



# PROJECT REPORT

## PROJECT 3: Data Visualization of Bird Strikes between 2000 – 2011

Domain: Transportation and Communication



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# INTRODUCTION

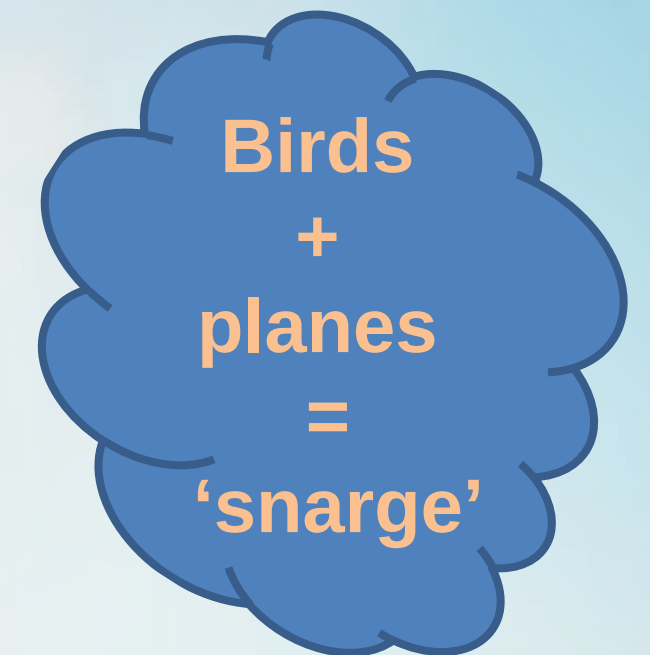
- Bird Strike: A collision between a bird and an aircraft (in flight mode/on a take-off/landing roll).
- Is common and can be a significant threat to aircraft safety (several fatal accidents have already been reported).
- Significant damage may be caused to smaller aircraft.
- All aircraft, especially jet-engine ones, are vulnerable to the loss of thrust which can follow the ingestion of birds into engine air intakes.
- Bird strikes may occur during any phase of flight, but are most likely during the take-off, initial climb, approach and landing phases due to the greater numbers of birds in flight at lower levels.





# PROBLEM STATEMENT

- Transport and communication: Crucial domain in the field of analytics.
- Major Concerns: Environmental impact and Safety.
- Why should we be worried? Bird and other wildlife strikes annually cause over \$650 million in damage to U.S. civil and military aviation. They put the lives of aircraft crew members and their passengers at risk.
- Important issue because of the ever-increasing amount of vehicles and people.



The most famous example of a dangerous bird strike was the 2009 “Miracle on the Hudson,” in which a US Airways jet was forced to land on the Hudson River after both engines of the aircraft ingested birds and failed

# ANALYSIS:

- Our project visually depicts the data collected on Bird Strikes by Federal Aviation Administration (FAA) between 2000-2011.
- Approach:
  - Python: Used for Data Cleaning
  - Tableau: For Visualization.
- Based on the findings, a story was created.
- For better understanding, the results were displayed on 3 dashboards of the story, listed as:
  - Direct/Indirect Impact on Mankind
  - Location, Air Service and Environmental Conditions
  - Study on Birds

## Attributes present in the data

Record ID  
Aircraft: Type  
Airport: Name  
Altitude bin  
Aircraft: Make/Model  
Wildlife: Number struck  
Wildlife: Number Struck Actual  
Effect: Impact to flight  
FlightDate  
Effect: Indicated Damage  
Aircraft: Number of engines?  
Aircraft: Airline/Operator  
Origin State  
When: Phase of flight  
Conditions: Precipitation  
Remains of wildlife collected?  
Remains of wildlife sent to Smithsonian  
Remarks  
Wildlife: Size  
Conditions: Sky  
Wildlife: Species  
Pilot warned of birds or wildlife?

- Link to Dataset: [https://docs.google.com/spreadsheets/d/1PF1PQ4qg4ySrtyOXiF6SFGX7P0Qfl\\_r/edit?rtfpo=true&sd=true#gid=1443108996](https://docs.google.com/spreadsheets/d/1PF1PQ4qg4ySrtyOXiF6SFGX7P0Qfl_r/edit?rtfpo=true&sd=true#gid=1443108996)
- Link to Python Notebook: [https://colab.research.google.com/drive/1UUxDYFA0zJPxjnfjqMAudMI\\_E-0w4ghz](https://colab.research.google.com/drive/1UUxDYFA0zJPxjnfjqMAudMI_E-0w4ghz)
- Link to Tableau: Story: <https://public.tableau.com/app/profile/priya.kumari3667/viz/DataVisualizationofBirdStrikesinUSAccordingtoFAAbetween20002011/InrelationtoHumans>



# DATA CLEANING

- Dataset was first read.
- Missing and null values were found and removed using dropna( ) method. (5416 null values were removed, there were no duplicate values)
- Cleaned file is downloaded for visual analysis in Tableau.

```
In [37]: df.shape  
Out[37]: (25558, 26)
```

```
In [42]: df.isnull().sum()  
Out[42]: Record ID      0  
Aircraft: Type      129  
Airport: Name      129  
Altitude bin      129  
Aircraft: Make/Model    0  
Wildlife: Number struck 129  
Wildlife: Number Struck Actual  0  
Effect: Impact to flight 129  
FlightDate      129  
Effect: Indicated Damage  0  
Aircraft: Number of engines? 267  
Aircraft: Airline/Operator 129  
Origin State     449  
When: Phase of flight 129  
Conditions: Precipitation  0  
Remains of wildlife collected?  0  
Remains of wildlife sent to Smithsonian  0  
Remarks      4771  
Wildlife: Size      129  
Conditions: Sky      0  
Wildlife: Species      0  
Pilot warned of birds or wildlife? 129  
Cost: Total $      0  
Feet above ground    129  
Number of people injured  0  
Is Aircraft Large?    129  
dtype: int64
```

```
In [43]: df.dropna(inplace=True)
```

```
In [44]: df.shape  
Out[44]: (20142, 26)
```

```
In [45]: df.isna().sum()  
Out[45]: Record ID      0  
Aircraft: Type      0  
Airport: Name      0  
Altitude bin      0  
Aircraft: Make/Model  0  
Wildlife: Number struck  0  
Wildlife: Number Struck Actual  0  
Effect: Impact to flight  0  
FlightDate      0  
Effect: Indicated Damage  0  
Aircraft: Number of engines?  0  
Aircraft: Airline/Operator  0  
Origin State      0  
When: Phase of flight  0  
Conditions: Precipitation  0  
Remains of wildlife collected?  0  
Remains of wildlife sent to Smithsonian  0  
Remarks      0  
Wildlife: Size      0  
Conditions: Sky      0  
Wildlife: Species      0  
Pilot warned of birds or wildlife?  0  
Cost: Total $      0  
Feet above ground    0  
Number of people injured  0  
Is Aircraft Large?    0  
dtype: int64
```

```
In [57]: df1=pd.DataFrame(df)
```

```
In [60]: df1.to_csv('Cleaned_Project1_Data_BirdStrikes.csv', index=True)
```

# KEY PERFORMANCE INDICATORS

- Impact/Effect on flight due to variation in altitude and environmental conditions.
- Phase of Flight, which is directly or indirectly proportional to altitude
- Injuries due to fatal accidents: Ultimately, the primary goal of safety above all else is to keep people safe
- Species and Size of Birds.

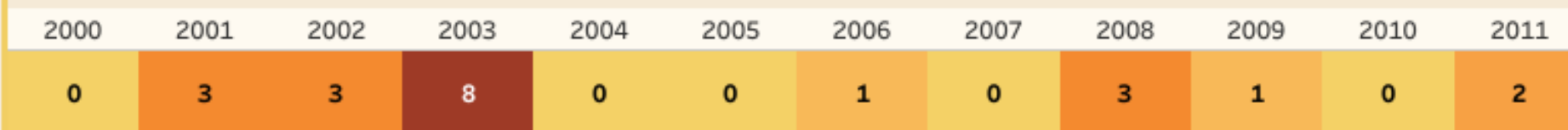




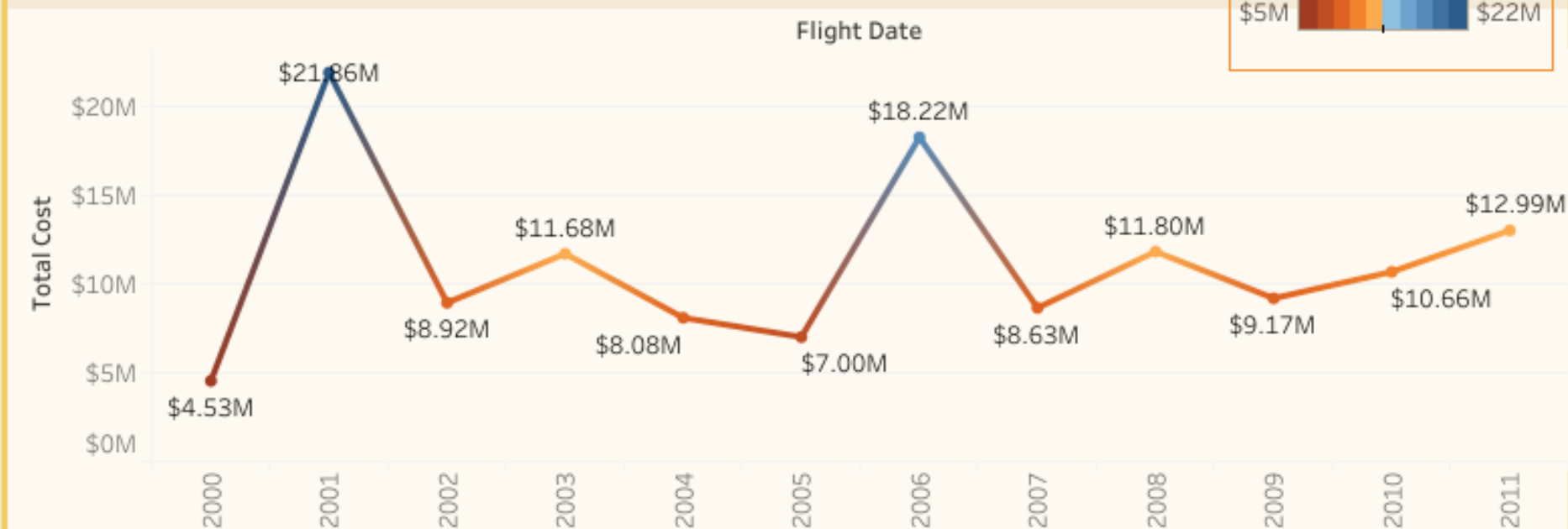
# Data Visualization of Bird Strikes between 2000 - 2011



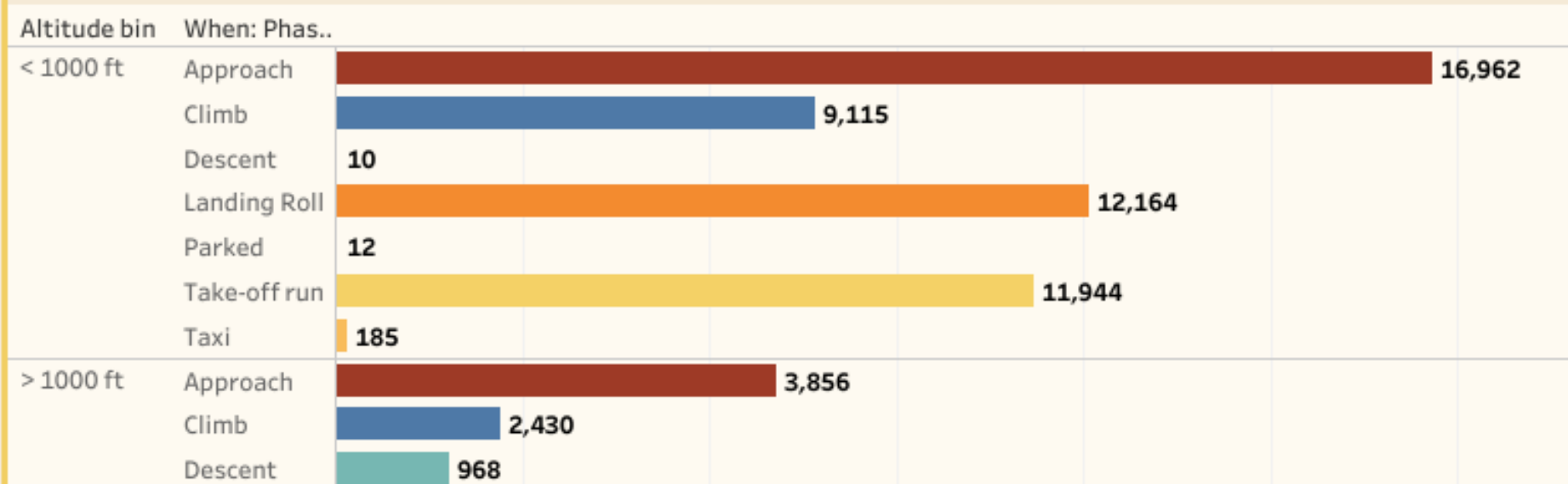
### Number of people Injured



### Yearly Cost Incurred



### Average Altitude in different Phases at time of Strike

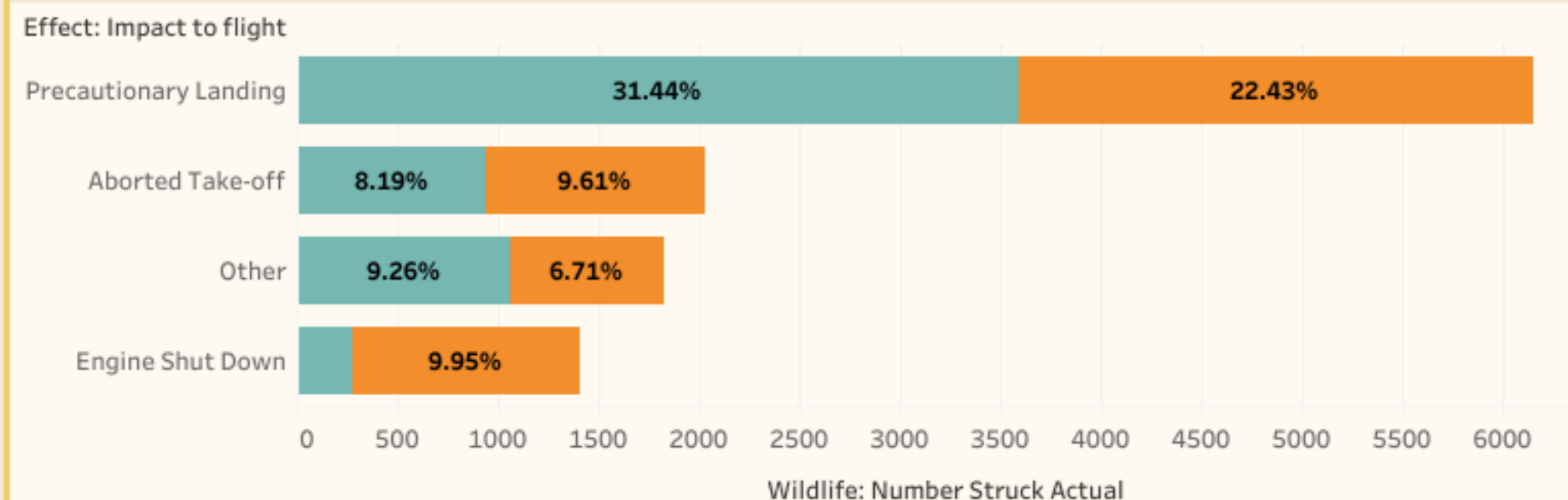


Total number of Bird Strikes

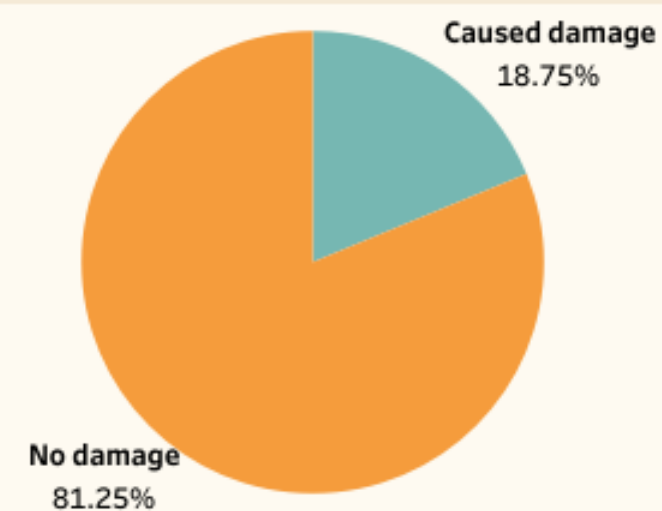
### Number of Bird Strikes/year



### Prior Warning and effect of strike relation



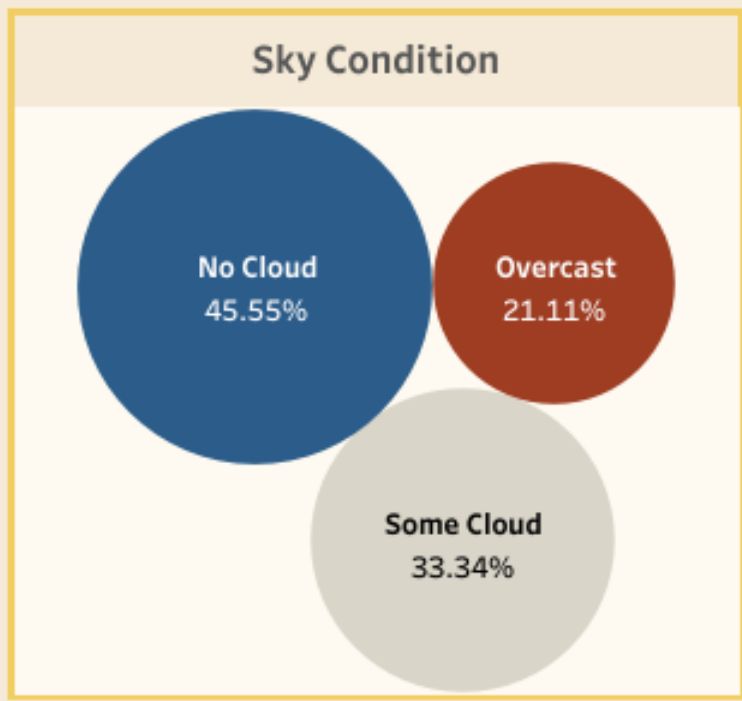
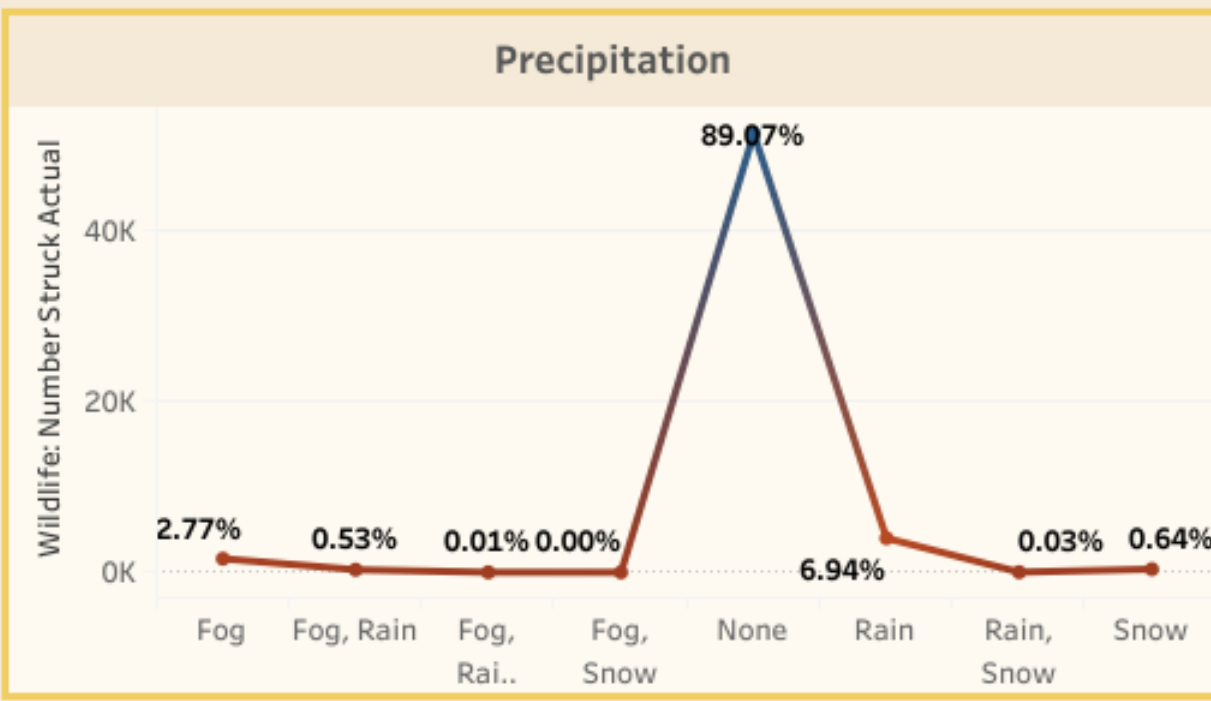
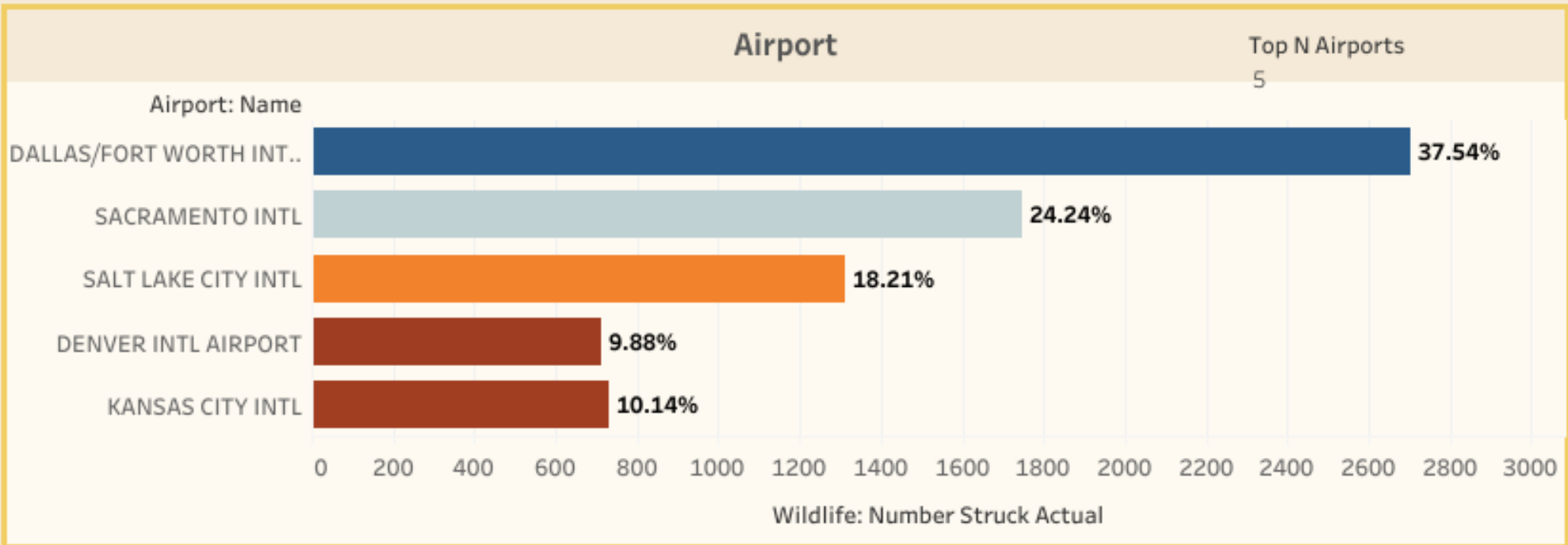
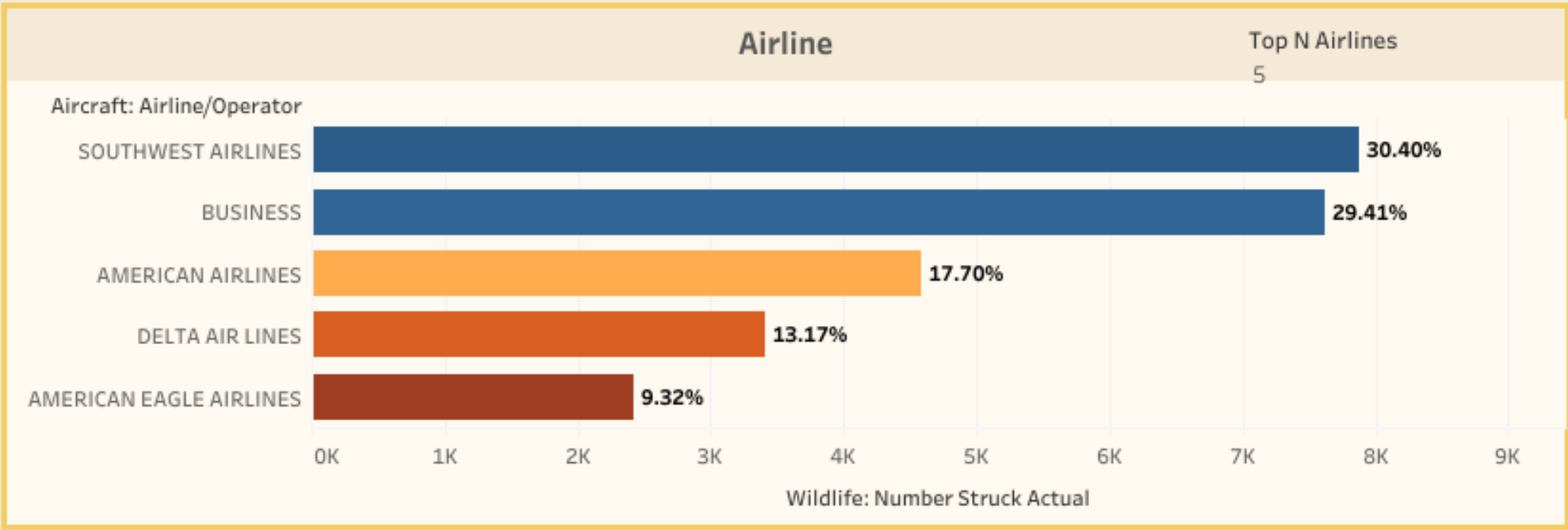
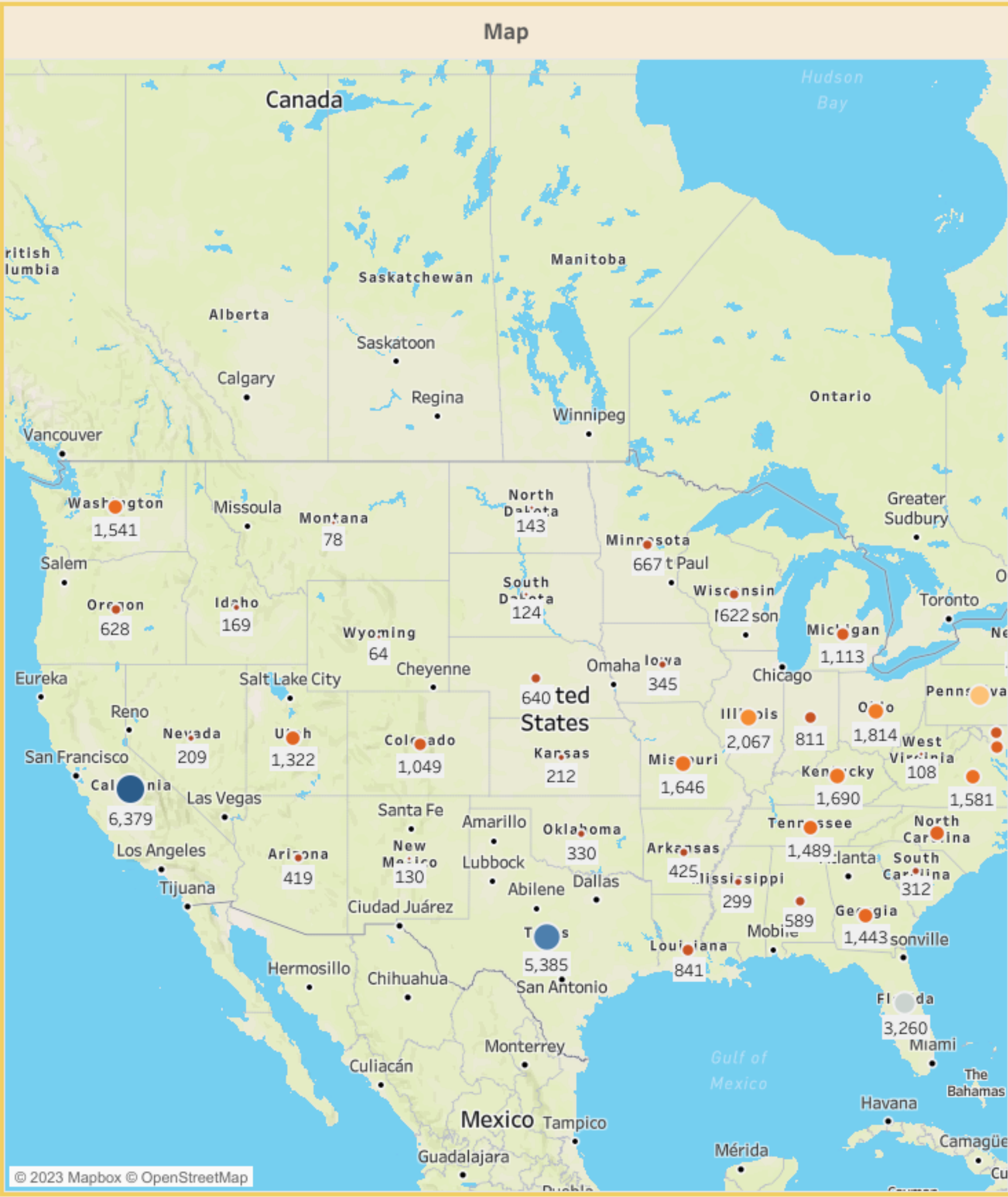
### Effect on Flight



### Were Pilots informed?

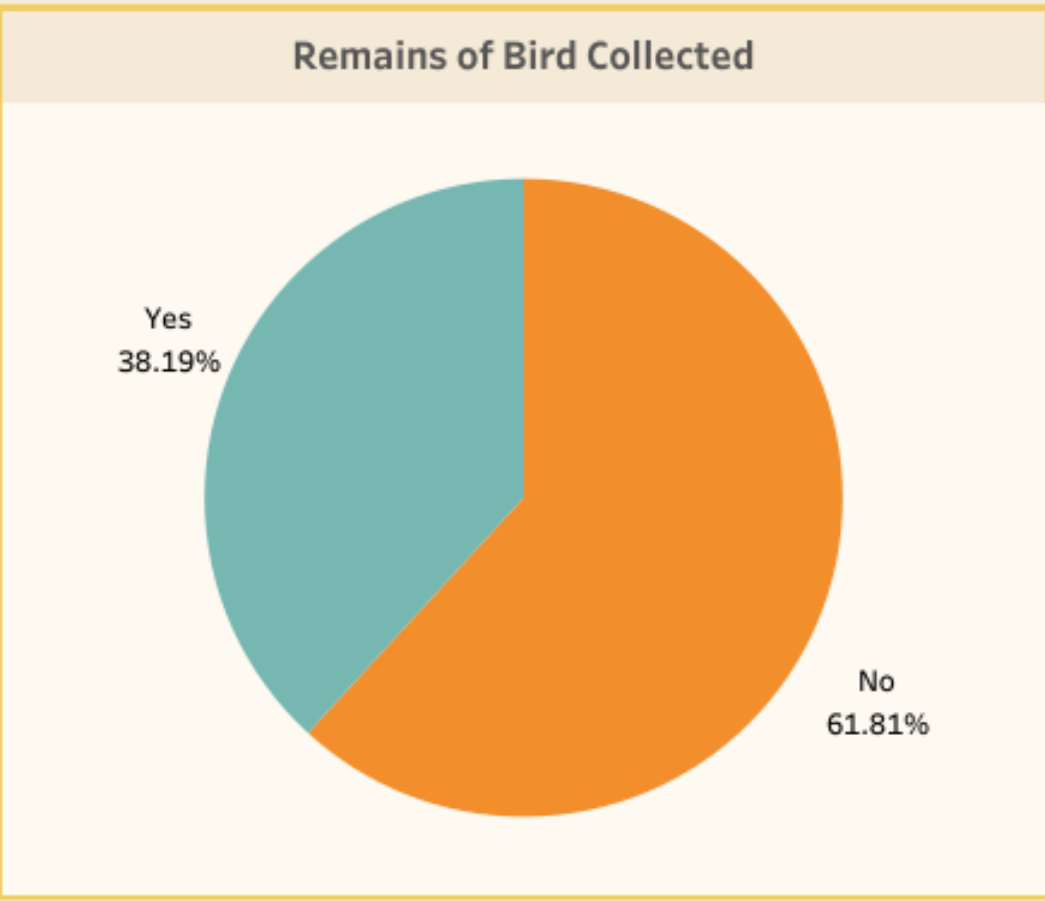
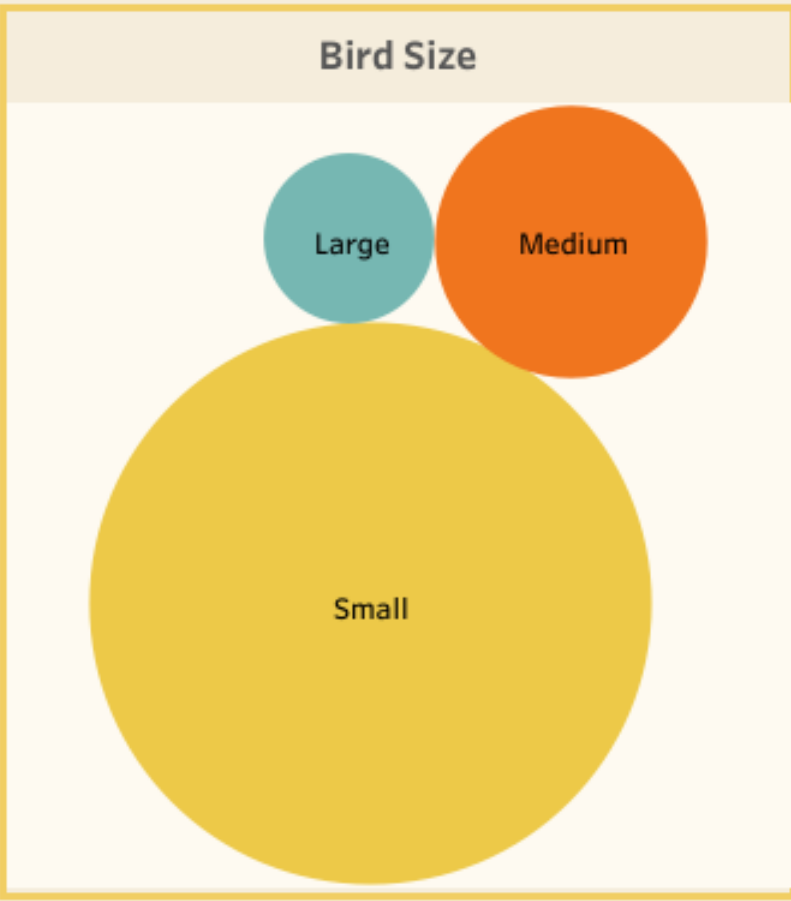
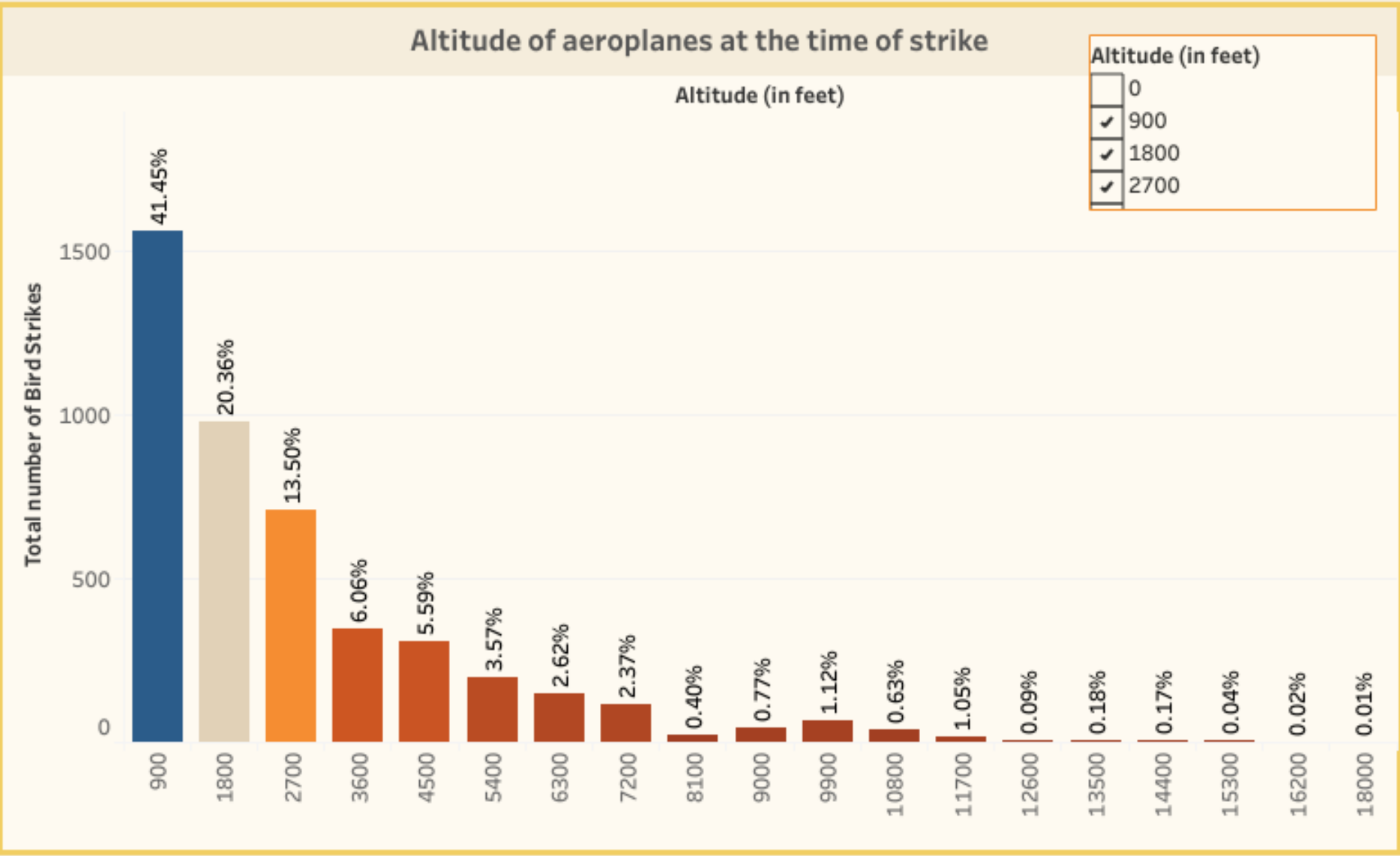
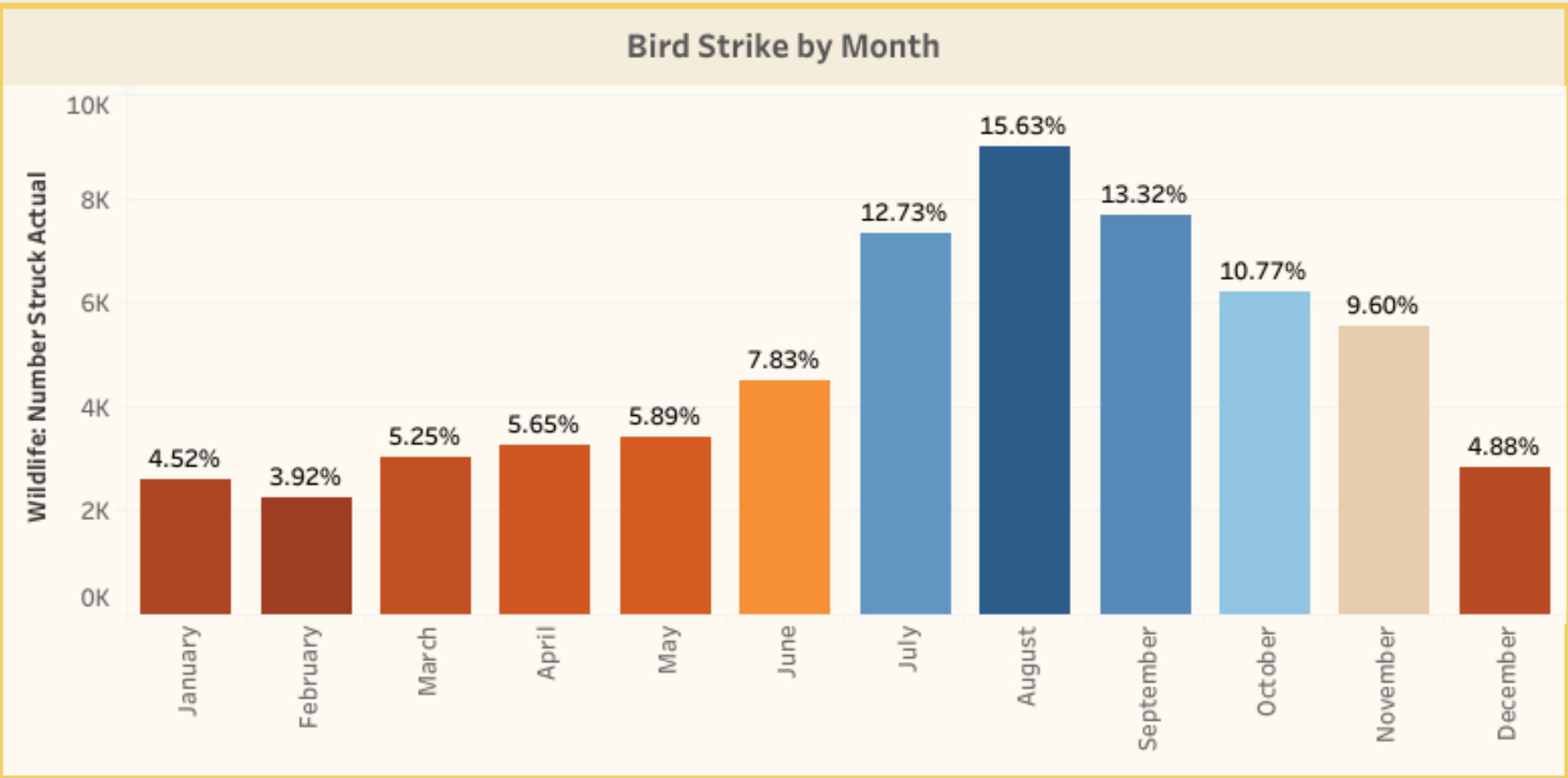








Species												Top Species encountered	
	Year of Flight Date												5
Wildlife: Sp..	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
Unknown bird - small	878	1,047	1,145	1,154	1,258	1,297	1,543	1,388	1,169	2,027	1,675	1,531	
Unknown bird - medium	1,285	329	444	443	428	636	539	471	454	636	457	611	
Mourning dove	122	89	238	198	110	258	317	201	210	246	305	202	
European starling	349	584	1,302	1,310	477	328	981	495	1,013	545	676	568	
Unknown bird - large	58	58	68	119	66	70	60	81	76	124	82	79	



# SOLUTIONS THAT CAN BE OFFERED

## Modifying Habitat

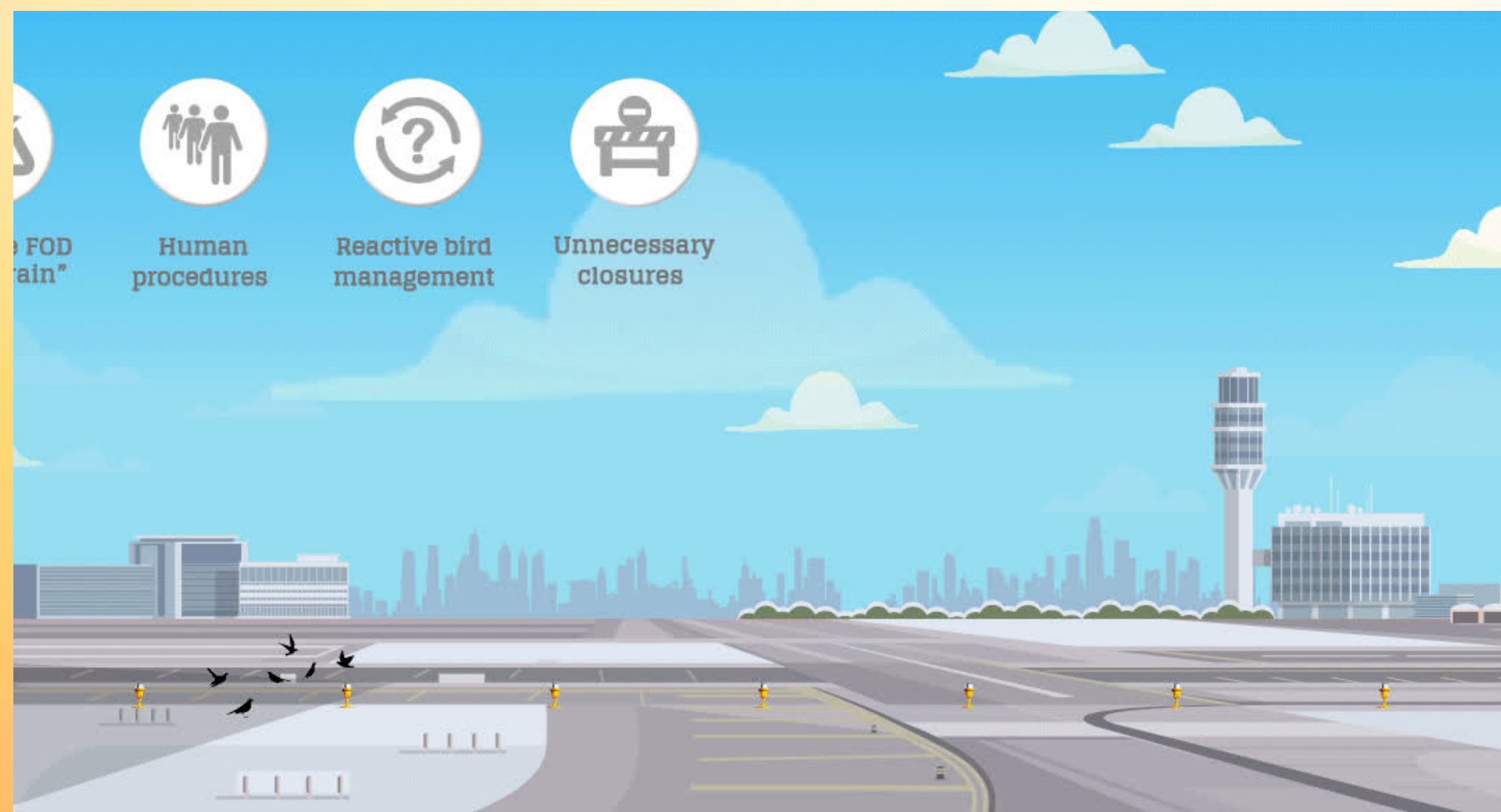
- Remove Seed bearing Plants to eliminate food sources
- Remove Bushes and Trees that serve as attractive nesting sites
- Use insecticides/ Pesticides to eliminate food sources for insect-eating birds

## Modifying Bird Behavior

- Use of Noise generators to disrupt Birds
- Use of lasers at dawn and dusk to scare them away
- Use of trained Falcons/ Dogs in the airport area to teach birds that the area has many predators

## Modifying Plane Behavior

- Use of radar equipment to track the density and movement of birds.
- Adjust flight times to avoid busiest hours to bird activity as per the location.





# DRAWBACKS & SOLUTIONS/FUTURE SCOPE

## Drawbacks:

- Habitats of Birds can get affected.
- Predators can sometimes themselves be a risk to the aircraft and cause confusion at the runway.
- It will require a proper infrastructure, that will be a costly affair.
- Restoration of electricity & Broadband might take sometime due to underground cabling



## Solutions/Future Scope:

- Bird Sanctuary can be set up wherein breeding box will also be a priority.
- Bird houses can be built to attract birds
- Bird robots in the form of predators can be used.
- Proper planning through Data Analysis.
- Use of robirds/drones/laser/radar equipment.

☺ Which one is real and which one a robird?





**THANK YOU!**