Business Problem

Birds STRIKE

Transport and communication are in the crucial domain in the field of analytics. Environmental impacts and safety are, nowadays, two major concerns of the scientific community with respect to transport scenarios and to the ever-growing urban areas.

A **bird strike** is strictly defined as a collision between a bird and an aircraft which is **in flight or on a take-off or landing roll.** Bird Strike is common and can be a significant threat to aircraft safety. For smaller aircraft, significant damage may be caused to the aircraft structure and all aircraft, especially jet-engine ones, are vulnerable to the loss of thrust which can follow the ingestion of birds into engine air intakes. This has resulted in several fatal accidents.

Data is being collected for the **years 2000 -2011** about the birds strike happened. From analyzing the data we have to find out the answers for the case studies as well as the suggestions to reduce the number of birds strike rate.

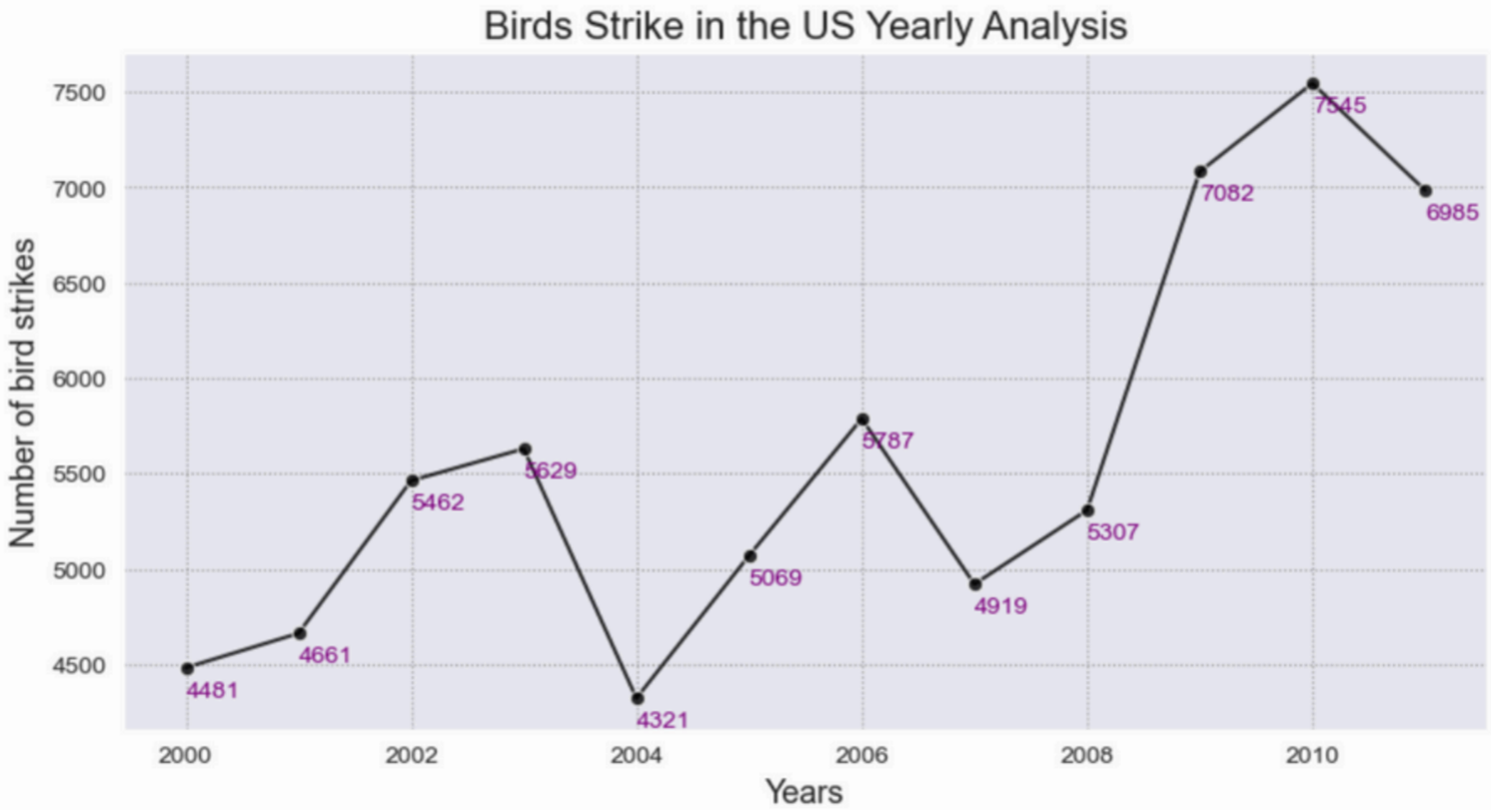
Research Questions

1. **Yearly Analysis** & Bird Strikes in the US
2. Visuals Depicting the Number of Bird Strikes
3. **Top 10 US Airlines** in terms of having encountered bird strikes
4. Airports with most incidents of **bird strikes – Top 50**
5. **Yearly Cost** Incurred due to Bird Strikes:
6. When do most **bird strikes occur**?
7. **Altitude** of aeroplanes at the time of strike
8. **Phase of flight** at the time of the strike.
9. **Average Altitude** of the aeroplanes in different phases at the time of strike
10. Effect of Bird Strikes & **Impact on Flight**
11. **Effect** of Strike at Different Altitude
12. Were Pilots Informed? & **Prior Warning** and Effect of Strike Relation.

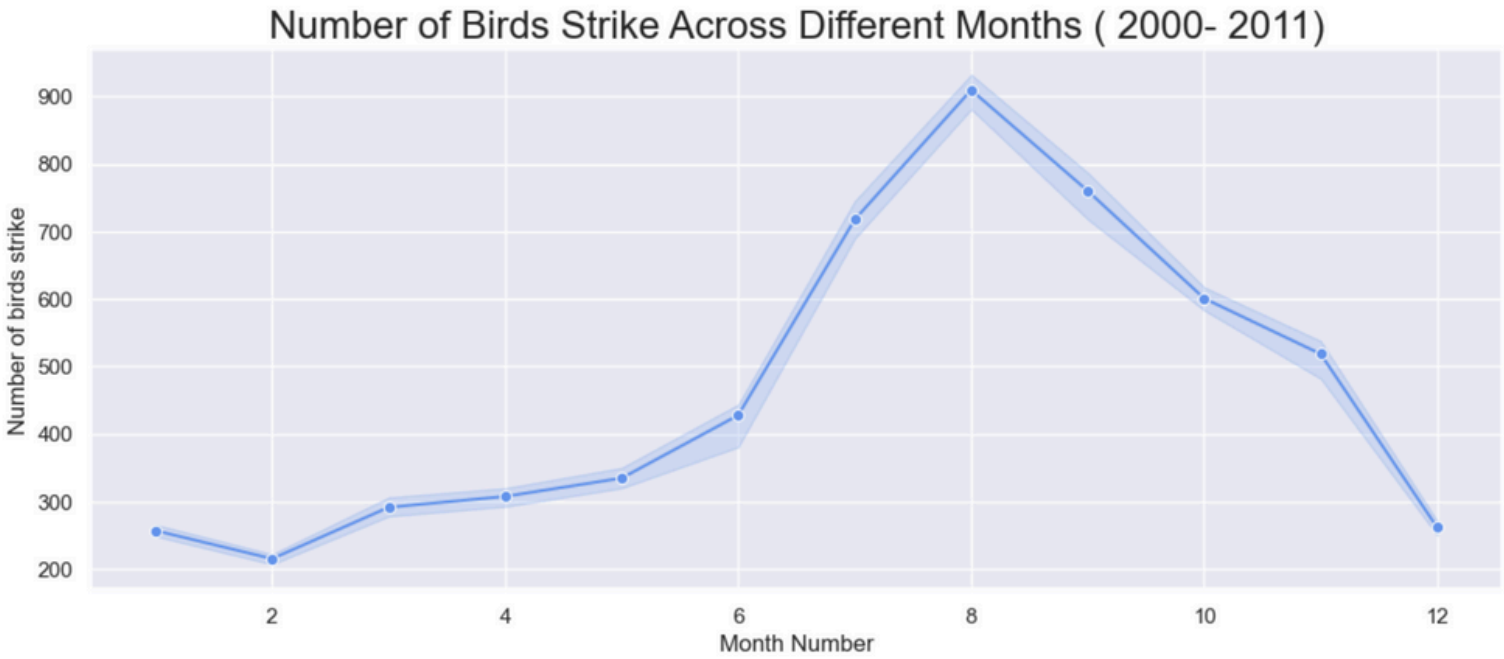
Hypothesis

- Birds Strike may occur during any phase of flight but are most likely during the take-off, initial climb, approach and landing phases.
- Smaller aircrafts face significant damage to the aircraft structure especially jet engines resulted in fatal accidents

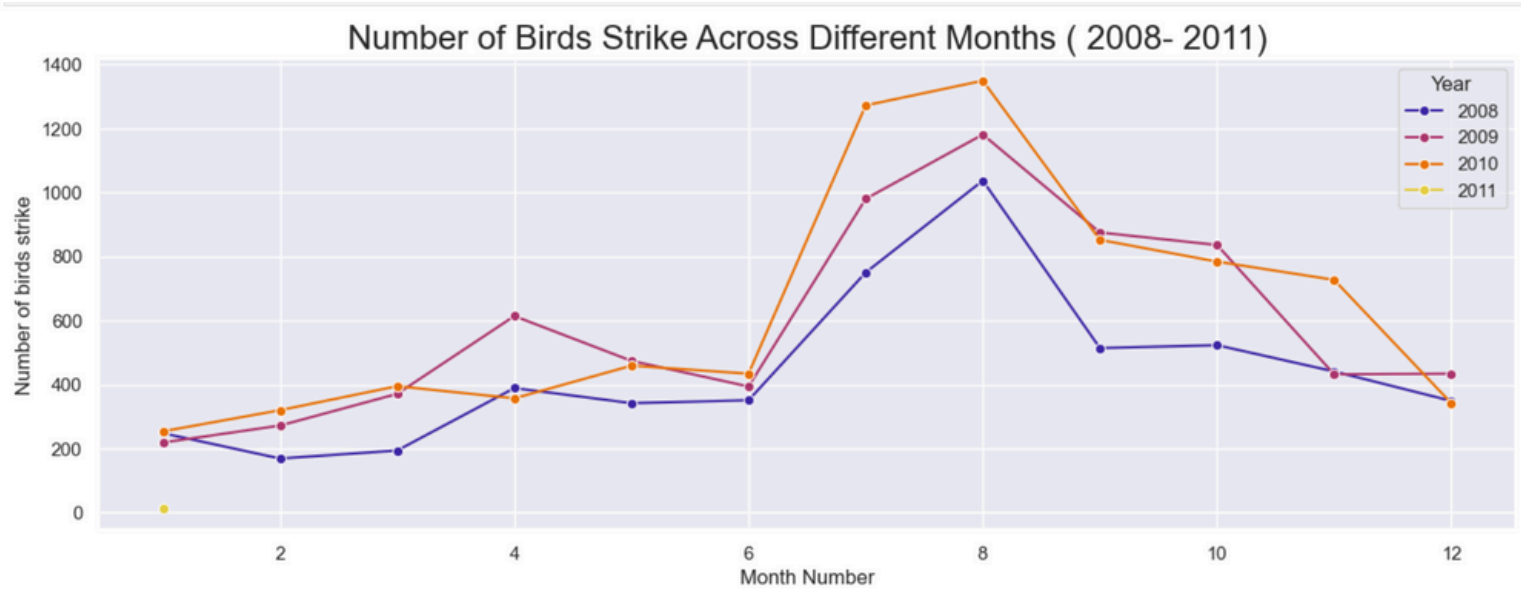
Yearly Analysis Bird Strikes in the US



As per the above yearly trend line as the years increasing the number of bird strikes are also increased where highest recorded in 2010 with 7545 incidents and lowest in the 2004 with 4321 incidents however their is dip in the incidents from 2010 to 2011 but not a big impact. **The reason behind the strikes increasing as the time increases is might be the increasing number of aircrafts as demand is increasing because of the population**

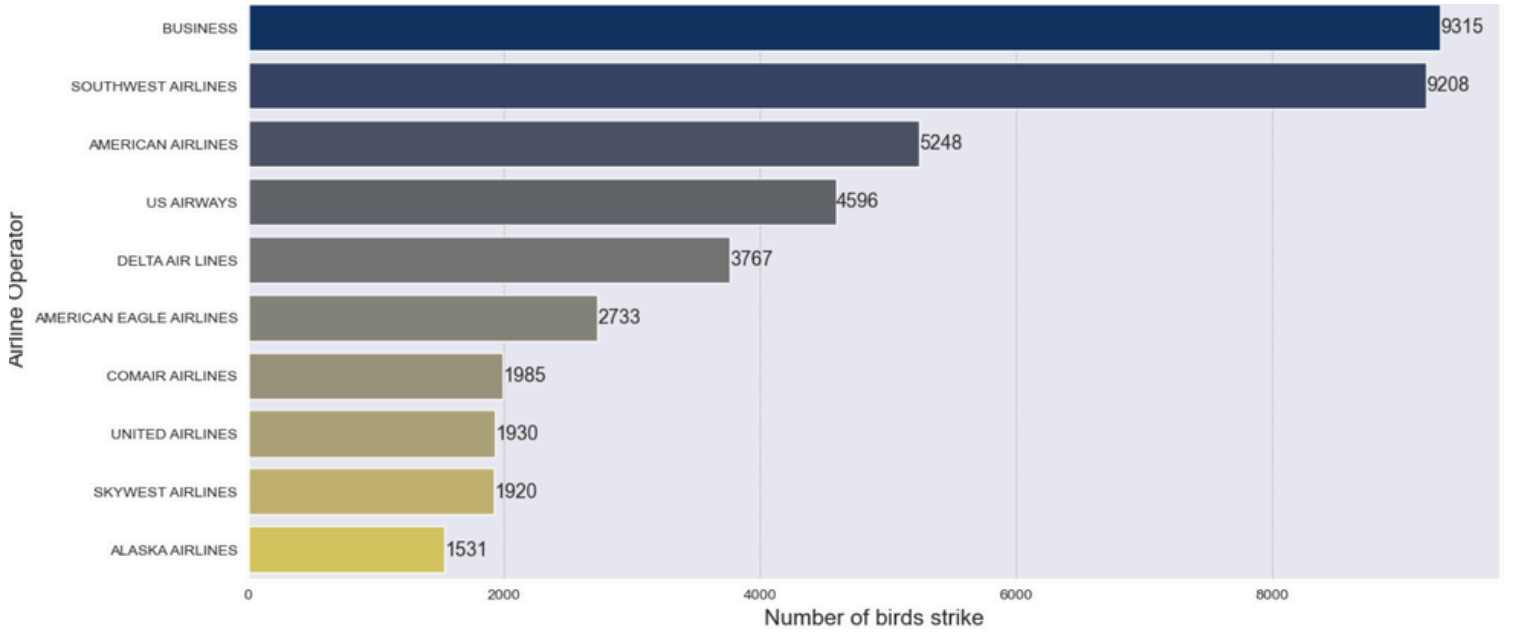


Here from the above graph we can see that in month **July, August, September and October** having the highest number of bird strikes that we can retrieve the climatic weather **conditions change in this season might be due to the weather conditions** led birds to stay closer to the area of airport and aircraft controlling area or stay on to the ground ..Don't know th exact reason but these 4 months having the most strikes as compare to other months



From the above graph we can say that **no change in this season increasing in number of birds strike** as we can see the all the last four years having same increase in that particular season that we see in all the years trendline for month so July August September and October is the rising concerning months to find the root cause for increment

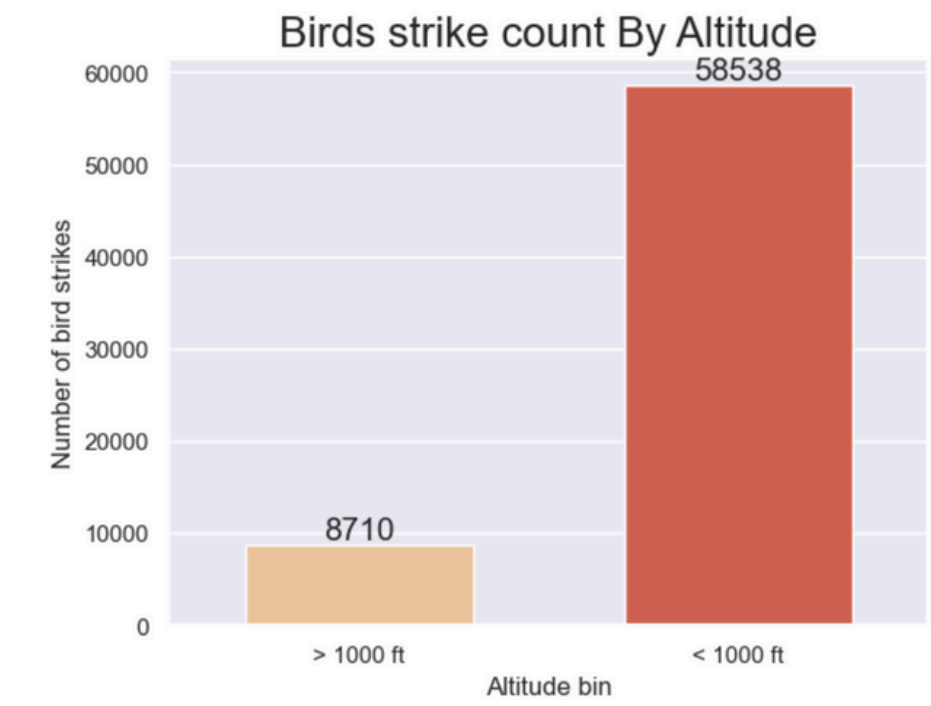
Top 10 Airlines In Respect Of Birds strike

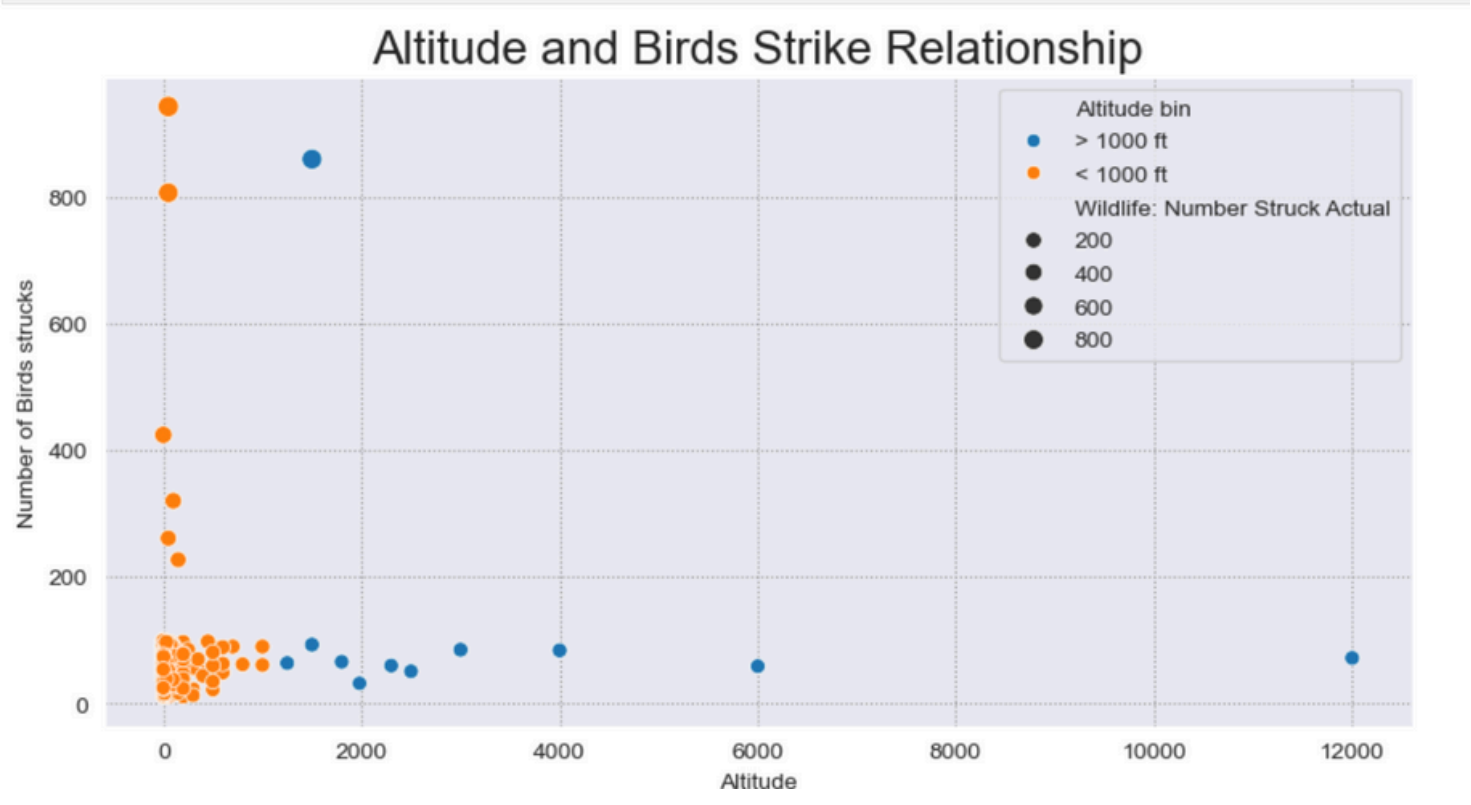


Here from the above graph we can see that **Business and Southwest airlines** having very highest number of birds strike around **9000** as compare to others airlines having less than 5000 birds strike

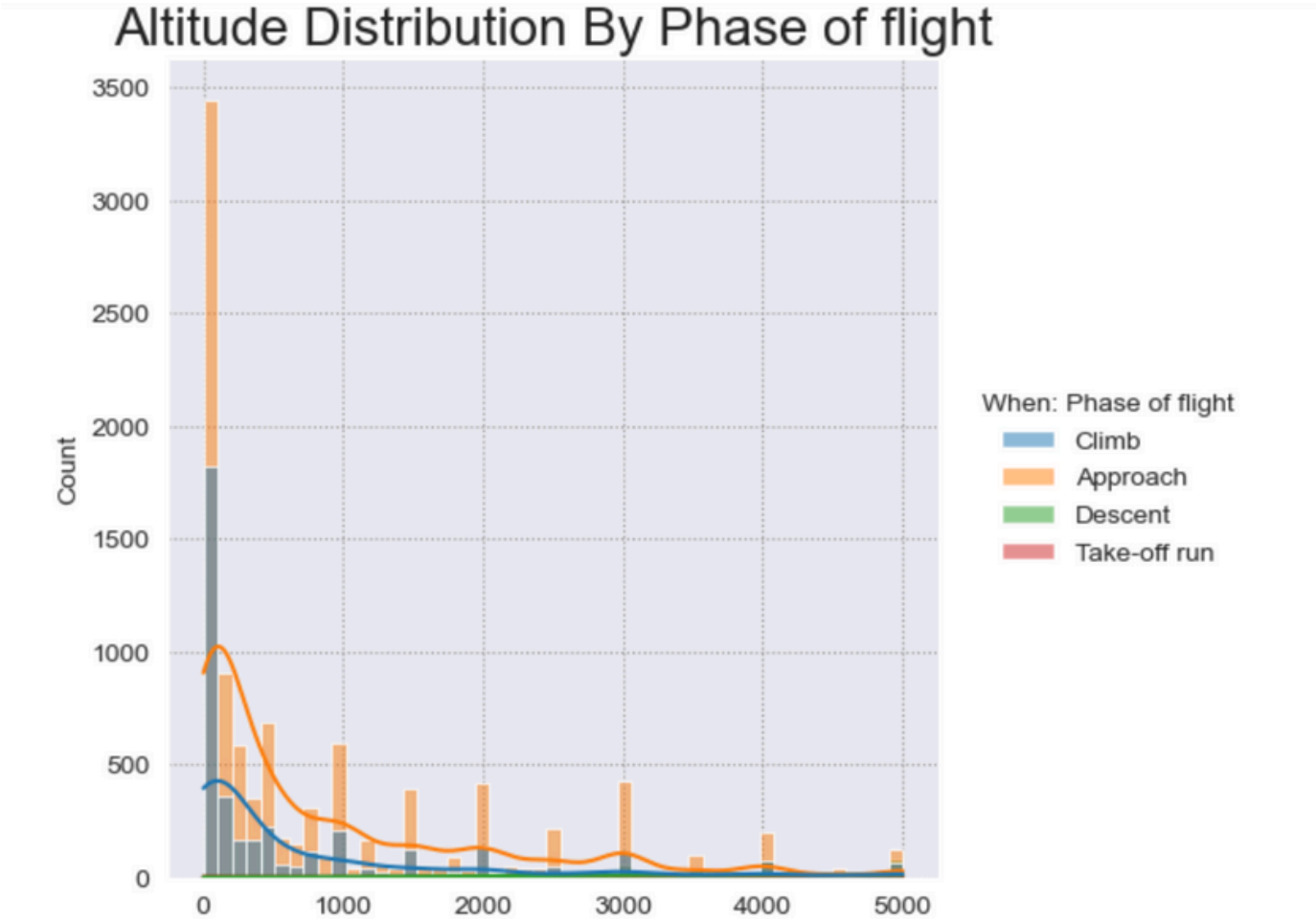
Altitude of aeroplanes at the time of strike

Hypothesis Testing 1 (Altitude Impact)



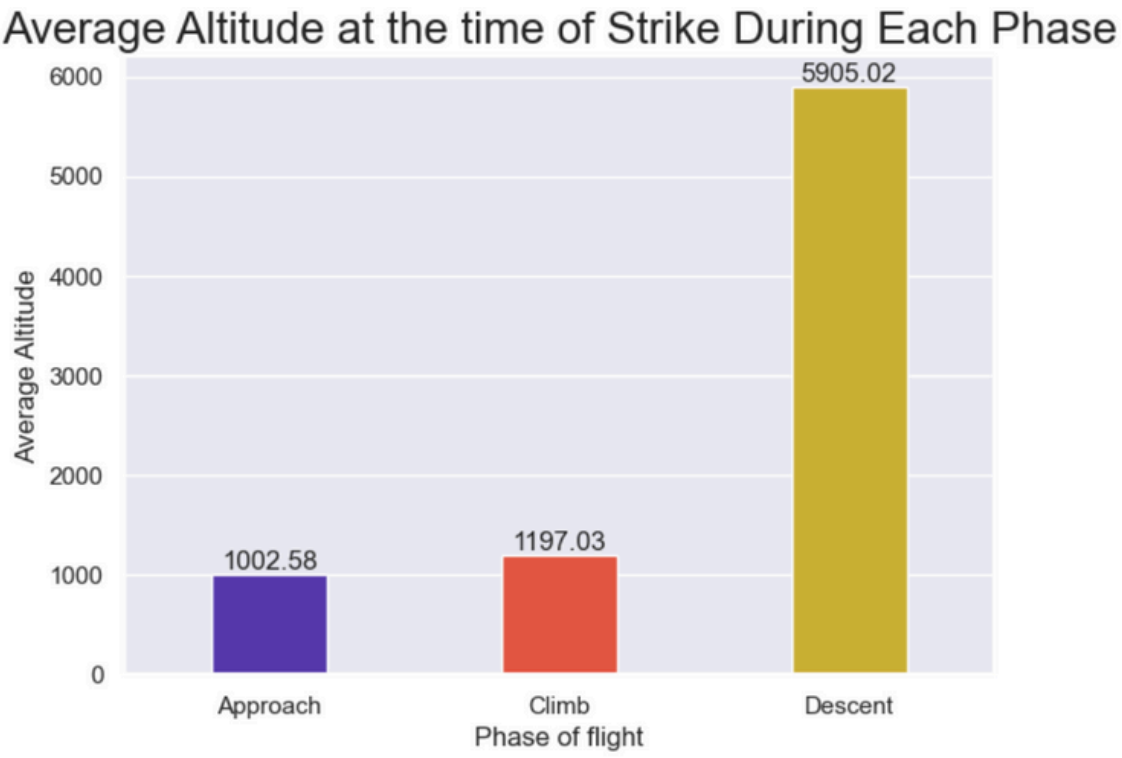


As per the second graph we can see the distribution of data as **many data points are clustered** where the altitude is less than 1000 as altitude is increasing less data is distributed is there so increasing altitude having negative impact on the birds strike and second bar chart shows the actual number of birds strike for when **altitude < 1000 is 58538** and **when altitude > 1000 is 8710** so **our hypothesis is correct** that mostly birds strike occur at the low altitude when aircraft is in take-off,initial climb, approach and landing phases



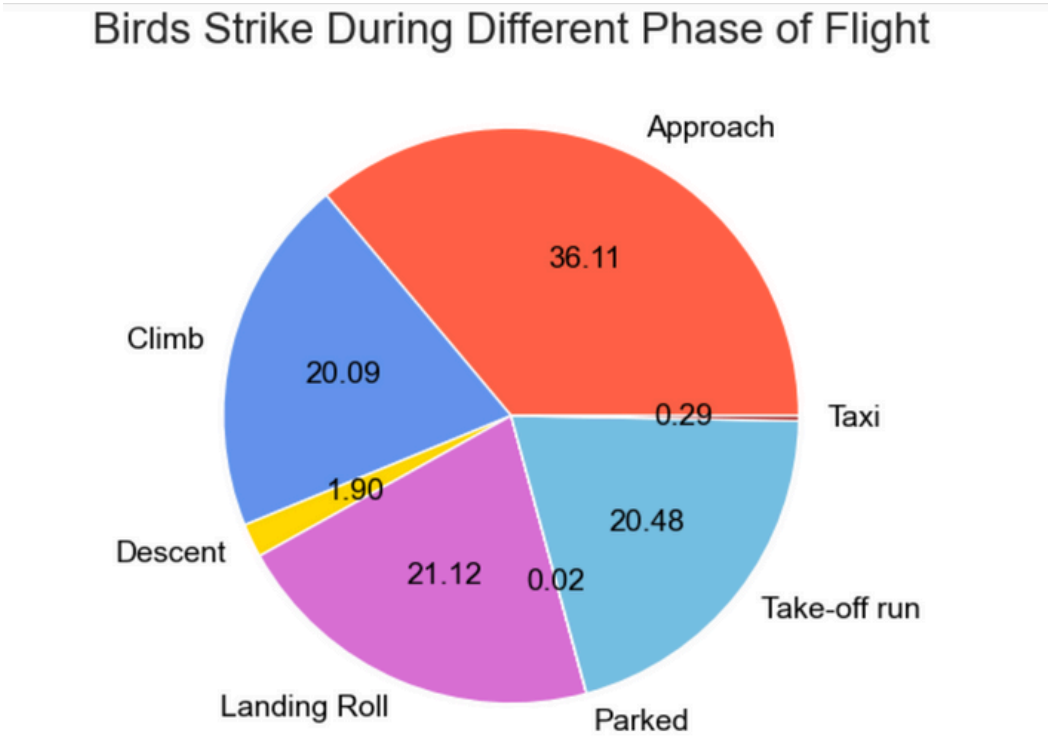
Here we can see two things first greater number of values for altitude < 1000 so birds striking most commonly happening in < 1000 altitude and second when the flight is approaching it encountered more birds strike and on the second when flight is about in its Climbing phase so that truly proves the hypothesis as well

Average Altitude of the aeroplanes



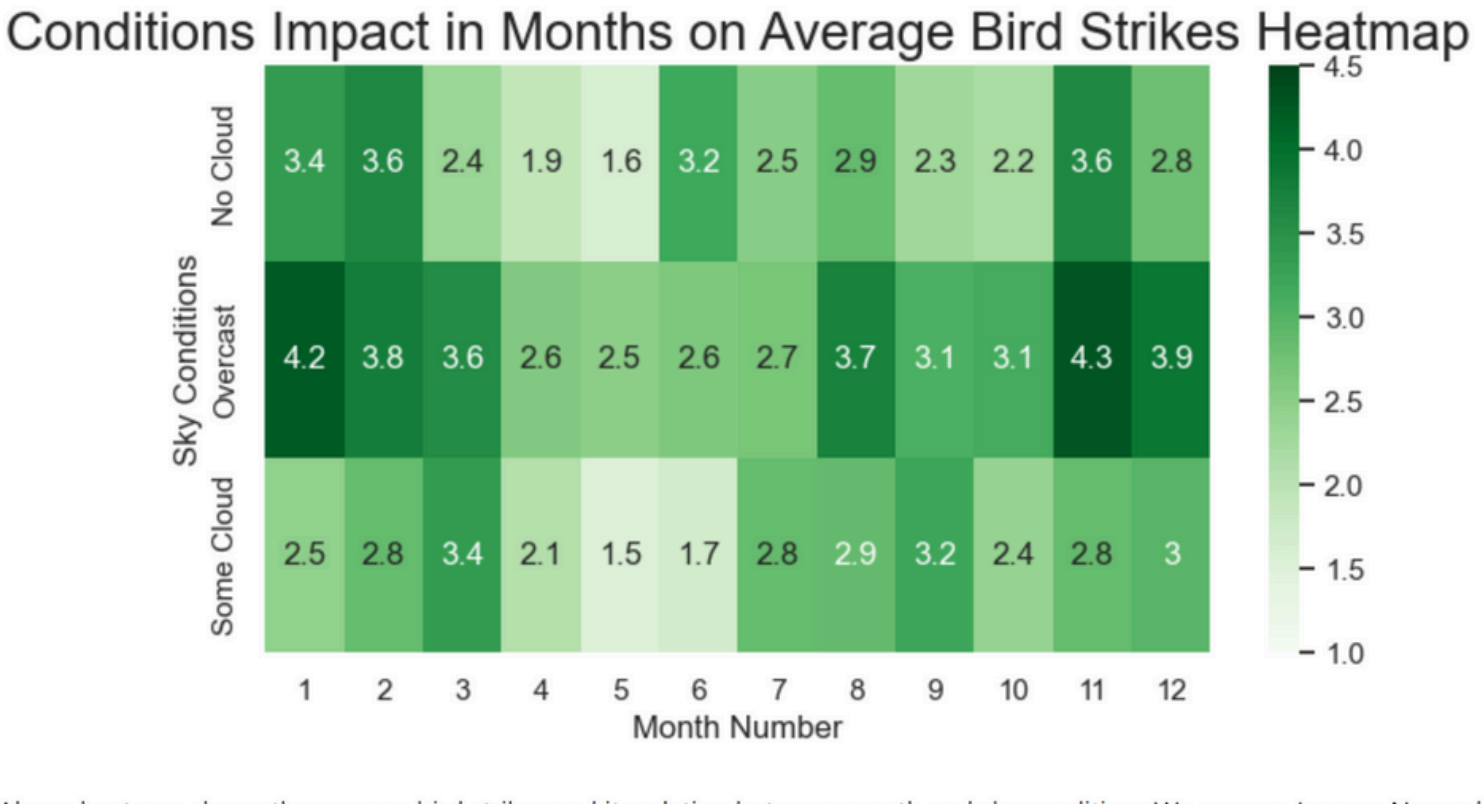
So from the above graph we can analyze that at the time of approaching phase where the most birds strike occurred the **average altitude is 1000** Approx. and **during climbing phase 1200** approx. and for the descent phase no use of that as around less incidents of birds strike occurred during that phase

Phase of flight at the time of the strike



From the above pie chart we can rertieve that most of the incidents occured at **Approaching Phase of flight 36%** approx and then **Landding Roll 21%** and then climbing and take off run phase contributing to 20% each.Approach phase is between the **phase when flight is under 5000 Feet AGL and flight is landed in run way so yes birds and other flying species is at this phase so higher possibility of birds striking occur at this stage**

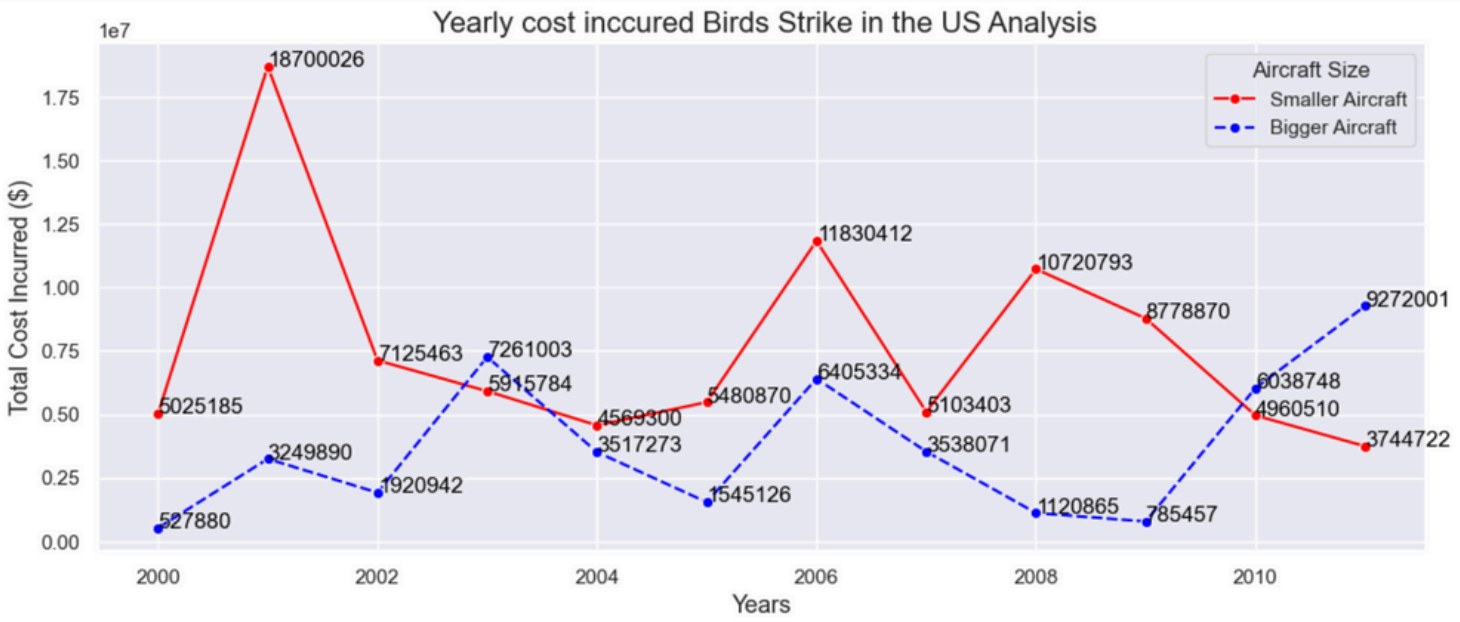
Sky Conditions impact on average Bird strike



Above heatmap shows the average bird strikes and its relation between month and sky conditions.We can see **Janaury November and december are having average bird strikes greater than 3.5 in Overcast** conditions and we can also see the the higher color values in overcast sky conditions that means

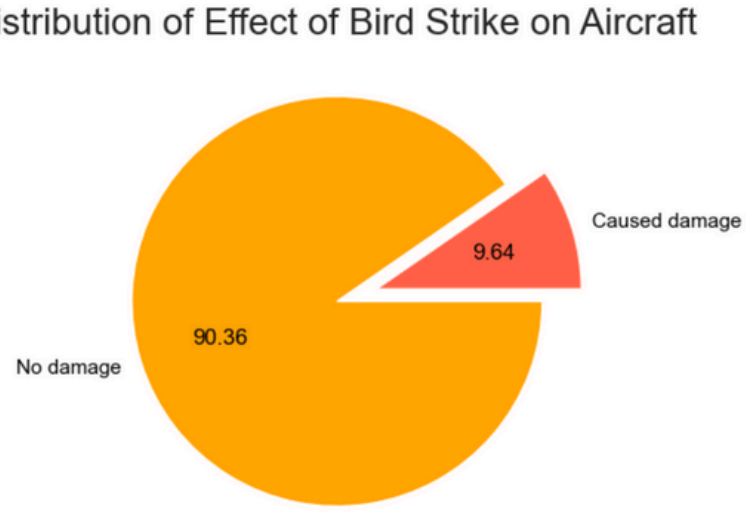
Yearly Cost Incurred due to Bird Strikes

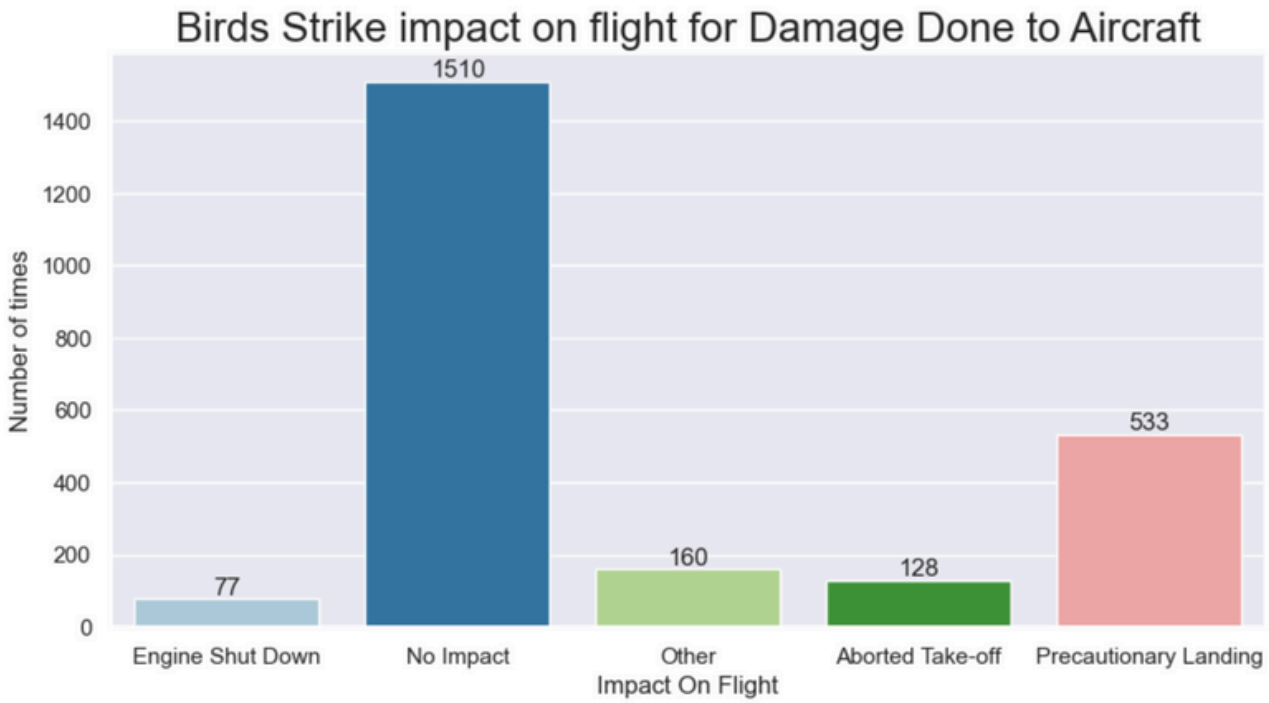
Hypothesis Testing 2 (Aircraft Design Impact)



From the above line chart we can analyse that cost incurred for the incidents during **2001** is **high for smaller aircraft** (**$18700026**) as too high as compare to BiggerAircraft(**$3249890**) as smaller aircrafts might have size issues or less jet engine which make the difficult for the aircraft to handle the strike that increases the cost for them but as time progress in the **recent year 2011 aircraft larger in size** have incurred **more cost ($ 9272001)** as compare to smaller aircraft($ 3744722). **Our hyppthesis is not proved** as smaller aircrafts face more accidents resulting in high cost incurred for it but for the recent year 2011 it shows different results

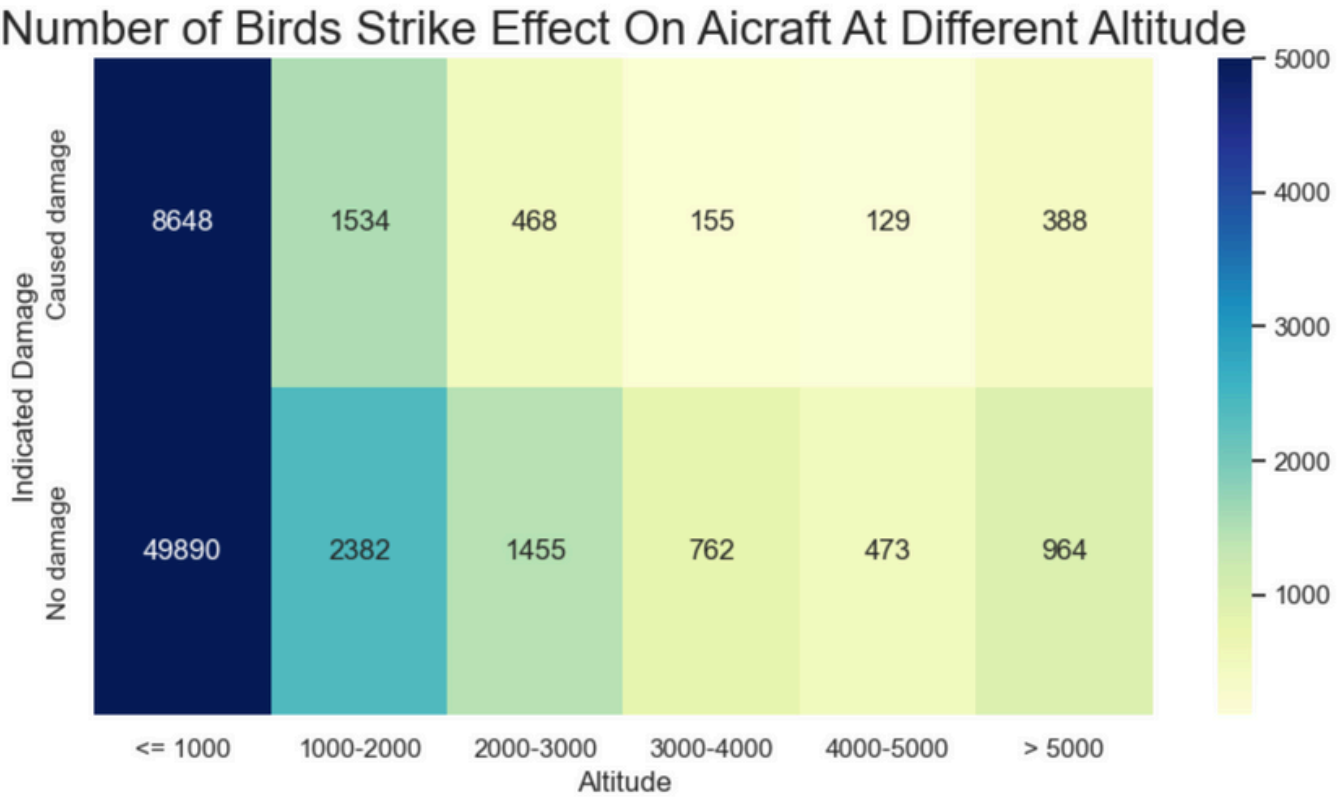
Effect of Bird Strikes & Impact on Flight





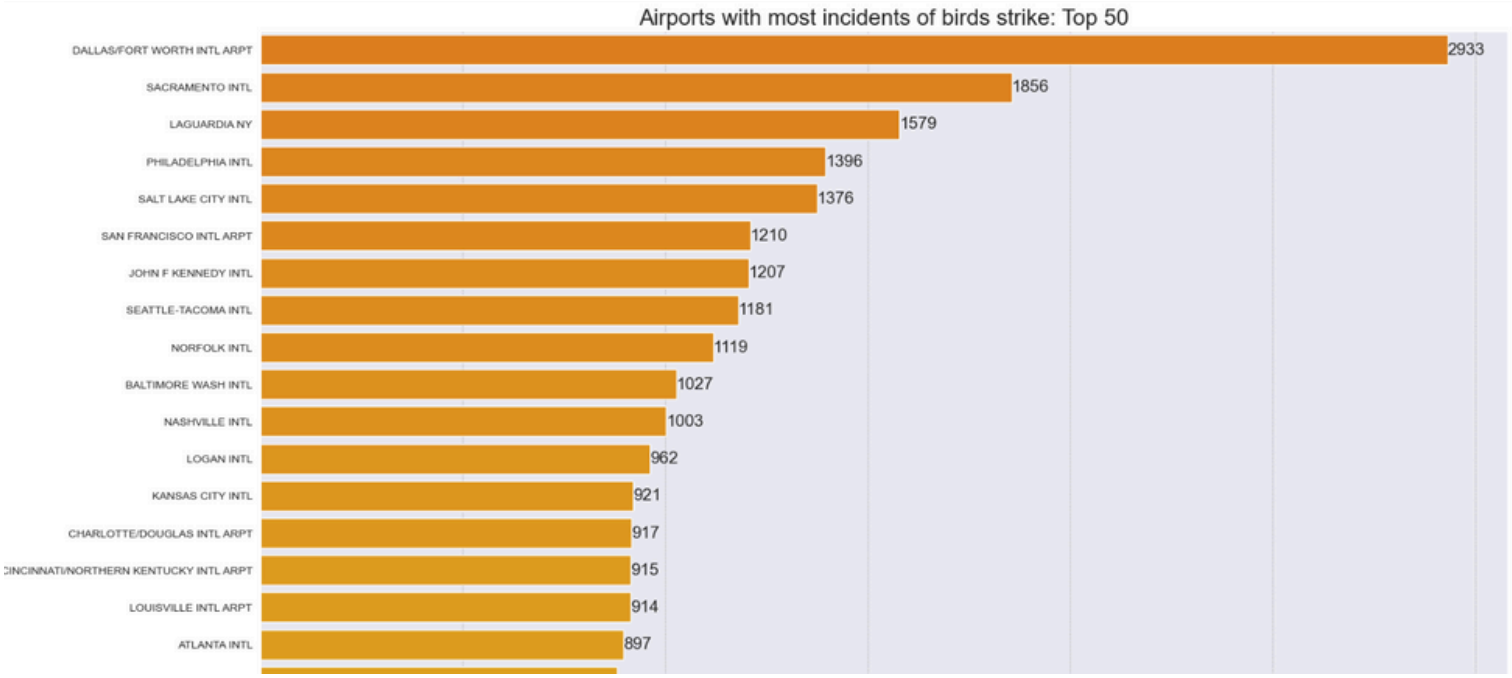
From the above graph the **no impact is the most number of times** in aircrafts that means no action taken related to the flight and flight run as usual it runs when the bird strike incident is happened and next we see the **precautionary landing is taken by the air controllers around 533 times** this step is taken and this number is good or bad both because the 533 times taken landing that leads to delays in flights and the cost as well but this is also good step to ensure the safety of the passengers

Effect of Strike at Different Altitude

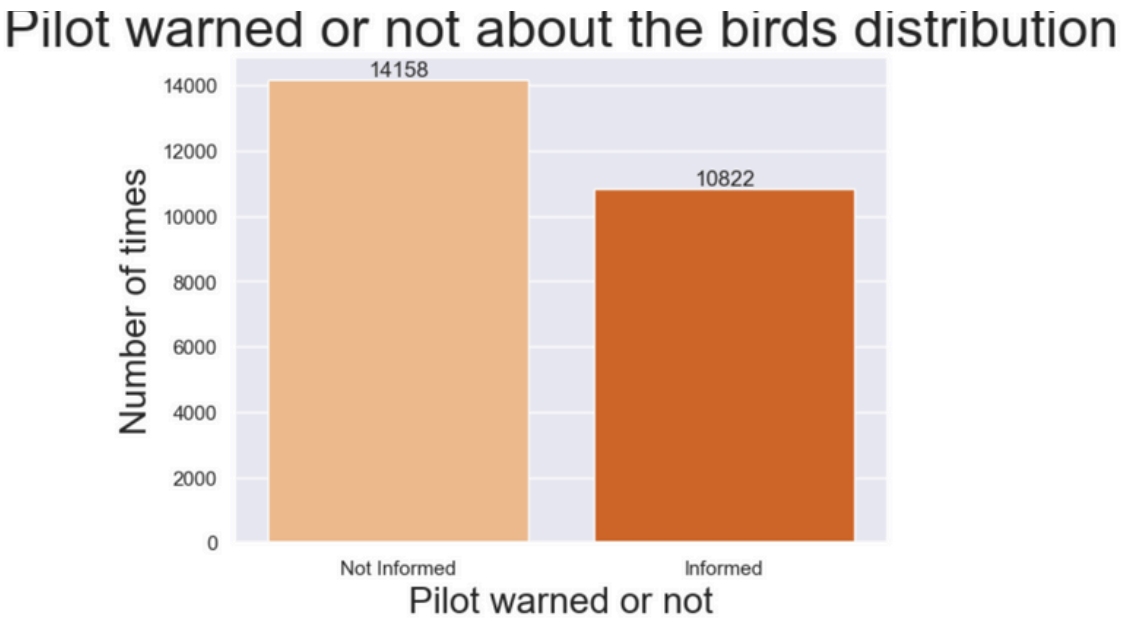


From the above heatmap we can retrieve that as we see earlier more number of bird strikes occured at less altitude and now we see the **damage is also done at <= 1000 altitude** and by the altitude is increasing the damage on aircraft by birds strike is also also decreasing same case apply for the non damage done to aircraft by the birds strike so a**ltitude is key factor playing in the damage as well**

Airports with most incidents of bird strikes – Top 50

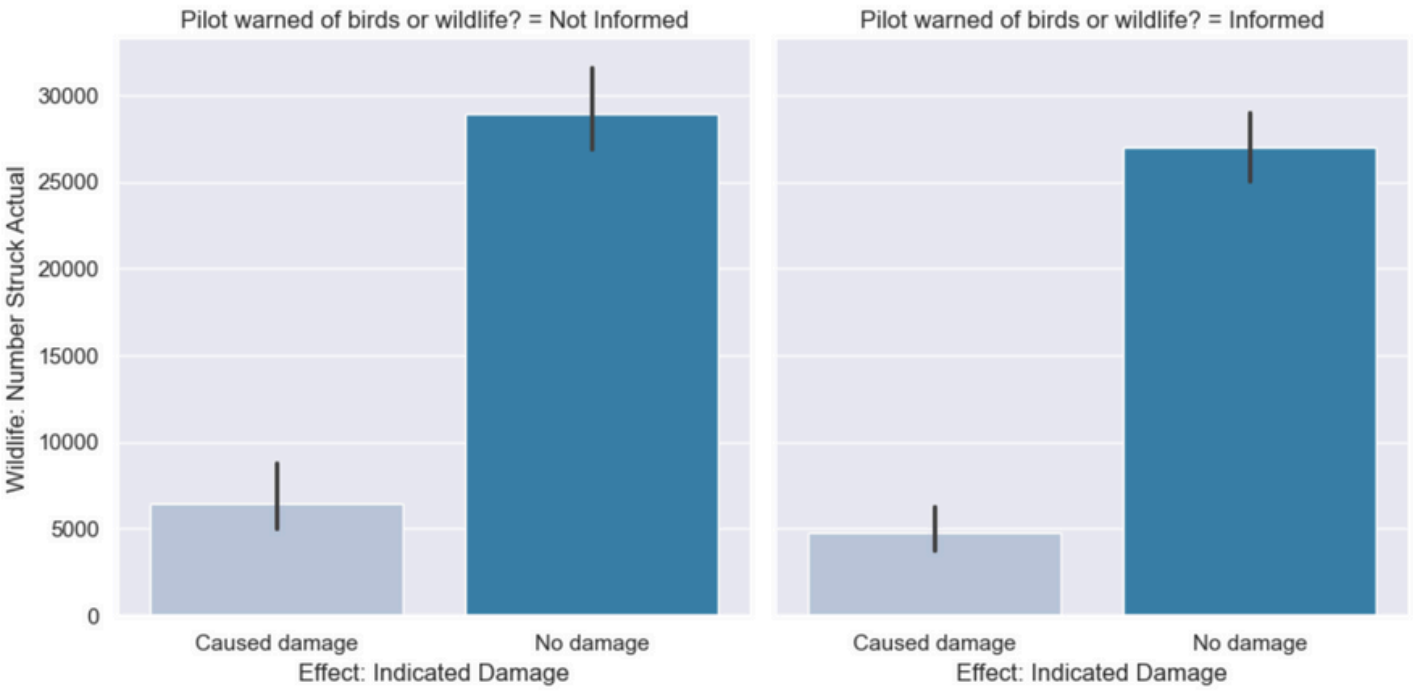


Were Pilots Informed? & Prior Warning



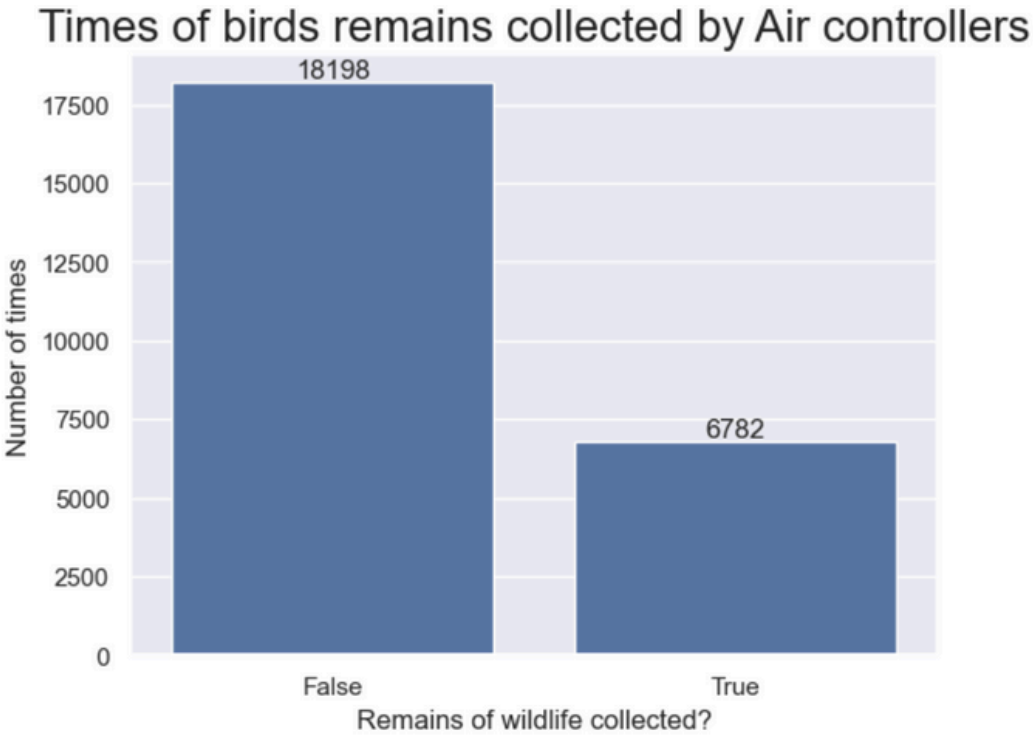
From the above visuals we can retrieve that as **equal distribution** of warnings as many times pilot warned many times not but not informed is greater than informed because it is difficult for air controller to detect the birds in the sky as well

Prior warnings and damage effect



From the above graph we can see that **when the pilot are informed the birds strike impact less damage** as compare to when pilot are not informed but the data above showing the all birds strike in both the informed and not informed and the distribution is nearly around same values that mean **after informing the pilot the bird strike still done** but the impact is not as per the when pilots are not informed and the difference between caused damage in both the cases is also not so big so pilots should be provided with more trainings how to handle if you informed by the air controllers

Remains collected by air controllers



From the above graph we can see that many times the remains are not collected and yes it is difficult to find that also but we should work on the techniques on how to finding out the remains and sending to Smithsonian

Suggestions

1. Above analysis portray that the most birds strike occured in low altitude. So air controllers should **focus on working on technologies to track** the area under 1500 ft. and clear the area as how much they can.
2. Air controllers also **investigate the some pilots** who actually involved in the bird striking incidents specially after giving them warning becuase as per the data their is not a big difference comes in case of informing or not informing pilots.So might be their is a chance that they have not taking these bird strikes serious.
3. Air controllers also should investigate the matter of **increase in the cost inccured** for Larger aircrafts because the larger aircraft having a trend change in the cost inccured.
4. As per above analysis about **only 27% remains of collected** and if we try to focus on collection of remains of body and sending to smithsonian then might be we also got to know about which specific type of birds are involved in our bird accidents.