Safety Study

Bird Strikes Events

Date:

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Abbreviations

AIB: Aviation Investigation Bureau

BASH: Bird Aircraft Strike Hazard

IBSC: International Bird Strike Committee

EASA: European Aviation Safety Agency

ICAO: International Civil Aviation Organization

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Introduction

As soon as people started to fly, bird strikes became a significant safety issue. At present, hundreds of bird strikes are reported every year, and the consequences vary between a damage to a total aircraft hull loss.

It has been estimated that the material cost of bird strikes may be more than one billion dollars annually. But in addition, there is the immeasurable cost of losing human lives.

How could we fly safely sharing the same sky with the birds? The question is difficult to answer because of the complex reasons why bird strikes happen. The increasing number of flights and growing bird population will also bring new challenges in the future.

This thesis approaches the subject by concentrating on bird strike events in Saudi Arabia. The thesis reviews and analyze all bird strike reports received by Aviation Investigation Bureau (AIB) between January and October 2017.

Based on the reports analyzed, the importance of good bird strike reporting was not yet clear for all stakeholders. The altitudes, bird species, were often poorly identified, and a lot of other valuable data, such as weather details, In addition, bird strikes that did not cause any damage were often not reported. The aim in bird strike reporting should be better quality and higher frequency than what is currently found. This could certainly improve aviation safety.

Chapters Structure

Chapter1: is and introductory part, which gives a general idea about the objectives and methodology of this study

Chapter2: Bird Strike Overview, which briefly looks at some interesting general information and history of Bird Strikes.

Chapter3: shows the results of all variables that were analyzed in the bird strikes events received by AIB from January to October, 2017

Chapter4: the discussion and closing part. It contains the conclusion of this study and recommendations

Chapter 1: Objective & Methodology

Objective:

Bird strikes events in Saudi Arabia need to be analyzed frequently. This study attempts to identify the strengths and weaknesses of aviation safety procedures regarding bird strikes in Saudi Arabia and identify the level of existing reporting system and culture. In addition, recommendations will be given in this regard, based on analysis results, in order to help improving aviation safety.

Methodology:

- The Bird Strike reports were collected by AIB from Saudia Airlines, Flynas, Aramco, SaudiGulf and Air Arabia for the period from January 2017 to October 2017.
- The following data were collected from the airlines :
  - Date and Time
  - Aircraft Type
  - Flight phase
  - Location
  - Aircraft striked part

Chapter 2: Overview

2.1. What are Bird Strikes?

A collision between an aircraft and a bird is called a bird strike. Synonyms for a bird strike are a bird hit and a Bird Aircraft Strike Hazard (BASH). Bird strikes are a common flight safety problem, and they will become an even more significant issue in the future as the number of aircraft and birds increases. Bird strikes are very frequent and may occur to all aeroplane categories.

According to the International Bird Strike Committee (IBSC), bird /wildlife incidents are divided into three categories as follows:

Confirmed strikes:

- Any reported collision between a bird or other wildlife and an aircraft for which evidence in the form of a carcass, remains or damage to the aircraft is found.

- Any bird/wildlife found dead on an airfield where there is no other obvious cause of death (e.g. struck by a car, flew into a window etc.).

Unconfirmed strikes:

- Any reported collision between a bird or other wildlife and an aircraft for which no physical evidence is found.

Serious incidents:

- Incidents where the presence of birds/wildlife on or around the airfield has any effect on a flight whether or not evidence of a strike can be found.

According to that definition a bird strike has occurred, if:

- A pilot reports a bird strike;
- Aircraft maintenance personnel identify damage to an aircraft as having been caused by a bird strike;
- Personnel on the ground report seeing an aircraft strike one or more birds;
- Bird remains – whether in whole or in part – are found on an airside pavement area or within 200 feet of a runway, unless another reason for the bird's death is identified.

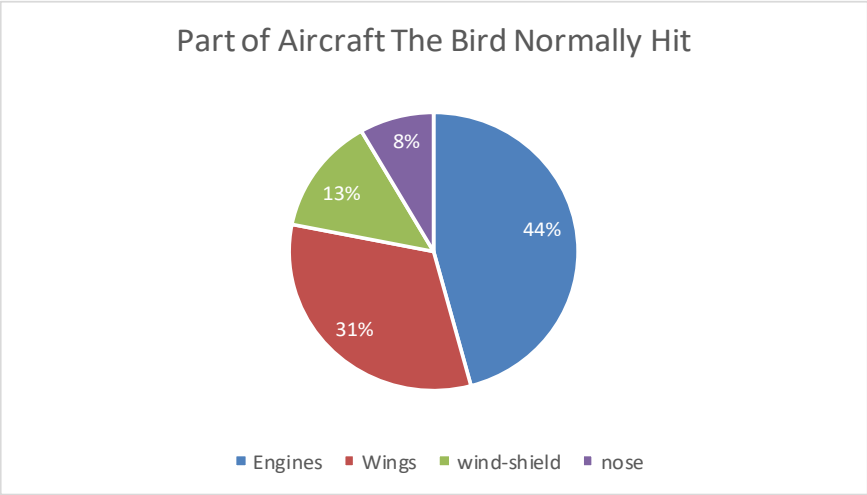
2.2. History of Bird Strikes

Bird strikes became a safety problem as soon as people started to share the sky with birds. The first bird strike happened already in the year 1905, and the first fatality was caused seven years later in 1912.

A study published in 2009 and has been updated in 2012 in the IBSC meeting, shows that the number of fatal accidents caused by bird strikes is 55 and number of fatalities is 276. Total hull losses up to 108.

An example of a bird strike was the crash of a Sita Air Dornier 228 aircraft on 28th of September 2012 in Nepal. The aircraft was reported to have crashed shortly after taking off from Kathmandu airport. The pilot had told the air traffic controller that they had hit a vulture. The forced landing was unsuccessful, and all 16 passengers and 3 crewmembers died.

2.3. Which Part Of Aircraft The Birds Normally Hit?



The European Aviation Safety Agency (EASA) has made research about accidents caused by bird strikes between the years 1999 and 2008. The engines sustained damage in 44% of the accidents. The wings were second with 31% and the wind-shield third with 13%. The nose part of the aircraft was damaged in only 8% of the strikes leading to an accident (EASA, 2009).

2.4. Which Part of Aircraft is the most sensitive?

EASA (2009) has performed a similar study where they compared bird strike accidents between the years 1999 – 2008. This study pointed out the parts of the aircraft where the bird strikes had caused damage. The result was that the engines sustained some damage in 44% of the accidents. When the different engine types were examined more carefully, they found that turbofan engines sustained damage in 53% of the cases. The corresponding figure for turbo propeller engines was 38%, whereas reciprocating engines were damaged in only 6% and turboshaft engines in only 3% of the accidents. The wings suffered some damage in 31%, the windshield in 13%, the nose in 8% and the fuselage in 4% of the bird strike accidents.

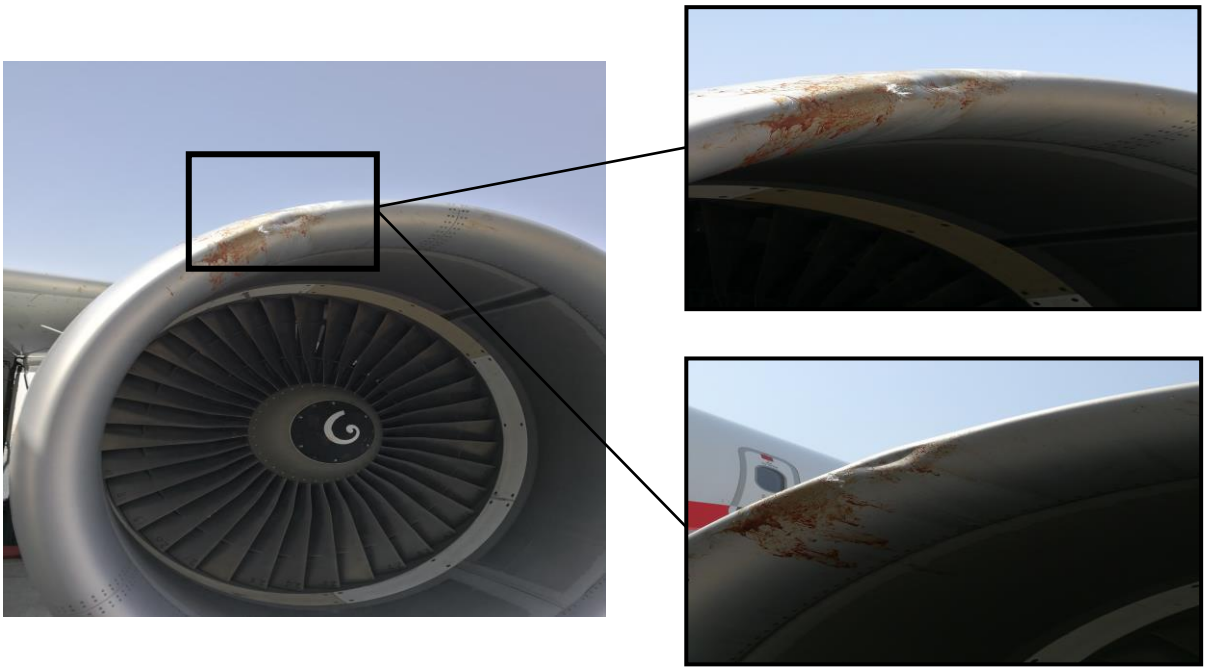
2.5. How are Bird Strikes Dangerous?

It is good to remember that most of the bird strikes may not cause any hazard and the probability of dying in a bird strike is very small. It can also be misleading to think that strikes with large birds would always be the most dangerous ones. Even a flock of small birds can easily break an engine, windshield or another aircraft structure and lead to a

serious hazard to safety. The size of the bird does not directly correlate with the damage sustained either. In fact, mass density varies a lot according to bird species.

For example, the Starling (Sturnus vulgaris) have a 27% higher mass density than gulls and can form flocks with up to 10000 birds. This is why Starlings are sometimes called “feathered bullets” (EASA, 2009).

Simply by following the laws of physics, the mass of the bird and the aircraft velocity are the two values that affect the kinetic energy of the strike. This makes a significant difference between the various phases of flight. During take-off, engines are often set at maximum power, while during approach, they can be running at idle. High engine RPM makes take-offs more dangerous than approaches if a bird strikes the engine.



2.6. Bird Strikes Risk Assessment

		Severity			
		NEGLIGIBLE small/unimportant; not likely to have a major effect on the operation of the event / no bodily injury to requiring minor first aid injury	MARGINAL minimal importance; has an effect on the operation of event but will not affect the event outcome / requires medical treatment	CRITICAL serious/important; will affect the operation of the event in a negative way / suffers serious injuries or medical treatment of minors	CATASTROPHIC maximum importance; could result in disaster/death; WILL affect the operation of the event in a negative way / death, dismemberment or serious injury to minors
Probability	LOW This risk has rarely been a problem and never occurred at a college event of this nature	LOW (**1**)	MEDIUM (**4**)	MEDIUM (**6**)	HIGH (**10**)
	MEDIUM This risk will MOST LIKELY occur at this event	LOW (**2**)	MEDIUM (**5**)	HIGH (**8**)	EXTREME (**11**)
	HIGH This risk WILL occur at this event, possibly multiple times, and has occurred in the past	MEDIUM (**3**)	HIGH (**7**)	HIGH (**9**)	EXTREME (**12**)

Explanation of Risk Ranking		
LOW	MEDIUM	If the consequences to this event/activity are LOW / MEDIUM, your group should be OK to proceed with this event/activity. It is advised that if the activity is MEDIUM, risk mitigation efforts should be made.
HIGH		If the consequences to this event/activity are HIGH, it is advised that you seek additional event planning support.
EXTREME		If the consequences to this event/activity are EXTREME, it is advised that you do not hold this event without prior consultation with Risk Management

2.7. Bird Strikes, Growing Problem in the Future

Aviation is a rapidly growing business. More than 3.5 billion passenger were flown in 2015, an increase of 240 million compared with 2014. In 2014, The Airbus Company has published a Global Market Forecast for the coming 20 years. The estimations in that forecast shows a 4.7% annual increase in global passenger traffic. However, flights In Saudi Arabia has also increased in 2015 by 9.6% compared with 2014 and 9.5% for passengers in the same period.

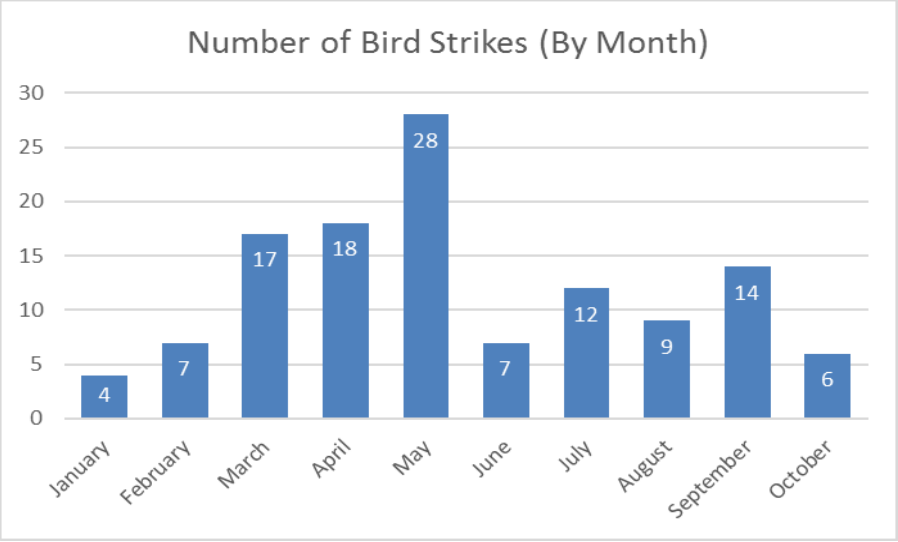
But do we know how many birds there are sharing the sky with us? Globally, the number of individual birds has been estimated at around 100 billion.

By looking at the numbers above, there is no doubt that bird strikes are a significant safety issue now and in the future.

Chapter 3: Analysis & Results

This chapter shows the results of all variables that were analyzed in the bird strikes events collected by AIB from January to October, 2017.

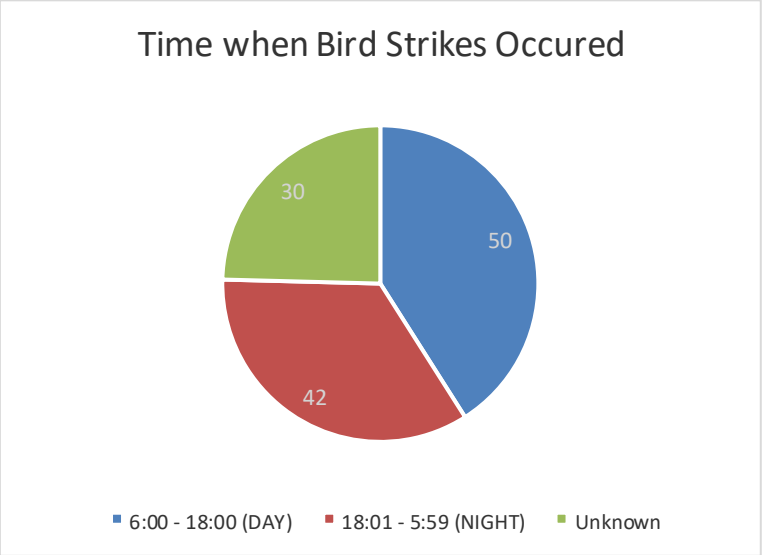
3.1. Number of bird strike reports collected



This data was collected from 5 airlines operating in Saudi Arabia, Saudia, Flynas, SaudiGulf, Aramco and AirArabia. The total number of bird strike till end of October was 122. We found that the highest number of bird strikes was in May with 28 events and

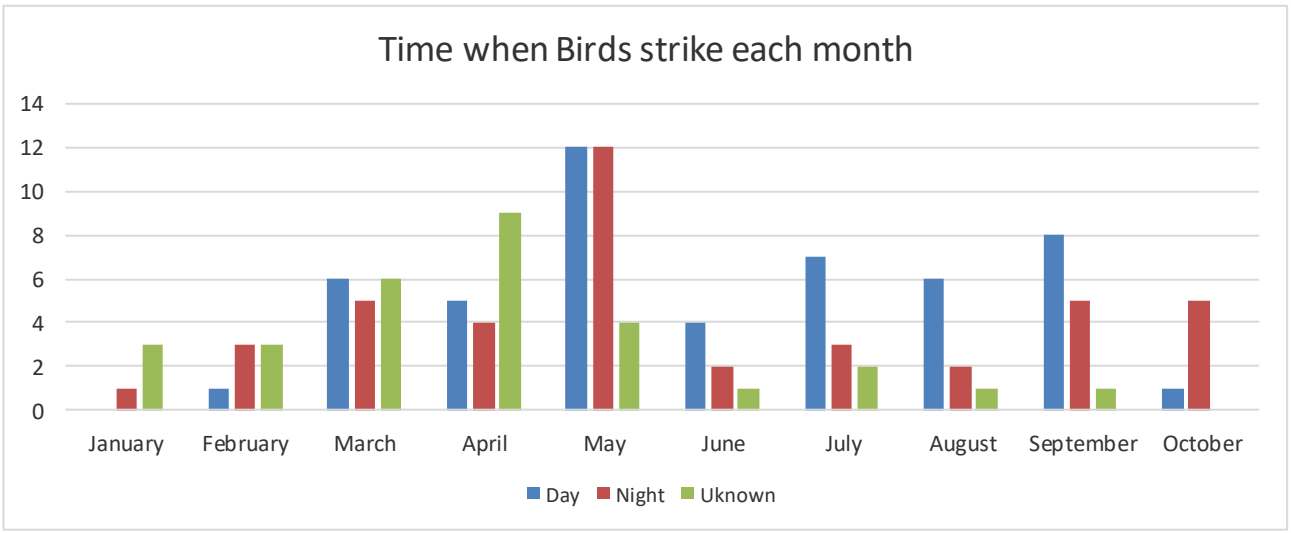
next in April by 18 events, 17 in March, 14 in September and 12 in July. However bird strikes events was lower in August with 9 events, 7 in February and June. 6 were found in October and finally 4 events in January.

3.2. Time when Bird Strikes occurred



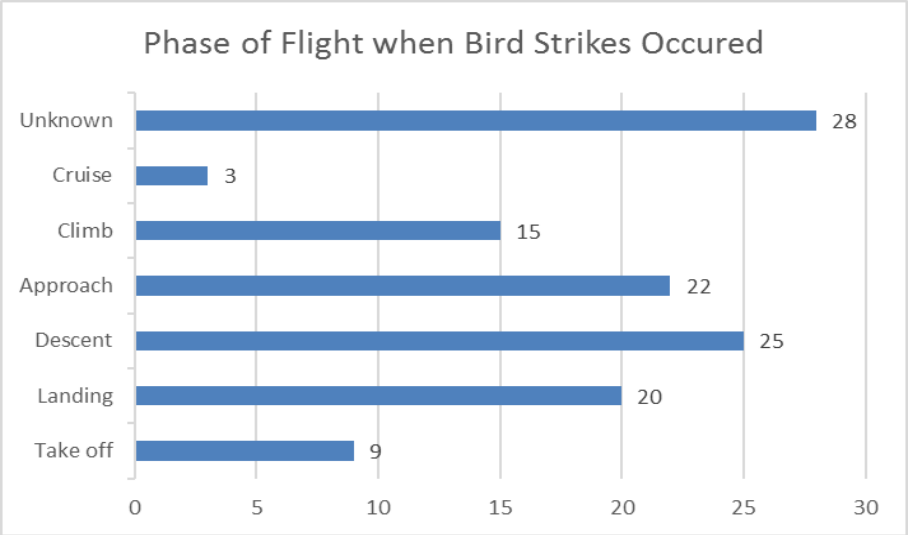
Out of 122 bird strike events, we found that 50 events occurred in the daytime between 6:00 – 18:00 Local Time, which mean (40%) of the total. While 42 events (35%of the total) occurred at night between 18:01 – 5:59 Local Time. Unfortunately time data for 30 events (25% of the total) is missing.

3.3. Time when Bird Strikes occurred (By Month)



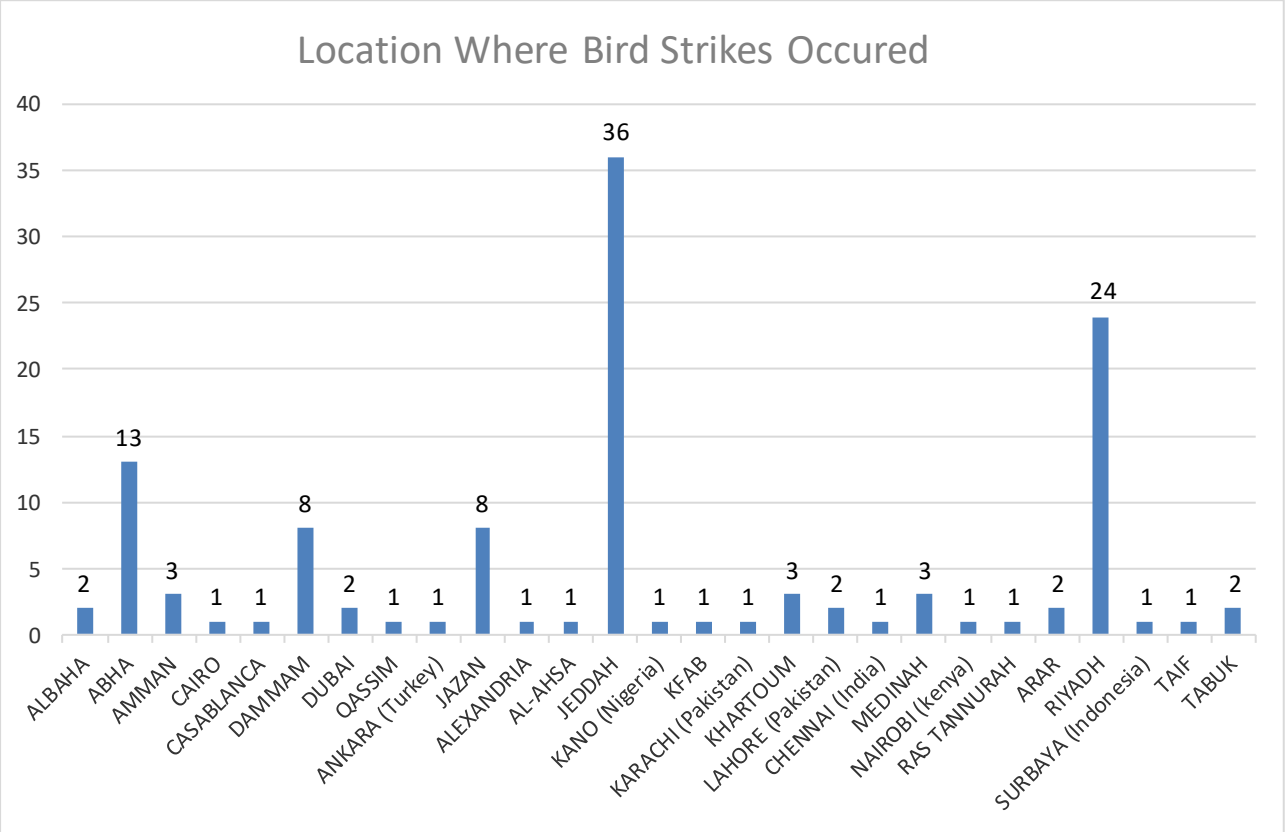
After considering the probability of unknown missing data time, we found that the number of bird strikes events is higher in the daytime in June, August and September, while in October the number is higher at night. Also, we noticed that the number is very high in both period of the day in May. Unfortunately, we were unable to determine others because of missing data.

3.4. Phase of Flight When Bird Strikes Occurred



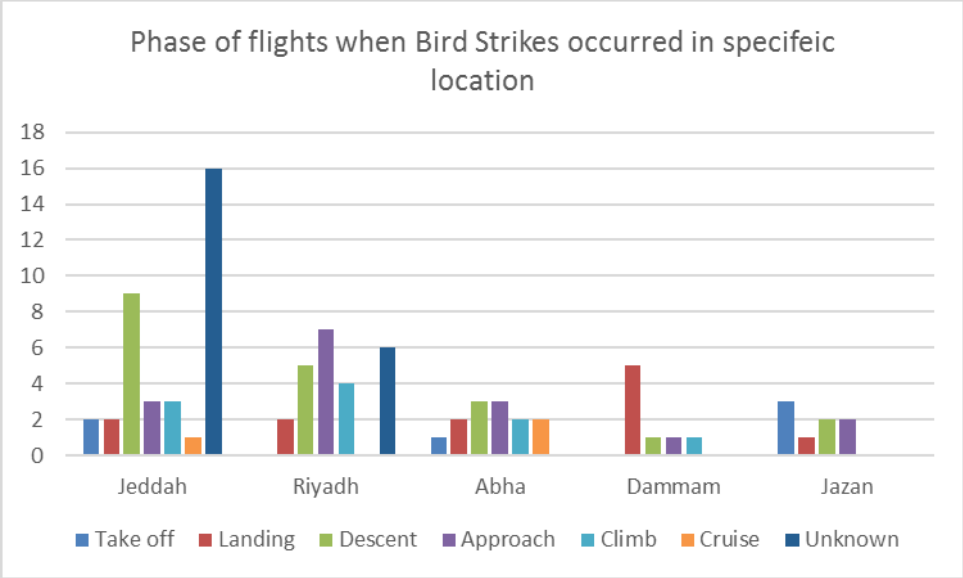
Out of 122 bird strike events collected between January and October 2017, 9 (7%) occurred during take off, 20 (16.6%) during landing, 25 (20.8%) in Descent phase, 22 (18.3%) during approach, 15 (12%) during climb, 3 (2.5%) during cruise and 28 events were unknown.

3.5. Location where Bird Strikes occurred



Between January and October 2017, bird strikes were reported from 27 different airports in Saudi Arabia and abroad. In Saudi Arabia We have 103 bird strike events out of 122, most of them were in Jeddah with 36 events (30%). Next in Riyadh with 24 events (20%), Abha with 13 events (10.8%) and both Dammam and Jazan have 8 events (6.7%). Other airports inside the kingdom have a total of 14 events (11.6%). 19 out of 122 events (15%) were abroad.

3.6. Phase of Flight When Bird Strikes Occurred in Specific Locations



When we analyzed the flight phases in the highest bird strike locations, we found that in Jeddah we have 16 events unknown and 9 out of 36 while descent. In Riyadh, we found 7 out of 24 events while approach as the highest. In Abha, we have 3 events while descent and approach as most events occurred at this phase. 5 out 8 while landing was the highest in Dammam. Finally in Jazan, the highest were during take off with 3 events.

Chapter 4: Recommendation

For over a hundred years, bird strikes have been a serious safety issue for the aviation business. Year after year the sky is becoming busier, both for aircrafts and birds, and the risk of bird strikes is increasing. However, AIB consider bird strikes as an important safety issue, should be solved in cooperation with operators and regulator by following ICAO procedures to mitigate this risk.

In this study, many observations and conclusions have been made. Based on this study AIB recommends the following:

- Send all notification occurrences related to bird strike to General Authority of Civil Aviation via Q5 system and a copy to Aviation Investigation Bureau.

- Increase quality of bird strikes report by making sure that form is completed properly especially for those reports where bird strike didn't cause any damage.
- Educate all employees in airports with the risks of Bird strike and followed procedures and how important to prevent it.
- Identify all attractive factors to birds in the airports and take necessary procedures.
- Issue quarterly reports related to bird strike occurrences and send it to all relevant authorities.
- Evaluate the efficiency of reporting system within (6) months from date of issuance, and invite all related authorities if needed.
- Conduct annual Bird/wildlife control committee, with participation of all operators, regulator members, airport planning, maintenance and operation.
- Establish bird strike committee over GCC.