Flight Operation Briefing Notes

Operating Environment

Birdstrike Threat Awareness

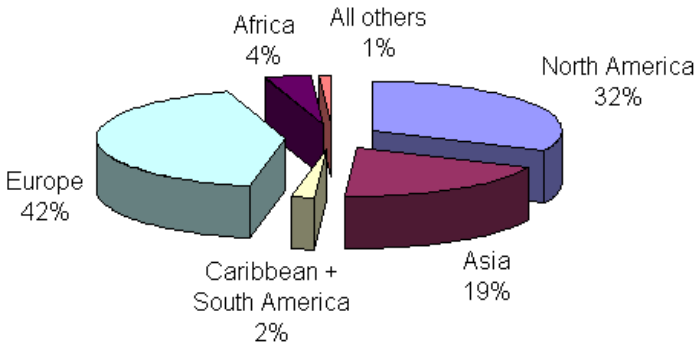
I Introduction

In-service experience shows that birdstrike events are common. Pilots may expect to encounter from two to five birdstrikes during their career.

II Statistics

The Federal Aviation Administration (FAA), reported over 33000 birdstrikes to civil aircraft between 1990 and 2000.

Different parts of the world have different levels of exposure to the risk of birdstrike, as shown in **Figure 1**.

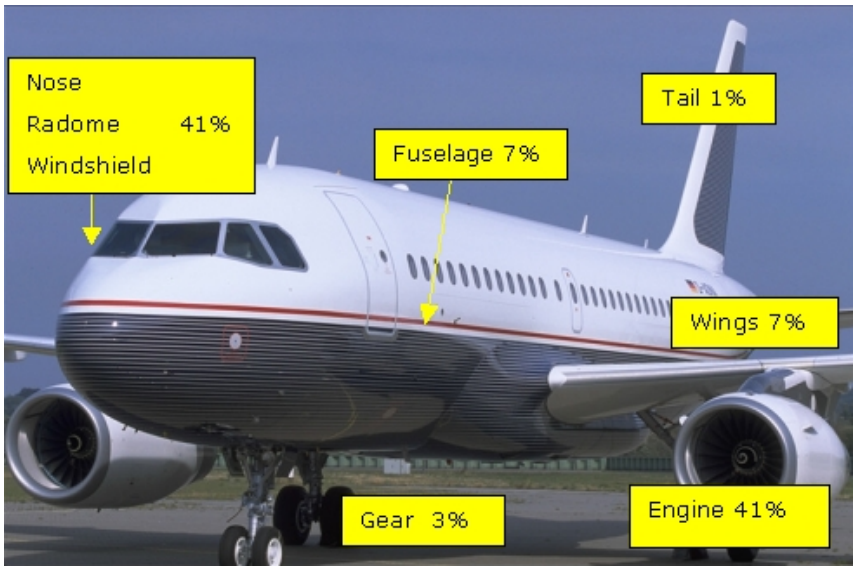


(Source: ICAO)

Figure 1

Birdstrikes by ICAO region 1980-96

The locations and percentages of impacts shown in the following illustration are based on statistics from pilot and maintenance reports.



(Source: Airbus)

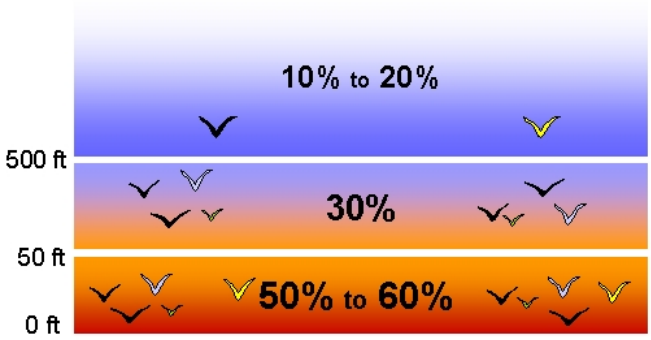
Figure 2

Statistical impact distribution on an aircraft

The Civil Aviation Administration (CAA) of the United Kingdom estimates that UK registered aircraft of more than 12500 pounds (5700 kilos) strike a bird about once every thousand flights.

15 to 20% of birdstrikes cause damage to the aircraft.

The majority of birdstrikes occur at very low altitudes, below 500 ft above ground level.



(Source: French DGAC)

Figure 3

The distribution of birdstrikes based on altitude

III Risk of birdstrike at airports

In the early 1950's, birds became a hazard for aeronautics, due to the development of jet engines. Airports looked at bird scaring methods, such as audio and visual devices, or the use of natural predators, such as falcons, without obtaining any noteworthy results.

The best way to avoid birds at airports appeared to be to make airports less attractive to the birds:

- Short grass around airports was progressively replaced by long-grass management, in which birds have difficulties landing.
- Moorlands, or poorly-drained areas, were transformed into wooded zones, where light-weight bird species replaced the more dangerous heavy-weight birds, such as gulls or geese (**Figure 4**).
- Agricultural activities at airports are closely monitored, to ensure that they will not attract wildlife.
- Putrescible-waste operations, which provide a major source of food for wildlife, were removed from areas near airports.

(Photo credit: Transport Canada website)

Figure 4

Flock of Canada geese in flight

IV Operational Effects of Birdstrikes

IV.1 General

Airbus In-Service Occurences analysis shows the following:

- One birdstrike out of five causes damage to the aircraft.
- Two birdstrikes out of three cause either a delay of one hour and a half for aircraft and engine check, or a longer delay for engine change or structure repair.
- Following a birdstrike during takeoff or climb, one aircraft out of three does not fly to destination (RTO, IFTB or diversion).
- Birdstrike on the radome can significantly increase fuel consumption, due to drag increase.

IV.2 Engine Birdstrikes

In particular, events linked to the engines revealed that:

- Approximately 50 % of engine birdstrikes damage the engine(s).
- When an engine strike occurs and damages the engine, usually:
  - The fan blades are damaged with significant vibrations
  - The EGT increases.
- Approximately 20 % of engine birdstrikes at takeoff and climb cause an In-Flight Turn Back (IFTB).
- Approximately 25 % of engine birdstrikes at takeoff result in the flight crew rejecting the takeoff.
- Only 2% of engine birdstrikes require the flight crew to shut down the engine.

V Birdstrike Damage

Damage is usually proportional to the bird size and the engine thrust setting.

Small birds such as "starlings", weighing approximately 80 grams (2.8 oz) can cause engine damage especially when at high thrust.

For example:

- A flock of starlings "*sturnus vulgaris",* damaged two A340 engines on the same wing, but without thrust loss.

On the other hand:

- The ATC of a maritime airport warned an A320 flight crew on approach that there were birds on the runway. The flight crew decided to continue. The engines did not ingest any birds and no damage was found, but the airport maintenance cleaned up the bodies of 250 seagull bodies! Low thrust setting is assumed to have avoided engine damage.

VI Birdstrike Course of Actions

VI.1 Suspected Birdstrike

A suspected birdstrike should be considered, if the flight crew sees birds flying very close by, but no there is no confirmation (no change in the engine sound, no parameter fluctuations, no sound of birdstrike).

VI.2 Confirmed Birdstrike

A confirmed birdstrike should be considered, if the flight crew:

- Sees birds flying very close by, and
- Hears a bang, or
- Observes temporary or permanent changes in the engine parameters, or
- Hears changes in the engine sounds, or
- Observes significant changes to flight instruments, e.g. unreliable airspeed.

If a birdstrike is confirmed, there are three potential situations:

The airspeed is below 100 kt

A rejected takeoff at low speed has no serious consequences and shall be envisaged for any suspected or confirmed birdstrike. The aircraft will return to the ramp for an integrity check.

The consequence will be a flight delay, but events analysis have shown that the next takeoff is then performed with a fully operational aircraft, avoiding a possible flight disruption.

The airspeed is above 100 kt and below V1

A rejected takeoff at high speed is a more serious matter. Action must be taken quickly to ensure a complete stop before the end of the runway.

If the birdstrike is only suspected, the takeoff should be continued.

If the birdstrike is confirmed, but engine bird ingestion is only suspected, the Captain must evaluate other factors:

- How many engines are affected? (Any decision may differ for a 2 or a 4 engine aircraft.)
- Statistically, a continued takeoff followed by an IFTB is a preferred option.

If the birdstrike is confirmed and engine bird ingestion probable, aborting the takeoff can be a good decision. This allows the engines to be inspected.

In any case, takeoff must be interrupted, if a thrust loss is detected before V_1.

The airspeed is V1 or above

The takeoff must be continued, unless the Captain judges that the aircraft will not fly safely after liftoff (e.g. in the case of uncontained engine failure or total thrust loss on more than one engine).

VII Preventive Strategies

The presence of birds at an airport should lead to possible actions being mentioned in takeoff and approach briefings. The following points could be memorized, to help prepare the briefing.

VII.1 At Takeoff

- Airports are responsible for bird control and must provide adequate bird scaring when necessary. This is also called the “Bird Control Program”. Therefore, do not take off if birds are fouling the runway. Advise the tower and expect an airport action.
- Switch on the aircraft lights up to 10000 feet at takeoff, and below 10000 feet at landing. It is assumed that lights provide an additional warning to the birds, and help them to localize the aircraft.
- Flight crews must react immediately when a birdstrike occurs at takeoff, because there is no time left for analysis. Flight crews should be mentally prepared well before takeoff.
- Using the weather radar to scare the birds has proved to be inefficient.

VII.2 At Landing

- On short final, do not go around, if birds are encountered, but fly through the bird flock and land. Try to maintain a low thrust setting.
- The use of reverse thrust on landing after a birdstrike should be avoided. It may increase engine damage, especially when engine vibration or high EGT are indicated.

VIII Summary of Key Points

The following points should be noted, to deal with the risk of birdstrike:

- The risk of a birdstrike increases, with proximity to ground.
- The risk of damage after a birdstrike increases with engine thrust.
- The presence of birds at an airport is a point to be mentioned in a briefing.
- A large flock of birds, even of small birds, can damage all the engines of an aircraft. This can cause great loss of power during takeoff run.

IX Associated Flight Operations Briefing Notes

The following briefing notes can be read to complete this information:

- **Conducting Effective Briefings**
- **Revisiting the Stop or Go decision**

X Regulatory References

- ICAO's principal regulatory document dealing with aerodrome design and operations is Annex 14, Volume I.
- The Federal Aviation Administration (FAA) issued an Advisory Circular (AC 150/5200-33) which describes in details bird attractants near or at the airports, and measures to be taken to reduce the risk of birdstrike.

XI Additional Reading Materials / Websites References

The following websites offer valuable additional information:

- The Transport Canada Civil Aviation site (**http://www.tc.gc.ca/)** comprises a part assigned to wildlife control (Transport Canada > Civil Aviation > Aerodrome Safety > Wildlife Control). It gives recommendations to the crew as well as to the airport managers.
- The Canada Birdstrike Committee site (**http://www.birdstrikecanada.com/)** provides information on yearly conferences organized by the committee.
- The FAA Wildlife Hazard Mitigation site (**http://wildlife-mitigation.tc.faa.gov**) comprises an FAA on-line strike reporting formular.

This FOBN is part of a set of Flight Operations Briefing Notes that provide an overview of the applicable standards, flying techniques and best practices, operational and human factors, suggested company prevention strategies and personal lines-of-defense related to major threats and hazards to flight operations safety.

This FOBN is intended to enhance the reader's flight safety awareness but it shall not supersede the applicable regulations and the Airbus or airline's operational documentation; should any deviation appear between this FOBN and the Airbus or airline's AFM / (M)MEL / FCOM / QRH / FCTM, the latter shall prevail at all times.

Airbus Customer Services
Flight Operations Support and Line Assistance

1 Rond Point Maurice Bellonte - 31707 BLAGNAC CEDEX FRANCE

FOBN Reference : FLT_OPS – OPS_ENV – SEQ 05 – REV 01 – OCT. 2004