Prepared by
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BIRD STRIKES

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History & Introductions

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. The term is often expanded to cover other wildlife strikes - with bats or ground animals. 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-engined ones, are vulnerable to the loss of thrust which can follow the ingestion of birds into engine air intakes. This has resulted in a number of fatal accidents.
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. Since most birds fly mainly during the day, most bird srikes occur in daylight hours as well.
The Federal Aviation Administration estimates bird strikes haved resulted in over 200 worldwide deaths since 1988. Here are some major bird strike incidents:

1. The first reported bird strike was by Orville Wright in 1905, and according to the Wright Brothers' diaries: "Orville flew 4,751 meters in 4 minutes 45 seconds, four complete circles. Twice passed over fence into Beard's cornfield. Chased flock of birds for two rounds and killed one which fell on top of the upper surface and after a time fell off when swinging a sharp curve."

2. The first recorded bird strike fatality was reported in 1912 when aero-pioneer Cal Rodgers collided with a gull which became jammed in his aircraft control cables. He crashed at Long Beach, California, was pinned under the wreckage and drowned.

3. The greatest loss of life directly linked to a bird strike was on October 4, 1960, when Eastern Air Lines, a Lockheed L-188 Electra flying from Boston, flew through a flock of common starlings during take off, damaging all four engines. The plane crashed shortly after take-off into Boston harbor, with 62 fatalities out of 72 passengers.

4. Bird strikes aren't confined to commercial aircraft. The Space Shuttle Discovery also hit a bird (a vulture) during the take-off of STS-114 on July 26, 2005, although the collision occurred early during take off and at low speeds, with no obvious damage to the shuttle.

5. In the summer of 2007, Delta Air Lines suffered an incident in Rome, Italy, as one of its Boeing 767 aircraft, on takeoff, ingested yellow legged gulls into both engines. Although the aircraft returned to Rome safely, both engines were damaged and had to be changed.

6. In the same year, a Boeing 757 from Manchester Airport to Lanzarote Airport suffered a bird strike when at least one bird, supposedly a heron, was ingested by the starboard engine. The plane landed safely back at Manchester Airport a while later. The incident was captured by two plane spotters on opposite sides of the airport, as well as the emergency calls picked up by a plane spotter's radio.

7. In one of the most famous incidents of recent years, US Airways Flight 1549 from LaGuardia Airport to Charlotte/Douglas International Airport ditched into the Hudson River in 2009 after experiencing a loss of both turbines. It is suspected that the engine failure was caused

by running into a flock of geese at an altitude of about 3,200 feet, shortly after takeoff. All 150 passengers and 5 crew members were safely evacuated after a successful water landing.

Effects

The nature of aircraft damage from bird strikes, which is significant enough to create a high risk to continued safe flight, differs according to the size of aircraft. Small, propeller-driven aircraft are most likely to experience the hazardous effects of strikes as structural damage, such as the penetration of flight deck windscreens or damage to control surfaces or the empennage. Larger jet-engined aircraft are most likely to experience the hazardous effects of strikes as the consequences of engine ingestion. Partial or complete loss of control may be the secondary result of either small aircraft structural impact or large aircraft jet engine ingestion. Loss of flight instrument function can be caused by impact effects on the Pitot Static System air intakes which can cause dependent instrument readings to become erroneous.
Complete Engine failure or serious power loss, even on only one engine, may be critical during the take-off phase for aircraft which are not certificated to 'Performance A' standards.
Bird ingestion into one or more engines is infrequent but may result from the penetration of a large flock of medium sized birds or an encounter with a smaller number of very large ones.
In some cases, especially with smaller fixed wing aircraft and helicopters, windscreen penetration may result in injury to pilots or other persons on board and has sometimes led to loss of control.
Although relatively rare, a higher altitude bird strike to a pressurised aircraft can cause structural damage to the aircraft hull which, in turn, can lead to rapid depressurisation. A more likely cause of difficulty is impact damage to extended landing gear assemblies in flight, which can lead to sufficient malfunction of brakes or nose gear steering systems to cause directional control problems during a subsequent landing roll. A relatively common but avoidable significant consequence of a bird strike on the take off roll is a rejected take off decision which is either made after V_1 or which is followed by a delayed or incomplete response and which leads to a runway excursion off the end of the departure runway.

Defenses

The primary defense against hazardous bird strikes stems from the requirements for continued safe flight after strikes which are included in the general airworthiness requirements of the Aircraft Type and Aircraft Engine Type Certification processes. However, these requirements are not a complete protection and are also mainly focused on large fixed wing transport aircraft. The relevant design requirements for smaller fixed wing aircraft and helicopters are very limited.
The opportunities to mitigate the risk of hazardous bird strikes in the first place are centred on airports, because this is where the greatest overall volume of conflict occurs, and because this is where management and control of the hazard is most easily achieved.

However, there are two problems with this approach:

1. The airport-centred bird strike risk is rarely confined to the perimeter of any particular airport

2. Many of the most hazardous strike encounters - those with large flocking birds - take place so far from the airport that the airport operating authority will often have little real influence over the circumstances.

The basis for managing bird strike hazard at and around airports is considered in more detail in **ICAO Doc 9137 Airport Services Manual**
Establishing and monitoring levels of bird activity is important and a critical part of this process is the recording of bird strikes at the local level. This then provides the opportunity to build up larger databases and to share the information.
Guidance on effective measures for establishing whether or not birds, on or near an aerodrome, constitute a potential hazard to aircraft operations, and on methods for discouraging their presence, is given in the **ICAO Airport Services Manual, Part 3**. Further detail is provided in a number of State-published documents which are useful beyond their jurisdictions and are:

- ICAO Doc 9137 Airport Services Manual,
- International Bird strike Committee (IBC)
- ICAO Electronic Bulletin: 2008 - 2015 Wildlife Strike Analyses, 2017
- Airbus – Flight Operations Briefing Notes: Bird strike Threat Awareness
- ICAO Annex 14 – Aerodromes. Paragraph 9.5
- Eurocontrol Skybrary: Operators Checklist for Bird strike Hazard Management
- United Kingdom CAA, Aeronautical Information Circular 28/2004
- Department of Environment, Senior Ornithologist, IR Iran (Sadegh Sadeghi Zadegan, Hassan Rezaiefar)

Typical Scenarios

1. Bird ingestion to one out of two engines of a departing jet transport occurs at 200 feet AGL, after take off has been made despite ATC advice of the presence of large birds and an offer to have them dispersed. As a result, one engine is disabled completely or may sufficiently damaged to the extent of only producing reduced thrust. An emergency return to land is made.

2. A flock of medium-sized birds is struck by a jet transport just after V_1 but before V_r with a rejected take off response despite take off performance being limiting due to aircraft weight. As a result, an overrun occurs with substantial aircraft damage.

3. A twin-engined light aircraft flies into a single heron at 200 feet agl after take off and it breaks through the windscreen and hits the pilot who temporarily loses control so that upon recovery, a forced landing ahead is the only option

4. Wing root damage to a single-engined light aircraft caused by a vulture-strike during climb out causes structural damage to such an extent that control is lost and terrain impact results

Contributory Factors

- Habitat features, including open areas of grass and water as well as shrubs and trees, provide food and roosting sites for birds. Even transient water accumulation on uneven pavements can be a significant bird attractant.
- Landfill and other waste disposal sites often attract large numbers of birds if they are not carefully managed.
- Some types of agricultural activity, on or in the vicinity of an airport, may attract birds.
- Migrating birds often follow well-defined flight paths in considerable numbers. This can create a hazard if the flight paths are near an airport.
- Airports in coastal locations often have a much higher level of un-managed bird activity than do inland airports.
- Most airports contain considerable areas of grass within their perimeters. Even dry grass can be attractive as a loitering area for birds by day or night.

Solutions

- Habitat management, including reduction or elimination of trees, shrubs and other plants which provide food, shelter or roosting sites for birds.
- Netting or draining of streams, routinely wet grassland and areas of standing water. Prevention of transient formation of such areas after heavy rainfall.
- Aerodrome grass management appropriate to the prevalent species and the degree of risk that they pose. Grass height maintenance can be very important.
- Liaison with local authorities to ensure that landfill waste disposal sites are not operated so as to create an aircraft hazard.
- Liaison with local farmers to limit the attraction of birds to fields.
- Use of bird scaring techniques such as:
  a) Broadcast of bird distress signals;
  b) Firing of pyrotechnic bird scaring cartridges.
- Tactical detection of large flocking birds using specialised ground-based radar equipment.

Bird Strike in Iran

Bird strike is of natural problems facing Middle East because of:
1 - Geographical location, locating and itinerary of bird migration.
2 - large area of IRAN .
3 - Number of airports.
4 - The large size of Flight Operations.

Since Iran is a very large country (1.65million km2, 2,200km northwest – southeast, 1,300km north–south, and 67million inhabitants) travelling by air is very popular and is, compared with

other means of transport, relatively cheap. Iran has more than 60 civil airports of which some are situated next to wetlands.
According to the data recorded by Civil Aviation Organisation of Iran, the bird species involved in bird strikes are mostly unidentified.
Fortunately, bird strikes have never resulted in casualties in Iran, but the material damage may exceed millions of dollars per year. Several suggestions to minimize the bird strike risk are given.

Bird Control in Iran

The civil airports are not provided with full-time bird control units. Typically, the ground staffs of airports are controlling the birds by pyrotechnics and rifles.
Some advantages on bird strike are:
*Steps towards establishment of the “Bird Strike National Committee”.
*Control activities by the ground staff (but no full-time staff responsible for bird control).
*Pyrotechnics and rifles.
*More awareness in CAO Iran

Iran Regulations

I.R. Iran regulations regarding bird/ wildlife strike:
The basis for managing bird strike hazard at and around airports in Iran is responsibility of the Iranian Airport company. Iranian civil Aviation Organization (CAO) has developed the Iran Civil Aviation Standards (ICAS). “Bird and Animal Hazard Management” is described through the: ICAS 114 - Volume 1: Aerodromes, Design and Operations, Chapter 10: Operating Standards for Certified Aerodromes, Section 14: “Bird and Animal Hazard Management”.

10.14.1.1 The aerodrome operator should monitor and record, on a regular basis, the presence of birds or animals on or in the vicinity of the aerodrome. Monitoring personnel must be suitably trained for this purpose.

10.14.1.2 Where regular monitoring confirms existence of a bird or animal hazard to aircraft operations, or when CAO so directs, the aerodrome operator must produce a “Bird or Animal Hazard Management Plan”, which would be included as part of the Aerodrome Manual.

10.14.1.3 The management plan must be prepared by a suitably qualified person such as an ornithologist or a biologist etc.

10.14.1.4 The management plan must address

I. Hazard assessment, including monitoring action and analysis.
II. Pilot notification (NOTAM).
III. Liaison and working relationships with land use planning authorities.
IV. On-airport bird and animal attractors which provide food, water or shelter.
V. Suitable harassment methods.
VI. An ongoing strategy for reduction on bird and animal hazard, including provision of appropriate fencing.
VII. The subject of Birr strike is reviewed on Runway Safety Team (RST) of each airport and related safety indicator was concerned on Safety Management System (SMS) of the airport.

10.14.1.5 The bird and animal hazard management plan must be reviewed for effectiveness, on a regular basis, at least as part of each technical inspection.

10.14.1.6 Where the presence of birds or animals is assessed as constituting an ongoing hazard to aircraft, the aerodrome operator must notify the AIS in writing, to include an appropriate warning notice in the AIP and NOTAM.

10.14.1.7 Where a bird or animal hazard is assessed as acute, of short term or seasonal nature, additional warning must be given to pilots by NOTAM.

Note: Aerodrome operators are encouraged to provide bird strike incident information via mandatory occurrence report to IRI CAO.

As well, Iranian Civil Aviation Organization (CAO) has developed the national Civil Aviation Directives (CAD). In this regard, the "Area Surrounding of Aerodromes" is described through the CAD 5414 (first edition: March 2010). Some parts of the ICAO's Doc 9137, part 3 is included in this document.

Administrative Responsibilities

I. The IR of Iran Civil Aviation Organization (CAO)

a. To consider safety issues in relation with bird strike according to the DOC 9137, as well, supervision and maintain strike records.
b. To evaluate and identify areas of bird attractive in the airports which are situated in migration routes during different seasons, and reflect findings to the related units.
c. To send annual bird strike reporting forms to ICAO.

II. The Iranian Airports Company

a. Accordance to Annex 14: Reduction of dangers caused by bird strikes with aircraft.

Statistics

The Civil Aviation Organisation of Iran registered 318 bird strikes within the last 19 years in 31 airports. The number of registered bird strikes 1 to 64 in reported airports (Figure 1). The number of registered bird strikes varies from 10 up to 31 in various year (Figure 2), i.e. this means a ratio of 16/74 strikes per year and ratio of between 0.33 and 0.78 per 10,000 movements. The distribution of strikes over the year shows peaks in spring and August (Figure 3).

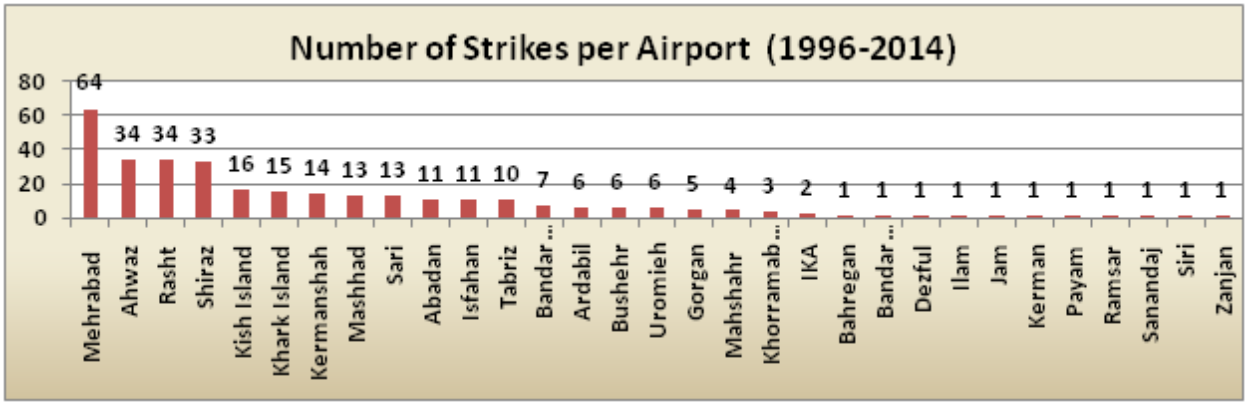

Figure 1 Total number of bird strikes in each civil airport, 1996-2014.

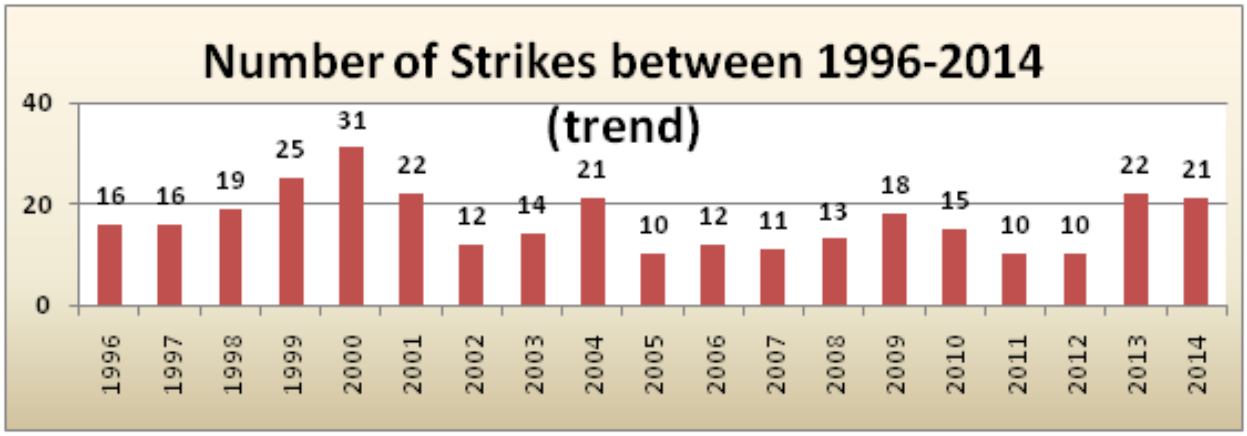

Figure 2 Total number of bird strikes on civil airports in each year.

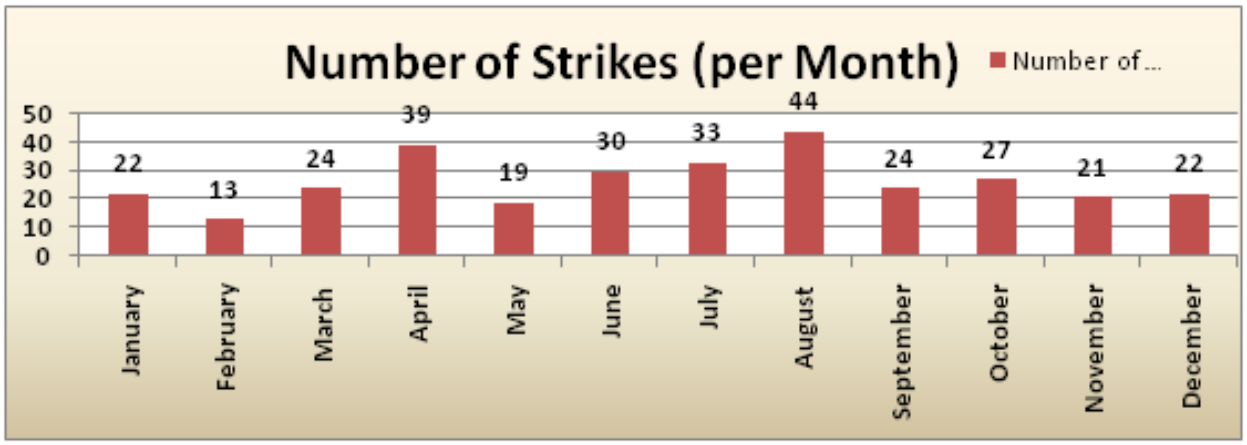

Figure 3 Monthly distribution of the total number of bird strikes on civil airports.
A lot of information on the bird strikes is missing. Species identification is poor, 69% are unidentified.

From those of identified species, 26% are birds of prey, 25% Pigeon and Doves, 11% Pheasants, 10% Sparrows, 9% Gull and Terns, and remaining of 19% are belonging to 14 species (Figure 4).

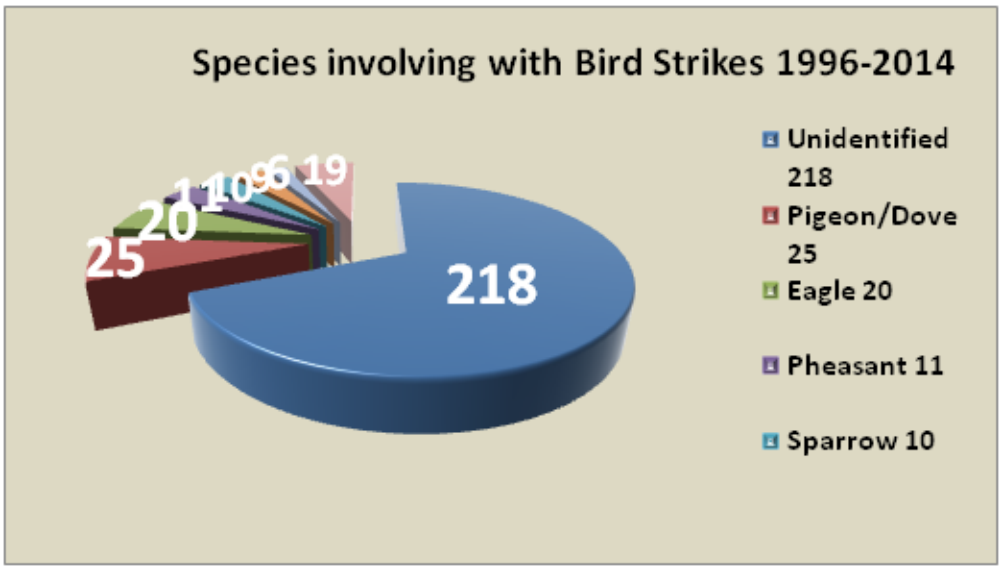

Figure 4 The distribution of Species involving with bird strikes 1996-2014.

Furthermore, not much information is available on the impact point; 52% is unknown. From those of identified points, 33% are belong to engines, Fuselage 18%, Wing 15%, Radom & nose 10%, Windshield 6%, Landing Gear 6% and other parts 13% (Figure 5).

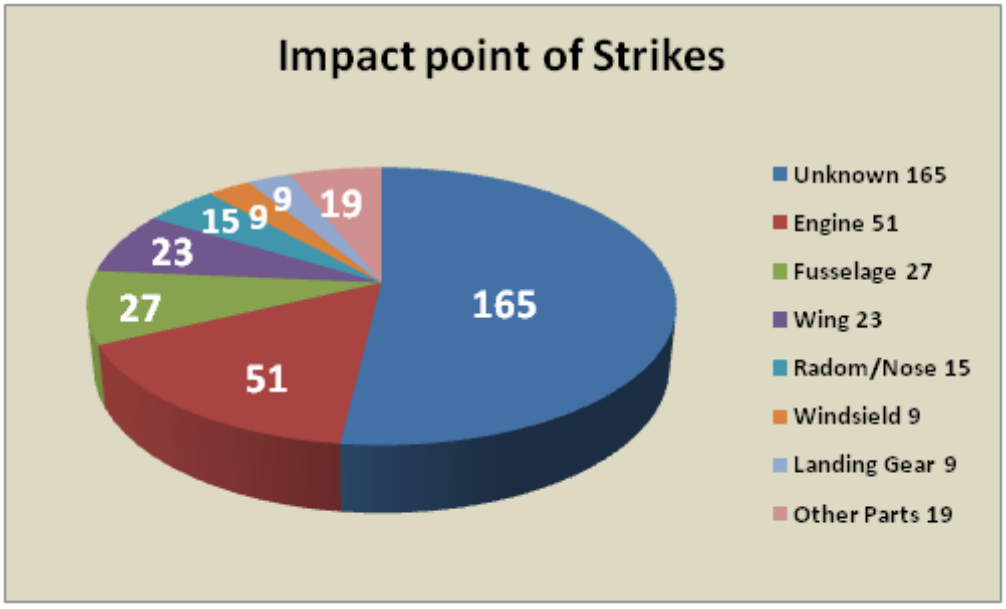

Figure 5 The distribution of Impact point of strikes 1996-2014

The total number of bird strikes at each airport doesn't only reflect the number of birds crossing the flight path of the aircraft, but also the number of aircraft movements. Unfortunately, there were hardly water birds among the bird strikes recorded by CAO Iran in the past ten years. For this reason, we could not compare the number of water birds in the sites close to the airports, nor could we calculate the potential risk of water birds to aircraft landing and departing from those airports (Figure 6).

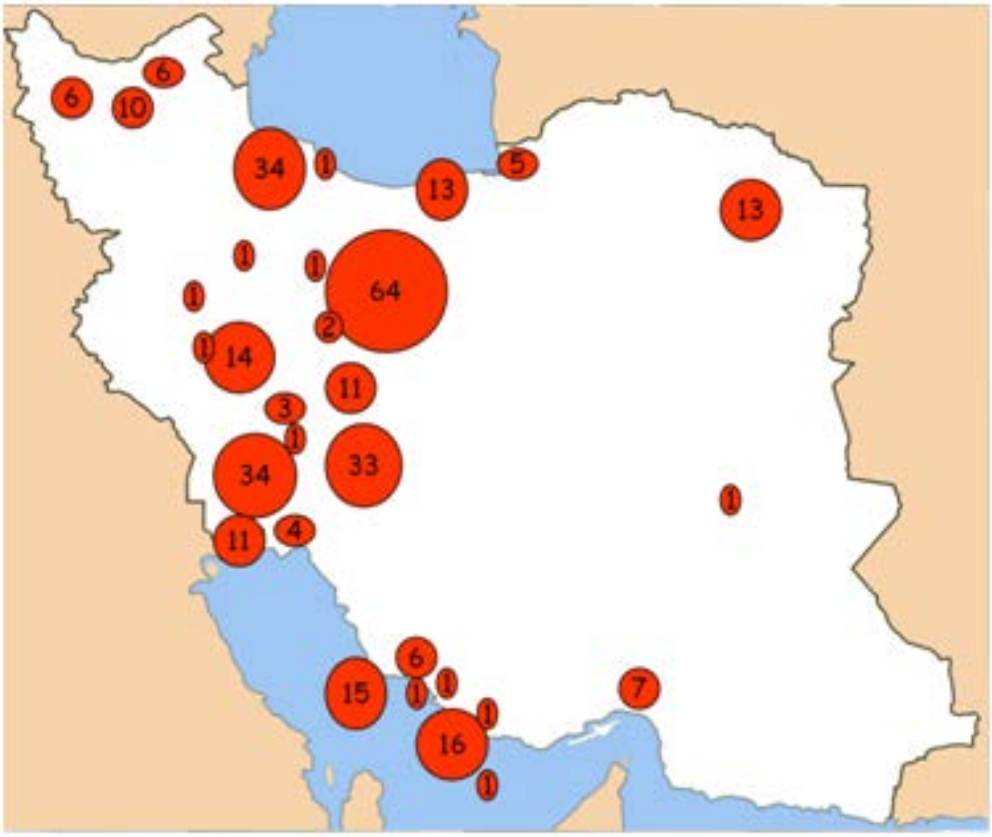

Figure 6 The distribution of 318 bird strikes over the 31 civil airports, 1996-2014

Progress of Migrant Birds on Iran

Eagles migrant in a year

Needed For Future

Fortunately, bird strikes have never resulted in casualties in Iran, but the material damage may exceed millions of dollars per year. To minimise the bird strike risk, several actions should be taken. As a first start, speed up the establishment of the National Bird Strike Committee. Since, the Department of Environment will be a member of the mentioned committee, this will help set up a bird remains identification scheme for the strike cases. Furthermore, in order to get as close as possible to the highest international flight safety standards, the Department of Environment will suggest the CAO Iran to establish bird control units, at the airports with most bird strikes.

i. Bird remains identification.
ii. More awareness in CAO Iran.
iii. Bird monitoring at and around airports.
iv. Bird strike risk assessment for all major airports.
v. Continuous monitoring of birds in and around the airports.
vi. Reporting all bird strikes and identifying the remains of birds (establishment of database).
vii. Preparation of bird/ wildlife management plan.
viii. Design and implementation of training programs.
ix. Establishing wildlife/ birds control units.

ATA Checklist for Bird Strike Hazard Management

Description

1. ATA tries to have access to up to date bird strike information for each airport . Where high relative rates are identified, ensure that further investigation of the circumstances is carried out with the assistance of the airport operator
   [Operators need to be aware of abnormal risks in order to manage their exposure to them down to a lower level.]

2. Ensure that flight crew are properly informed about known bird hazards which may affect them before commencing their flights, whether such information is published in AIPs, NOTAMs, OM(C)or BIRDTAMs (where available), or has been directly determined by the Operator.
   [Unless a specific effort is made to facilitate this, the pressures of time during pre-flight briefings has often resulted in such awareness not being gained.]

3. Ensure that flight crew are provided with appropriate guidance on response to the hazard. Particular attention should be given to engine ingestion for both the short final case (do not attempt a go around) and the take off roll case (do not attempt a rejected take off at high speed unless it is positively assessed that it is unlikely that it will be possible to get safely airborne.)
   [Tactical mitigation of unexpected bird hazard is an important element of risk management - many accidents and serious incidents have resulted from inappropriate flight crew responses to bird encounters].

- **An aircraft is hit by birds while on final approach to land - should the pilot continue the approach or initiate a go-around/missed approach?**
  Having encountered birds, the question to be answered is "what is the damage to the aircraft and what effect will this have on the safe conduct of the flight?"
  The full extent of any damage, to the engines and/or the control surfaces and landing gear, may not be apparent until applying power, configuring, or manoeuvring the aircraft. It might therefore be the case that, if a go-around is initiated, the pilots rapidly finds themselves in a situation where the runway is disappearing beneath them but the aircraft cannot safely fly a missed approach.
  Therefore, in the above scenario, it is advisable to continue the approach and land.

  A pilot sees a flock of birds ahead of him on final approach - should he continue the approach or initiate a go-around/missed approach?
  Having seen the birds, the question to be answered is "if a go-around is initiated, how likely is it that the aircraft will avoid a bird strike?"
  There are two matters to consider.
  Firstly, the behavior of birds towards an aircraft in flight is highly unpredictable and varies greatly by species, some waterfowl species typically dive but such behavior is not consistent and the birds may fly upwards, potentially into the path of the aircraft initiating a go-around.
  Secondly, the greater the engine thrust, the greater the damage caused by ingesting birds - it is probable that less damage will be caused if the birds are hit while the engines are at low speed or idle.
  Therefore, in the scenario described above, unless a go-around can be achieved with a reasonable degree of confidence that the aircraft will not hit birds, it is less hazardous to continue the approach to land.

4. Ensure that flight crew make reports on all actual or suspected bird strikes and any instances of observed bird activity which they consider could have been hazardous. It is important that flight crew have sufficient familiarity with bird species to recognise and record at least species groups and that, when reporting actual or suspected engine ingestion of birds, they record any observed engine thrust or torque fluctuations which might have been associated with an ingestion event.
   [An appropriate level of detail in all safety-related reports is the only way to maximise their value]

5. Have unequivocal guidelines in place for appropriate levels of maintenance inspection after any flight during which actual or suspected bird strike has occurred, especially if engine ingestion is or may be involved. These should be founded upon an operating culture which achieves a flight crew entry in the aircraft Technical Log after any such occurrence and clear procedures on the necessary authority to clear or defer such an entry.
   [Aircraft have been hazarded by the operation of further flights after engine ingestion events where inspection has failed to identify damage]

6. Even if there are no applicable ATC speed restrictions, apply a Company Maximum Speed below FL100 / 10000 feet of 250 KIAS for both climb and descent.
   [This will ensure that damage from any impact with the larger birds that increasingly predominate at higher altitudes is minimised]

7. If a particular airport, used by pure jet engined aircraft, is identified as having an above average risk of bird strike during initial climb then consideration should be given to introducing an SOP for that airport to fly the ICAO Noise Abatement Departure Procedure 1 (NADP 1)
   [This will minimise the probability of strikes at low level where bird density is highest because of the high climb rate and will also minimise the extent of any damage if birds are ingested due to the minimum climb speed]

ATA Flight Crew Guide-Bird Strike Mitigation

Introduction

The risks presented by aircraft-bird/wildlife encounters, like other aviation environmental risks such as icing and volcanic ash, can be effectively managed by the flight crew. The following document provides guidance on managing the aircraft-bird/wildlife risk. This information is for guidance only and does not supersede any regulatory, manufacturer or aircraft operator policies or procedures.

General Information

The formula describing collision impact force: F = [(1/2mass) X (*velocity squared)*] clearly indicates that speed is the prime determining factor in level of damage resulting from a collision. A 20% increase in speed results in a 44% increase in impact force.

Velocity can refer either to the speed of the aircraft or the rotational speed of the engine – the higher the speed the more likely the impact will be damaging. Encounters with flocking birds, particularly large flocking birds, are very hazardous Modern jet engines and turboprop blades have technological limits which can be exceeded by impact with birds and other wildlife

Airframe parts, such as windshields, radomes, slats, empennage, etc., are also vulnerable to bird and wildlife strikes

Aircraft and engine certification standards do not adequately consider the cumulative effect of simultaneous damage to the aircraft structure, systems and multiple engines which may result from a flock encounter.

ICAO standards require airport operators to mitigate bird and wildlife hazards on the airport. Airport personnel will use appropriate techniques to move birds or wildlife from your flight path. Report the presence of wildlife on the airport directly to airport personnel or via ATC.

Flight Planning

Be aware that migratory bird seasons, species, flight routes and altitude are very location specific. The level of risk from migratory birds may vary widely between your departure airport and destination airport and may cause conflicts with your flight planned route.

Review NOTAMS, airport briefing notes and the AIP for bird/wildlife warnings for your departure and arrival airports as well as climb and descent routes

Taxi & Takeoff

If birds or other wildlife are noted on or near the runway or departure path –either use another runway not affected by the birds or delay takeoff until the birds have been dispersed by airport personnel

Use of the aircraft's weather radar does not have any effect upon birds – they do not hear in the X-band frequency and the radar power output is too low

Birds do not regard aircraft on a runway, either with or without illuminated lights, or the spooling of a jet engine, as a threat. They will be unlikely to move until you start your takeoff roll which will, in most cases, be too late to avoid collision

If a birdstrike occurs during the takeoff roll the decision to continue or abort the takeoff should be based upon your aircraft's flight manual aborted takeoff criteria.

Initial Climb

If departing from an airport with known bird problems or reported bird problems, climbing on the ICAO Noise Abatement Departure Profile 1 will minimize the time and reduce the distance traveled to reach 3,000' AGL; 95% of birdstrikes occur below 3,000'

Birds tend to turn away or dive when confronted with an aircraft. If encountering birds pull up. This strategy will cause you to pass over the birds, reduce your speed to minimize impact damage and limit flight at lower, bird rich, altitudes Encounters with flocking birds can result in damage that affects multiple systems which may include engine/engines power loss, flight instrument/flight computer malfunction due to pitot tube damage, windshield damage, nose wheel steering loss, penetration of fuselage and flap/slat damage. Be aware that engine damage from bird ingestion can be difficult to detect with aircraft instrumentation alone. After a birdstrike carefully evaluate the condition of your aircraft and engines prior to deciding to continue your flight. A return for precautionary inspection may be in order.

If operating in an area of known bird activity use safe operating speeds during climb. Slower aircraft speeds will reduce impact force and the probability of damage in a collision. Below 10,000' do not exceed 250 KIAS or minimum clean speed, whichever is greater.

Descent, Approach and Landing

If operating in an area of known bird activity, slow down, slowing the aircraft will reduce the impact force and probability of damage in a collision. Below 10,000' do not exceed 250 KIAS or minimum clean speed, whichever is greater.

If landing at an airport with known bird problems try to remain at or above 3,000' AGL until necessary to descend on the normal 3° descent profile for landing.

If birds are reported on or near your landing runway request a different runway not affected by the birds or delay landing until the birds are dispersed by airport personnel

If the landing is assured, continuing the approach to landing is the preferred option. If more birds are encountered, fly through the bird flock and land.

At approach thrust settings ingested birds may bypass the engine core via the fan, reducing the likelihood of serious damage. If birds are encountered at approach thrust settings and landing can be made with that thrust setting, continue through the flock and complete the landing - a go-around attempt (high engine rpm) which enters the flock is more likely to result in serious engine damage and loss of thrust. Be ready to transition to instrument flight if windshields become obscured.

Upon landing after a bird strike, minimize the use of reverse thrust to lower the risk of engine damage caused by bird ingestion. Reverse thrust may increase engine damage, especially when engine vibration or high exhaust gas temperature is indicated.

Post flight

Maintenance protocols are in place to inspect engines and airframes after a bird strike. If a bird strike is suspected ensure a maintenance logbook entry is made describing the event in detail.

If wildlife hazards are encountered ensure the appropriate safety and/or bird strike report is completed and submitted. The collection and analysis of data from bird strike reports is a critical tool to identify and correct problems.

Summary

RESPONSES TO A KNOWN OR SUSPECTED BIRD STRIKE

Immediate action

- Fly the airplane and maintain flight path control.
- Monitor flight and engine instruments.

Multiple engine failure or thrust loss

- Attempt to restart engine(s).

Severe engine damage

- Shut down engine according to procedure.

Strong engine vibration

- Reduce thrust, which will often reduce vibration.
- Shut down engine per flight crew operations manuals guidance.

Multiple engine ingestion and abnormal engine indications

- Air turnback or diversion to nearest suitable airport.

Known or suspected multiple engine ingestion, with normal engine indications

- Consider air turn back or diversion to nearest suitable airport.
- Reevaluate decision to continue with extended-range twin-engine operational performance standards, extended range operations, or overwater flight because engine damage or performance degradation may manifest later in the flight.

Known or suspected strikes with large flocking birds, such as Canada geese

- Consider air turn back or diversion to nearest suitable airport, because damage may affect aerodynamic lift and drag, subsequent fuel burn, and ability to complete the flight safely.

Known or suspected airframe damage or engine damage

- Maintain or reduce speed — do not accelerate unless necessary for safety of flight or to maintain flight path control.

Damaged windshield or depressurization

- Below 10,000 feet, discontinue climb and level off.
- Above 10,000 feet, descend to 10,000 feet or the minimum safe altitude.

Known or suspected strike with landing gear extended or in takeoff or landing configuration with high lift deployed

- Use available system information to assess possible damage to flight controls and high lift devices, and make minimal and prudent changes in airplane configuration in accordance with the flight phase.
- Use available system information to assess possible damage to landing gear and associated systems, including exposed electrical, pneumatic, and hydraulic systems, and potential effects on the ability to steer and stop on the runway.

Known or suspected strikes to air data and angle-of-attack sensors

- Be aware that this may affect other airplane systems and have cascading effects.
- Be aware of the potential for loss or erroneous air data and degraded flight control modes, including loss of envelope protection or limiting, unreliable airspeed, propulsion systems in alternate mode.

Bird strikes during approach or landing

- If the landing is assured, continuing the approach to landing is the preferred option. If more birds are encountered, fly through the bird flock and land.
- Maintain as low a thrust setting as possible.
- If engine ingestion is suspected, limit reverse thrust on landing to the amount needed to stop on the runway. Reverse thrust may increase engine damage, especially when engine vibration or high exhaust gas temperature is indicated.

Postflight actions following a known or suspected bird strike

- Report all known or suspected bird strikes or bird activity on or in the vicinity of the airport via established procedures. Ideally this information reaches all stakeholders, including air traffic control, the airport operator, the airline, airplane and engine manufacturers (particularly the local representative), the national regulatory authority, and the appropriate national bird-strike committee or aviation wildlife hazard group.

BIRDTAM

A BIRDTAM is a specialized Notice To Airmen providing information regarding bird strike risk or warning, particularly for low level airspace.
Unlike ASHTAM or SNOWTAM, BIRDTAM is not an official International Civil Aviation Organisation (ICAO) term and is not in universal use. However, the term BIRDTAM is recognised in the European Aeronautical Information System Database (EAD) and has its own Aeronautical Fixed Telecommunication Network (AFTN) address.
Also BIRDTAM is the name given to an AFTN message, formatted to a specific NATO standard, which was originated by military services to provide information about bird strike risk, particularly in lower level airspace. The coverage area is relatively small, confined mainly to Northern Europe.

A BIRDTAM is based on observed bird activity, be it human observation or radar analysis, and predicted bird movement. Activity location is identified by use of a two letter grid reference assigned to a one degree by one degree area. A BIRDTAM will contain the following information:

- Originator's Sequence Number
- Effective Time - date and time in Coordinated Universal Time (UTC)
- Expiration Time - date and time in UTC
- Intensity Level - intensity level is assigned a numeric value between 0 and 8. Only values of 5 or higher are reported. The risk levels assigned to reportable numeric values are:
  - 5 - Fairly Great
  - 6 - Great
  - 7 - Very Great
  - 8 - Extremely Great
- Affected Area - the affected area(s) will be listed by grid reference
- Low Altitude - the base height of the bird activity (surface (SFC) or Mean Sea Level (MSL) reference as appropriate)
- High Altitude - the upper level (reference MSL) of the activity

A typical BIRDTAM as issued by the German Bundeswehr Geoinformation Office is as follows:

BIRDTAM NUMBER: 0280

EFFECTIVE TIME: 10 MAR 16:16

EXPIRATION TIME: 10 MAR 20:30

INTENSITY LEVEL: 5

AFFECTED AREA: MC

LOW ALTITUDE: SFC

HIGH ALTITUDE: 6000

Current BIRDTAM information, as issued by the German Bundeswehr Geoinformation Office and approved by the United States Air Forces in Europe (USAFE), can be found online at the FAA NOTAM website. This site includes a graphic showing both the coverage area and the grid identification system and also highlights the areas affected by the BIRDTAM(s) currently in effect.