shows details about count of Wildlife: Number Struck Actual. The marks are labeled by Origin State and count of Wildlife: Number Struck Actual.

The above map depicts the overall number of bird accidents in each state in the United States over a 10-year period. As can be seen, California, Florida, and Texas had the largest number of bird fatalities, ranging from 2000 to 2500. New York, Illinois, Kentucky, Pennsylvania etc were next, with roughly 1000-1500 incidents each. Few states, such as Maine, Vermont, Idaho, Montana, and Wyoming, have fewer than 100 accidents per year.
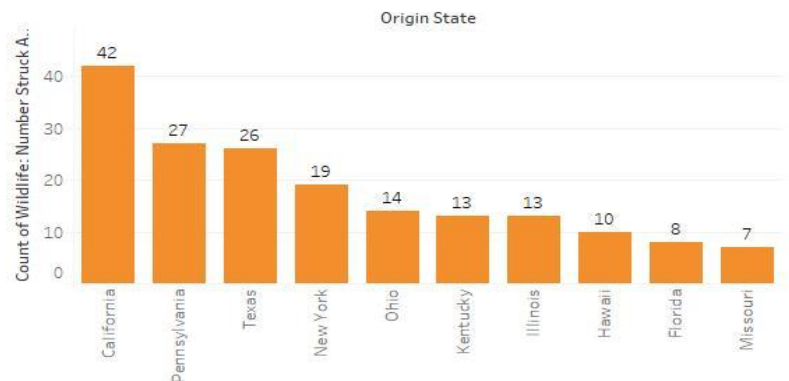
Dashboard illustrating Top 10 results for accidents with regards to States, Airline Company and Airports:
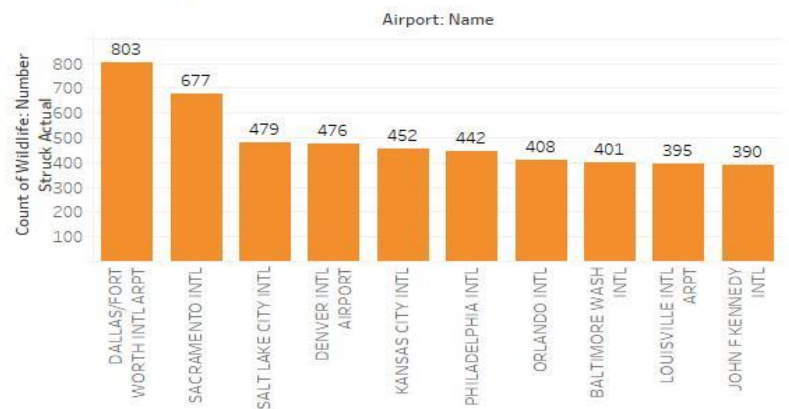
Top 10 results

Top 10 US airlines with their number of accidents.
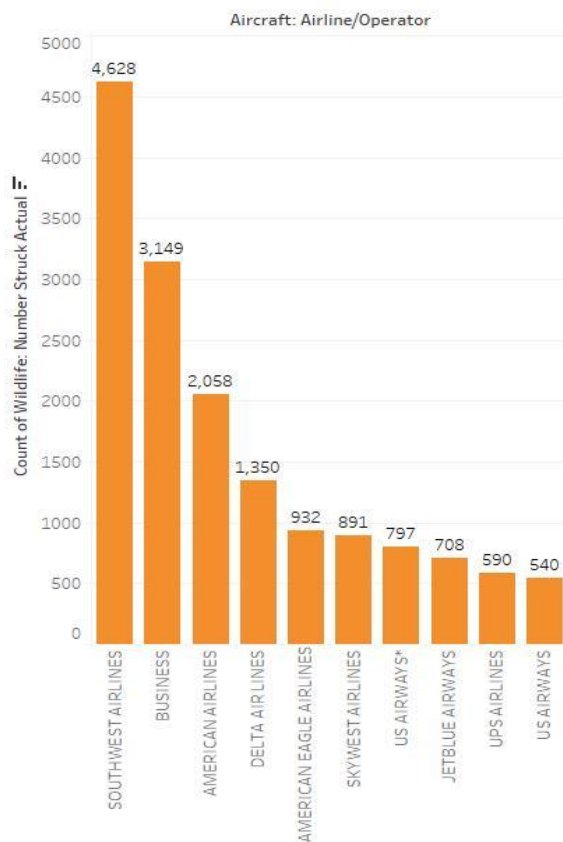
Top 10 US states with their number of accidents.

Top 10 US Airports with their number of accidents.

The Dashboard above depicts a few of the top ten trends in bird accidents by state, airport, and airline companies. Southwest, Business, American, Delta, and Skywest Airlines were the airlines involved in most of the bird accidents. When it comes to airports, it's evident that the majority of them, such as Dallas Intl, Sacramento Intl, Salt Lake Intl, Denver Intl etc are located in California, Florida, and Texas with the most accidents. The dropdown hierarchy too is depicted in the visualization where the number of accidents for airports could be seen by expanding each state.

Yearly Costs suffered due to bird accidents:

Yearly Cost suffered due to Bird accidents:

Sum of Cost: Total $ for each Flight Date Year. The marks are labeled by sum of Cost: Total $.

The animation in the above line chart depicts a yearly assessment of the costs suffered by airline businesses each year. We can observe that the costs have increased and decreased year after year, peaking in 2001 when they spent roughly 24 million dollars. It subsequently began to decline until 2005, when it reached a low of 7 million dollars. However, total accident losses continued to rise until 2011.

**Proportion of Phase of flights at the time of accident:**

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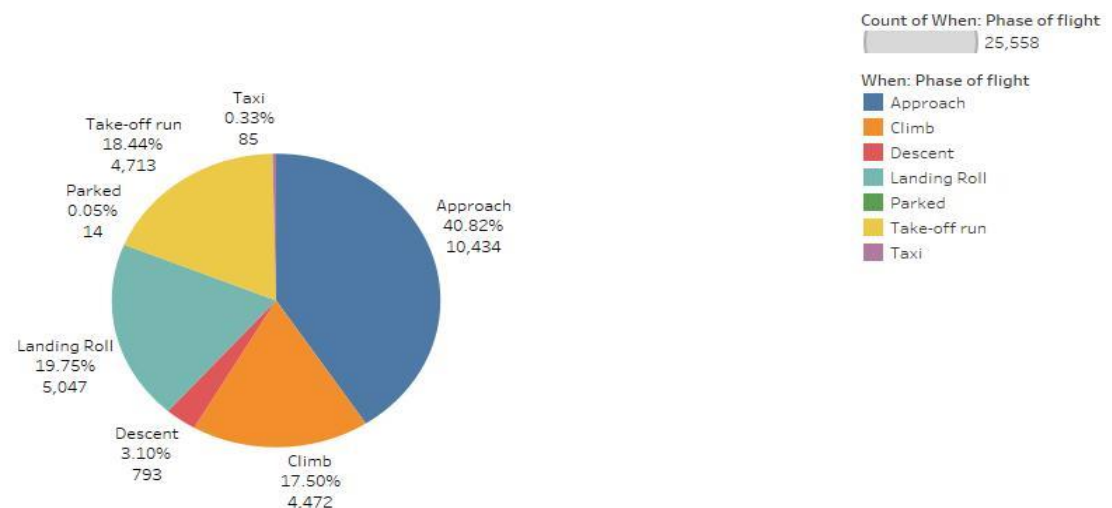
When: Phase of flight, % of Total Count of When: Phase of flight and count of When: Phase of flight. Color shows details about When: Phase of flight. Size shows count of When: Phase of flight. The marks are labeled by When: Phase of flight, % of Total Count of When: Phase of flight and count of When: Phase of flight.

The pie chart above depicts the various phases of flights during the accident. The majority 40% of the accidents happen when the plane is on its approach, which is when the plane slows down and the wheels are lowered in preparation for landing. Then, roughly 18% of accidents happen while the plane is taking off, climbing, or landing. The initial stages of the flight are Take-off and Climb, when the plane accelerates as it approaches takeoff and when the wheels close after about 5 minutes in the air. The landing roll is a vital stage of flight in which the plane slows to the point where it falls out of the sky just inches from the earth.

Outcome of bird strikes at different altitudes:
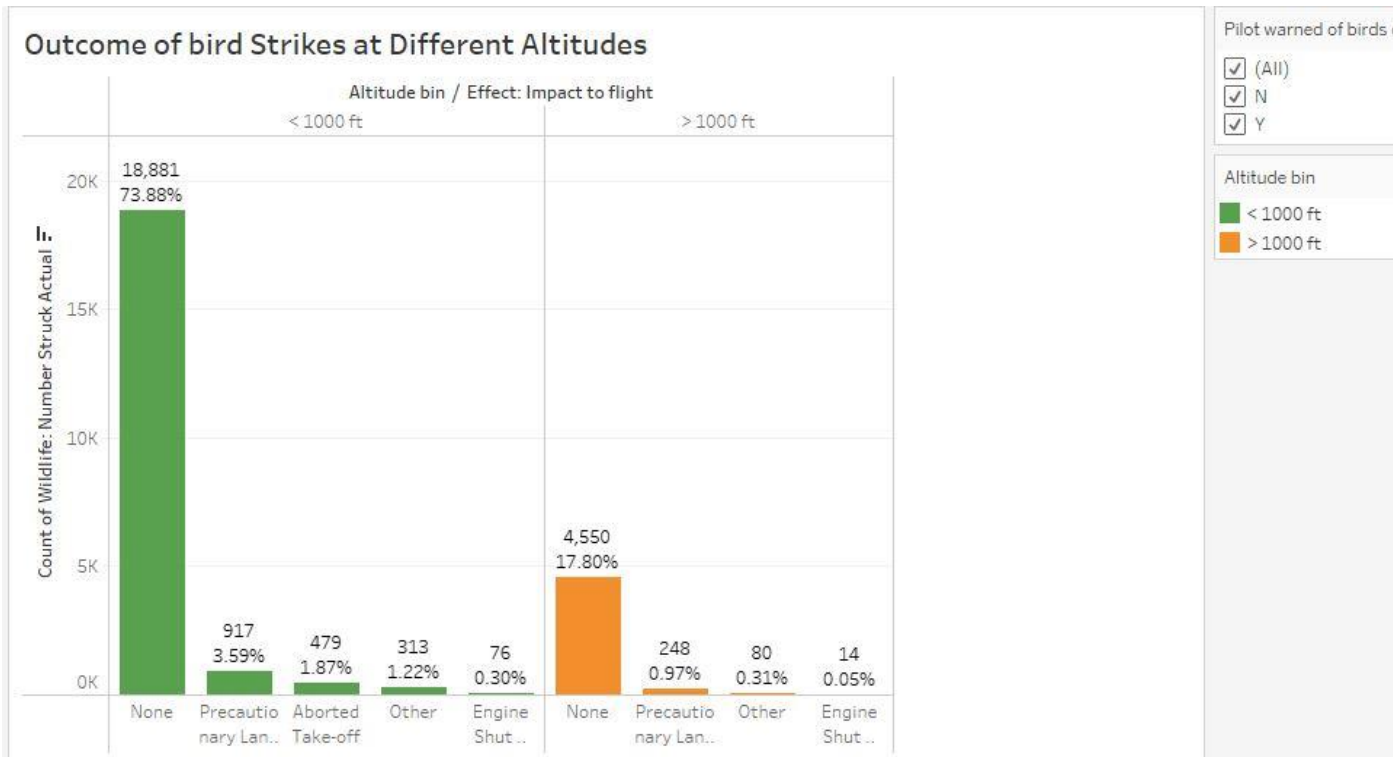
The bar graph above depicts the results of bird strikes at various altitudes. We have two categorical values, indicating whether the height was greater than or less than 1000 feet. A Y/N filter was also introduced to see if the pilot was notified before the strike. The good news is that in the vast majority of accidents, it had no impact on flight. However, on about 5% of occasions, the landing had to be done with precautions, the takeoff was aborted, or the engine was turned off.

Wildlife struck vs cost by each of the top 10 states for each year:
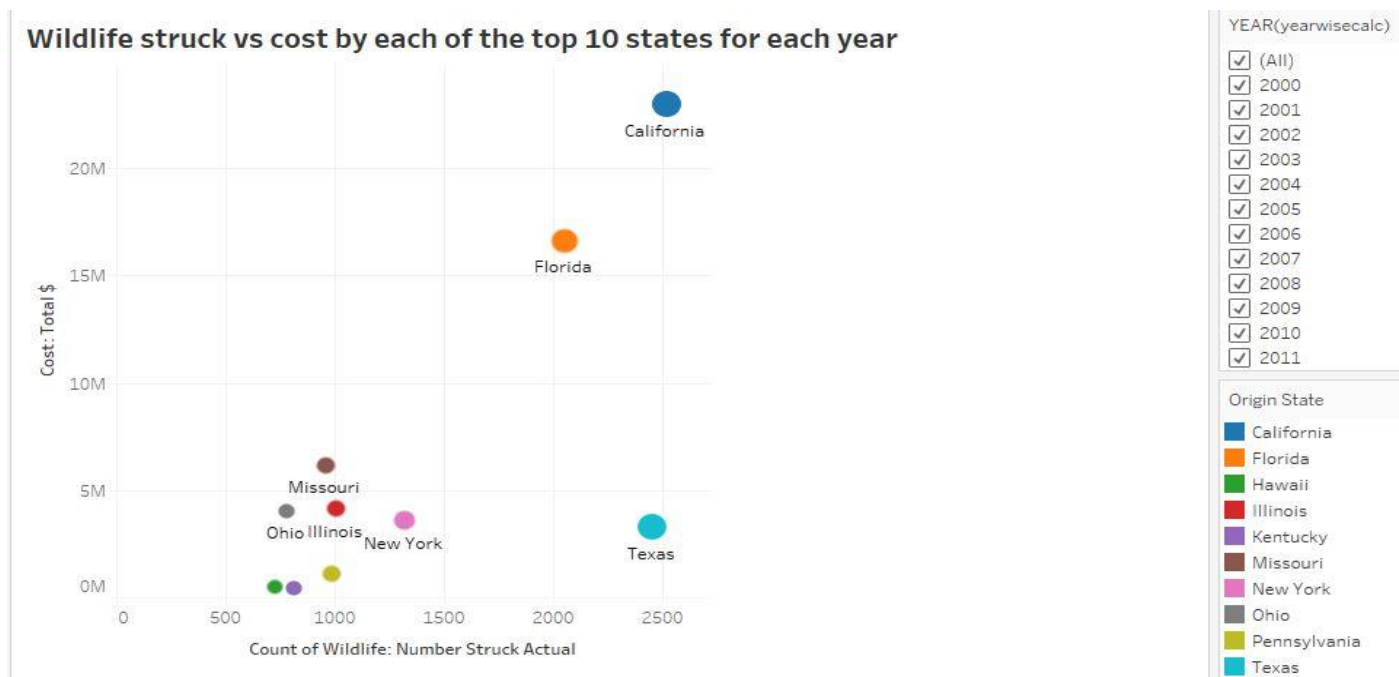
The scatter plot above depicts the number of accidents vs the cost incurred for every state. The top ten states in the United States have been plotted. In addition, the year parameter/calculated field have been introduced to examine the number of accidents vs cost plotted for that specific year exclusively. Overall, California, Florida, and Texas have the largest number of accidents and costs, followed by New York, Illinois, Missouri, and Ohio.

Conclusion:

Bird strikes are prevalent and can pose a serious threat to flight safety. Significant damage to the aircraft structure is possible for smaller planes. As a result, a number of deadly accidents have occurred. Bird strikes can happen at any time during the flight, but they're more likely to happen during takeoff, initial climb, approach, and landing roll because there are more birds in the air at lower altitudes. Because most birds fly throughout the day, the majority of bird strikes occur during daylight hours. In the first place, the opportunities to reduce the risk of hazardous bird strikes should be focused on airports, because that is where the greatest overall volume of incidents occur, particularly in the airports of populous states like California, Texas, Florida, and New York and because this is where management and control of the hazard are most easily achieved. This further opens up the possibility of considering other elements like habitat features, bird mitigation/agricultural activity, and many more as causes of accidents, and may encourage us to contemplate measures to reduce the number of accidents.