BIRD STRIKE PREVENTION IS AN INTERFACE RESOLVING EFFORT

(Based on chapter 2 "THE PROBLEM: BIRD STRIKE PREVENTION AS AN INTERFACE ISSUE" from appendix F of the final report "Emergency landing after bird strike, Boeing 737-4B6, Amsterdam Schiphol Airport, 6 June 2010": www.safetyboard.nl)

1. THE BIRD STRIKE ISSUE: UNDESIRABLE COLLISIONS, UNDESIRABLE PRESENCE OF BIRDS, OR UNDESIRABLE CROSSING OF THE FLIGHT PATH?

According to a recent definition, a bird strike is [translated] *"unintentional physical contact between an airborne aircraft and one or more airborne birds, with potentially harmful consequences for both".*[1] There are a wide range of factors that affect the risk of bird strike. The risk of a collision depends on the ecology of the region in which the airport is situated, the volume of air traffic and measures taken by the parties involved to reduce this risk. Moreover, the risk of bird strike also depends on the species of bird and the behaviour of this species and the (group of) birds involved.[2]

The size of the bird caught up in the engine generally has a major impact on the severity of the consequences of bird strikes. This means that large birds (such as geese, swans and a number of birds of prey) constitute a risk, as do birds that fly in large flocks (such as starlings). Geese are not only large and heavy birds, but fly in relatively large flocks.

The consequences of a bird strike naturally depend on the precise circumstances and the extent to which the bird strike affects the further course of the flight. According to Transport Canada[3] the nose of the aircraft, wings and engine are the parts most likely to be affected (in 19%, 13% and 13% of bird strikes respectively in the USA and Canada in the 1990s). These are followed by the fuselage (11%), the landing gear (9%) and the cockpit window (7%). Out of all bird strikes in which the flight phase was reported, 90% took place during the takeoff or landing phase of the flight. The Dutch Task Force for the Prevention of Bird Strikes with Civil Aviation Aircraft concluded as early as in the 1980s[4] that 98% of bird strikes occur below an altitude of 3,000 feet and around 88% below 600 feet. A majority of 70% of all bird strikes occur below 100 feet.

The issue of bird strikes around Schiphol is not unique in the sense that every airport faces risks associated with wildlife (in a broad sense: bird species and other wildlife) and bird strikes. What is unique to Schiphol is the combination of factors: the features of this particular airport, the physical environment, the ecology and land use in the Haarlemmermeer and its environs: the Netherlands as a whole and the Haarlemmermeer Polder are attractive natural habitats for birds, due to an abundance of food and water.[5] In 2007, the Aircraft Bird Strike Committee (*Commissie Vogelaanvaringen Luchtvaartuigen*, CVL)[6] called for special attention for the goose problem specific to the Netherlands: [translated] *"Bird control units at Dutch airports are logging more and more sightings of geese flying over the runways. However, the Dutch airports cannot influence the flight movements of these overflying geese, as their resting and foraging areas lie outside of the airport terrain and often also at a considerable distance from the airport."*

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1 Dutch Bird Strike Control Group, Shared Skies, Initial Policy Document, 11 June 2010.

2 The serious incident on 6 July 2010 involved a collision with Canada geese. The interviews conducted by the Dutch Safety Board have also shown that the risk must not be interpreted too strictly according to species.

3 McKinnon et al, Sharing the Skies, An Aviation Industry Guide to the Management of Wildlife Hazards, Transport Canada, 2001. This publication contains an in-depth exploration of safety improvement strategies and measures, based on a 'system safety approach'. The document focuses extensively on both the behaviour of various species of wildlife, including birds, and the types of measures that parties (involved in aviation) can take.

4 Recommendation by the Task Force for the Prevention of Bird Strikes with Civil Aviation Aircraft on protected areas surrounding airport terrain, Netherlands Civil Aviation Authority, 26 January 1987. Experts consulted by the Safety Board and the parties involved that were interviewed about the bird strike issue agree in this regard.

6 Set up in 1997 by the then Minister for Transport, Public Works and Water Management and Minister of Defence, by Decree of 1 September 2007, no. DGRLD/LI/97.800370, Government Gazette no. 183 dated 24 September 1997.

2. NATURE OF THE BIRD STRIKE ISSUE

During its investigation, the Dutch Safety Board came across various perceptions of the bird strike issue amongst the relevant parties located in the environs of Schiphol,[7] such as:

- Bird strikes as a control problem based on figures, such as the bird strike ratio.
- Bird strikes as a problem caused by the presence of (large numbers of) birds, particularly geese.
- Bird strikes as a dynamic question of separating aircraft from (groups of) birds that present a risk to aircraft.

The existence of several problem definitions is typical of the bird strike issue. The Safety Board therefore characterises the prevention of bird strikes at and around Amsterdam Schiphol Airport first and foremost as an interface issue.[8] Interfaces are necessary links between relevant parties that are essential in order to limit or prevent a safety risk, in this case collisions between birds and aircraft.[9] The parties liaise by means of these links in the areas of overlap between their individual activities, responsibilities and powers.

The extent to which risks occur is partly determined by the extent to which the interfaces between the safety systems of the parties involved function effectively. The risk of bird strike is unusual in that it does not just affect the aviation sector, but also other sectors: parties involved in nature and nature policy, agriculture and agricultural policy and spatial planning. Judging by the 'set' boundaries between the policy areas involved, interfaces are essential to coordination, as all those involved hold the key to part of the solution (powers and resources). For an effective safety strategy, interfaces can also mean making additional efforts or taking on additional responsibilities in order to achieve the joint goal, which is not the primary goal of the individual organisation.

The figure below illustrates the risk chain for the bird strike issue (top), the intervention chain (centre) and the relevant policy areas (bottom).[10] Each of these policy areas has its own separate control system of laws, rules and parties involved.

The Safety Board shares the view of the ICAO[11] that bird strikes are ultimately a matter of the "dangerous presence" of large birds or flocks (mass with critical consequences in the event of a collision) within aircraft flight paths. This is the danger to be avoided and on which efforts must be focused. This means that the bird strike issue can only be resolved if efforts are made in all areas, as illustrated in the figure below.

If birds are in, or at risk of entering, an aircraft's flight path, action can be taken in the form of last-minute measures. An integrated preventive approach requires the use of measures that target several of these links in the risk chain: from measures in the immediate vicinity of the runways, to measures on the airport terrain as a whole, to measures in the environs (control and spatial planning). Further towards the left of the risk chain, measures have a larger geographical scope. They are also shrouded by a considerably larger degree of uncertainty, as the link between the aircraft flight path and populations, in this case geese in the wider environs of Schiphol, is only indirect. After all, there is no way of knowing for certain whether, when and which bird or bird groups will actually cross the flight paths.

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7 These perceptions can be inferred from the available documentation and interviews conducted. These problem perceptions were also addressed during the Bird Strike symposium organised by the Dutch Bird Strike Control Group at Schiphol on 10 March 2011.

8 Dutch Expert Group on Aviation Safety (DEGAS) recommendation 2010-034 Interface Management, June 2010.

9 The recommendation issued by the DEGAS advisory board on safety in civil aviation to the former Minister of Transport, Public Works and Water Management on interface management, states: [translated] *"The aviation system is characterised by cooperation and coordination between various (groups of) organisations and (…) this coordination critically depends on the frequent exchange of information between these organisations. Safety can be endangered if information is not passed on correctly from one organisation to another".* DEGAS calls for properly functioning interfaces between the parties in the sector. The key to this is creating cohesion between the safety management systems of individual organisations.

10 The model is based on the "Swiss cheese model" concept and the essential cornerstones identified by the Dutch Bird Strike Control Group (NRV) as barriers in order to prevent bird strikes. See Reason, 1990, quoted in: *Causal model for air transport safety, Final Report,* Ministry of Transport, Public Works and Water Management, Directorate-General for Civil Aviation and Maritime Affairs, 2 March 2009.

11 Part 3 of the Airport Services Manual accompanying ICAO Annex 14 provides practical guidelines for airport authorities and airport operators. And: ICAO document 9137 AN/901 Part 3, par. 3.6.1

The possible measures and measures taken in practice are in the hands of players operating within various areas: flight operations (alerting and separating), airport management (keeping the airport terrain free of birds), land use and terrain management in the environs as well as fauna management in the wider environs, and finally spatial planning (avoiding land use that attracts birds). International and national policy in the field of nature policy, water and agriculture and the associated laws and regulations. Parties in various sectors are needed to coordinate and implement or organise the implementation of the measures.

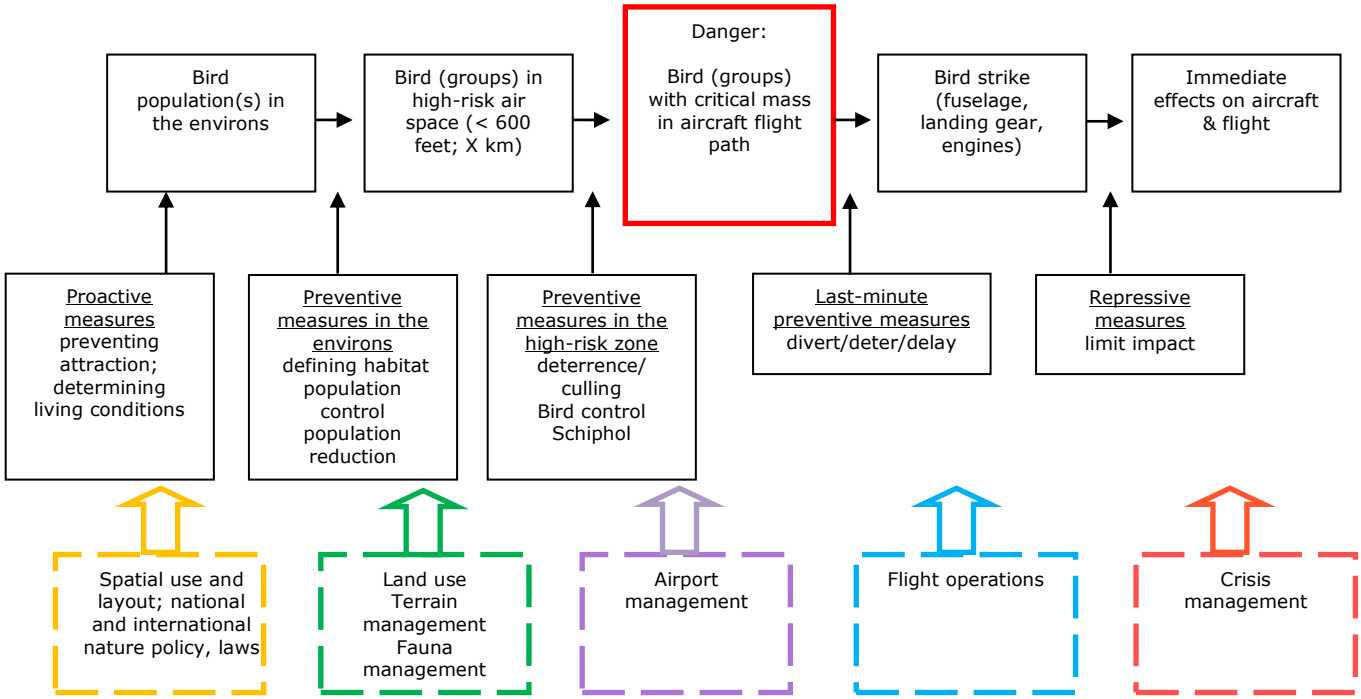


Figure: bird strike risk chain and intervention chain

The figure above illustrates the two key aspects of the bird strike issue:

- It is an interface issue: none of the parties can control the risk of bird strike on their own as it has areas of overlap with various sectors: spatial policy, nature, agricultural and wildlife policy and aviation safety policy. Liaison, collaboration and coordination are essential.
- It is a problem that is surrounded by a very large number of (partly uncertain) variables, such as the impact of soil use, nature policy and fauna management on the actual risk.

The Safety Board investigated how the parties involved implement bird control in practice at and around Schiphol and the extent to which mutual cooperation and coordination was successful. The results of this investigation are contained in the final report *"Emergency landing after bird strike, Boeing 737-4B6, Amsterdam Schiphol Airport, 6 June 2010".* The report can be downloaded from the Safety Board's website: www.safetyboard.nl.

Bird strike prevention: an interface resolving effort

IBSC Conference

Stavanger

25 - 29 June 2012

Dutch Safety Board (DSB)

Kas Beumkes, senior investigator (aviation)

Content

- Objectives, facts and figures DSB
- Bird strike involvement DSB
- Perceptions of bird strikes
- Bird strike risk & intervention chain
- Key aspects of bird strike control

Objectives DSB

What:
- reveal truth (important to victims)
- learn and prevent (safety lessons)

How:
- investigation of accidents/incidents
- thematical investigations
- investigation of follow-up recommendations

Facts and figures DSB

- independent organization
- multi-sectoral investigations
- Board of five members
- 70 FTE staff, ± 40 investigators
- founded in 2005
- located in Den Haag, the Netherlands

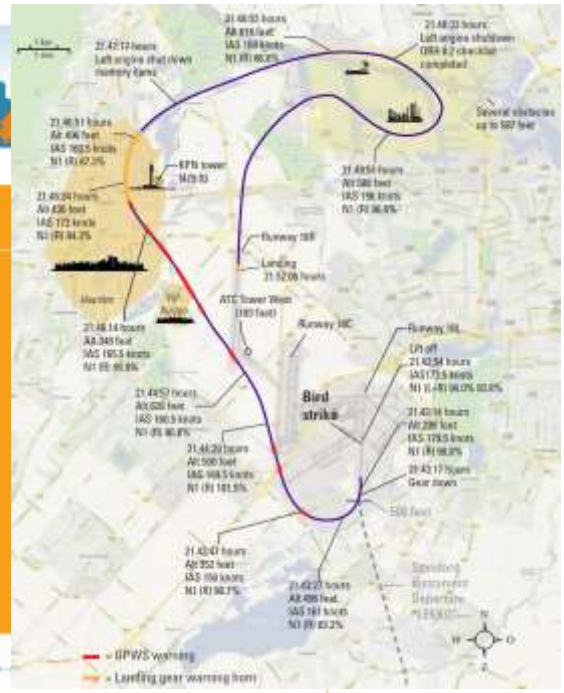
Bird strike involvement

Emergency landing after bird strike with flock of Canada geese

Royal Air Maroc
Boeing 737- 4B6

Amsterdam Schiphol Airport

6 June 2010



THE DUTCH SAFETY BOARD

Investigation scope

Three focus areas:

(1) Flight crew's response on the engine failure

(2) Low flying over residential area during emergency

(3) Bird strike control at and around the airport

Perceptions of bird strikes

1. Control problem based on figures (bird strike ratio)

Year	Schiphol
2007	5.5
2008	4.2
2009	7.1
2010	7.2

Perceptions of bird strikes

2. Presence of (large numbers of) birds

→ in NL: geese in particular

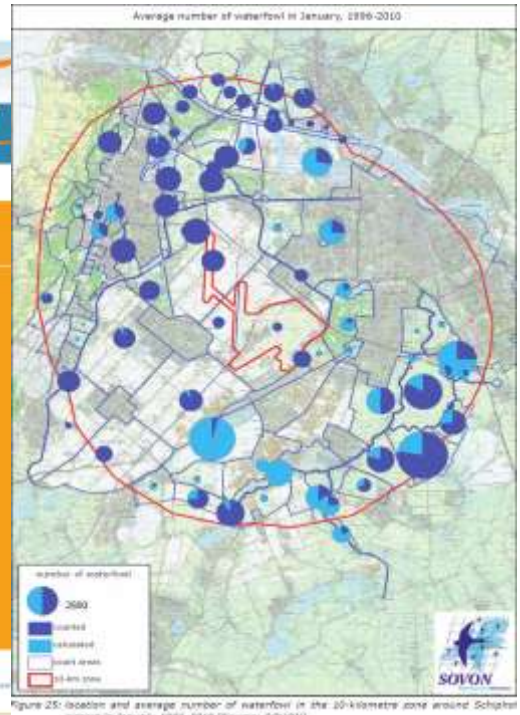
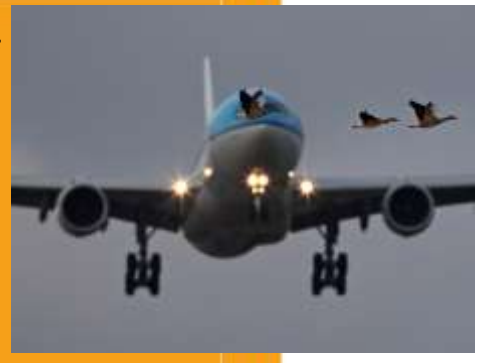


Figure 25: location and average number of waterfowl in the 10-kilometre zone around Schiphol airport in January 1996-2010 (Source: SOVON)

THE DUTCH SAFETY BOARD

Perceptions of bird strikes

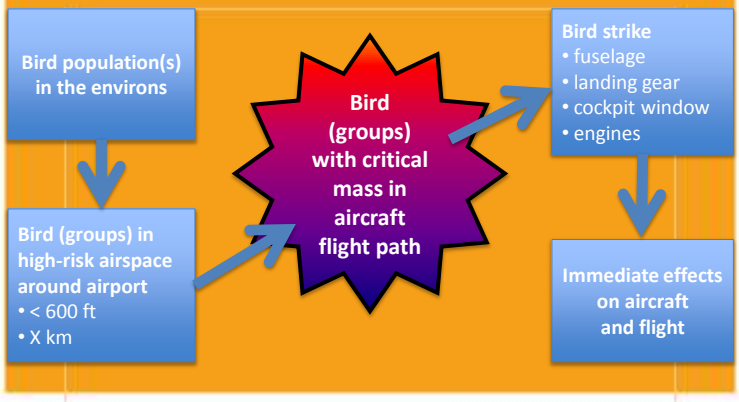
3. Dynamic question of separation flight paths of aircraft and birds



Bird strike control - interface issue

- Interfaces are necessary links between relevant parties that are essential in order to limit or prevent a safety risk → in this case mitigate collisions between birds and aircraft.
- The parties involved liaise by means of these links in the areas of overlap between their individual activities, responsibilities, and powers.

Bird strike risk chain



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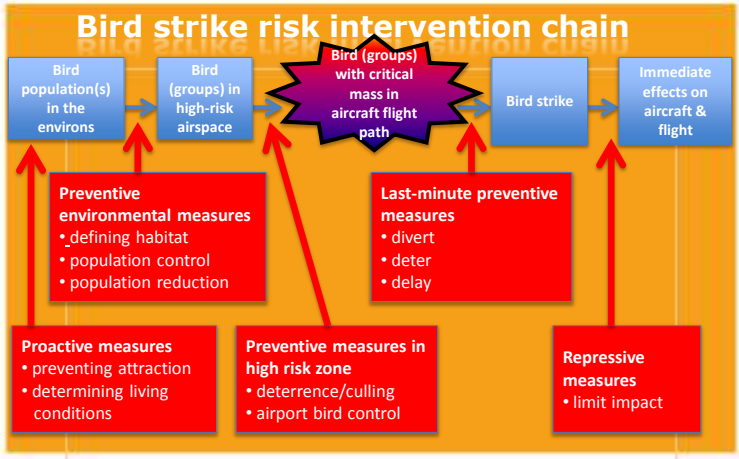
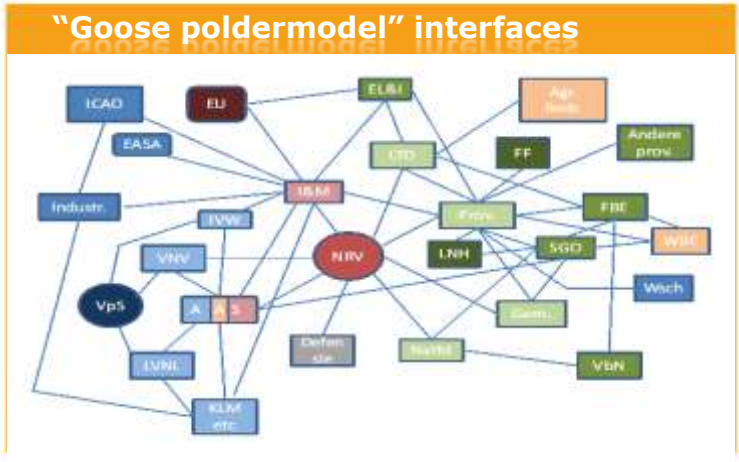
Bird strike risk intervention chain



THE DUTCH SAFETY BOARD

"Goose poldermodel" interfaces



THE DUTCH SAFETY BOARD

Bird strike risk & intervention chain

THE DUTCH SAFETY BOARD

Two key aspects of bird strikes

First aspect: **Bird strike control is an interface issue**

→ None of the parties can control risk of bird strike on their own as it has areas of overlap with various sectors: spatial policy, nature, agricultural and wildlife policy and aviation safety policy

→ Liaison, collaboration and coordination are essential

Two key aspects of bird strikes

Second aspect:

It is a problem surrounded by many (partly uncertain) variables, such as impact of soil use, nature policy and fauna management on actual risk

More info?

Final Report:
"Emergency landing after bird strike"

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