The Bird Strike Risk Reduction Advisory Board:

Dominique Schilderman	Dutch Airline Pilot Association	Pilots
Joep Kievits	KLM / Air France	Airlines
Joao Reis	Aeroporto de Lisboa	Airports
Hans den Rooijen	Dutch Civil Airports Association	Airports
Ian Witter	British Airports Authority	Airports
Nick Yearwood	UK Civil Aviation Authority	Regulator
Maarten van der Meide	Dutch Civil Aviation Authority	Regulator
Andy Baxter	Food and Environment Research Agency	Bird expert
Arie Dekker	Royal Netherlands Air Force	Chairman

State of the art in civil bird risk management

Wikipedia:

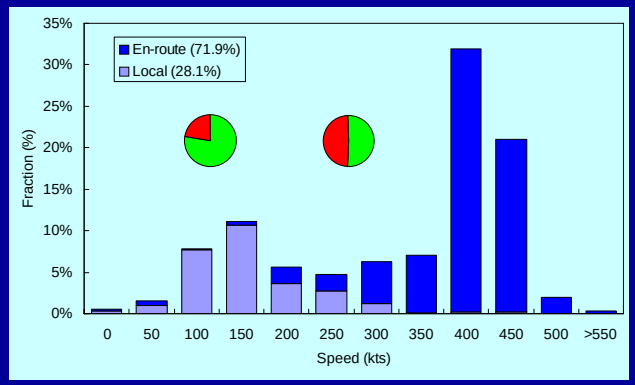
The state of the art is the highest level of development, as of a device, technique, or scientific field, achieved at a particular time.

This presentation:

Generic view at the problem and current measures

Ideas as to where future developments could be aimed at

The Nature of bird strikes



Military aviation, 2 problems:

- on/near airfield (grey)
- en-route (blue)

Civil aviation predominantly on/near airfield:

- 95% below 2500 ft; 70% below 200ft
- More BS during arrival than during departure (more time low altitude)
- Fan / rotor speeds higher during departure -> more damage
- Departure is critical phase for crew
- All serious BS related accidents during departure (Dolbeer 2007)

BSAB Bird Strike Risk Reduction Advisory Board

esa

A/C DO NOT HIT THESE BIRDS

Nevertheless,
Traditional bird strike prevention is based on the idea that birds on an airfield will, at an unpredictable moment, **FLY** and is therefore aimed at a “bird free airfield”.

Measures to realize such a “bird free airfield” include:

- Making airfields unattractive for birds by habitat management
- Active removal/dispersal of birds from RWY environment

Habitat management includes:

- No (or limited) agricultural use
- Dedicated grassland management
- Limiting nesting and roosting opportunities
- Efficient drainage and avoiding standing water
- Bird proofing buildings
- Taking away food sources

Bird control includes:

- Human presence, pyro acoustics, (laser) light, distress calls
- Shooting, catching, falconry, etc.
- Visual means (balloons, spinners, models)
- “Periodically re-invented wheels”

Google:

- Bird strike: 12,000,000 hits
- Bird strike prevention: 48,600 hits

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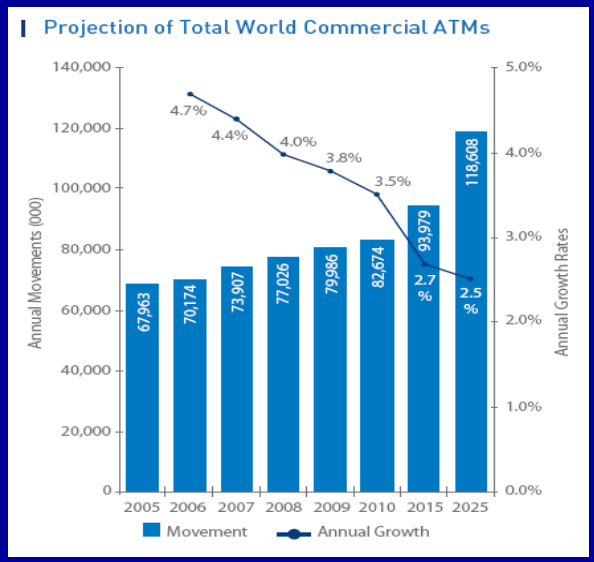
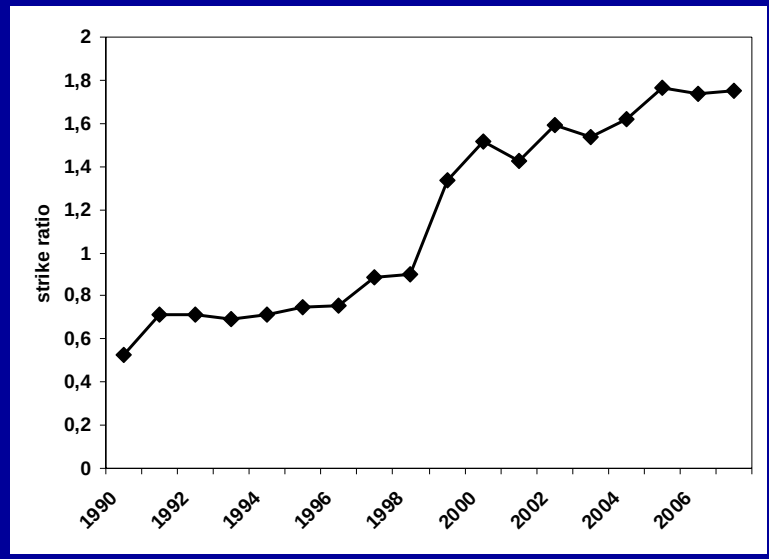
- Active removal/dispersal of birds from RWY environment
- Auditing and SMS approach to safeguard preventive measures

Traditional bird strike prevention is successful but…….

nowadays more is needed



Airports Council International. Global traffic forecast 2006-2025



Wildlife strike rates to civil aircraft USA 1990-2007 (Based on data from Dolbeer&Wright 2008)

- ATM growth of >2,5% per year.
- No significant overall decrease in BS ratio's (USA: increase)
- Absolute number of BS will rise,
- Increasing populations of large, heavy problem species.
- The number of BS related accidents will rise

While habitat management and active deterrence remain the prime prevention tools

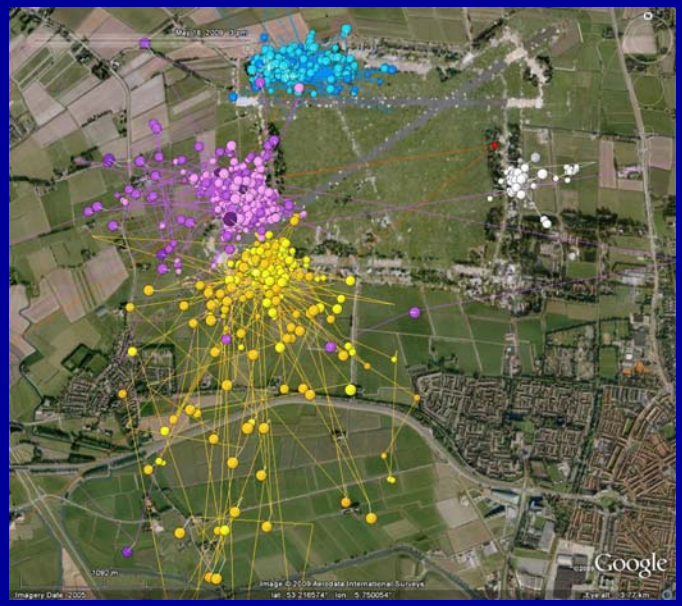
Next generation bird strike prevention requires additional techniques which concentrate on birds in flight, crossing the airfield

IT IS FLYING BIRDS THAT A/C HIT

Bird control new style: prevent birds flying

Simple evolutionary approach towards flying of birds

1. Flying is considered energy intensive
2. There is selection pressure against waste of energy
3. Birds minimize spending energy and avoid flying



GPS transponder study on Buzzards and Carrion Crow on Leeuwarden Airbase seem to support this:

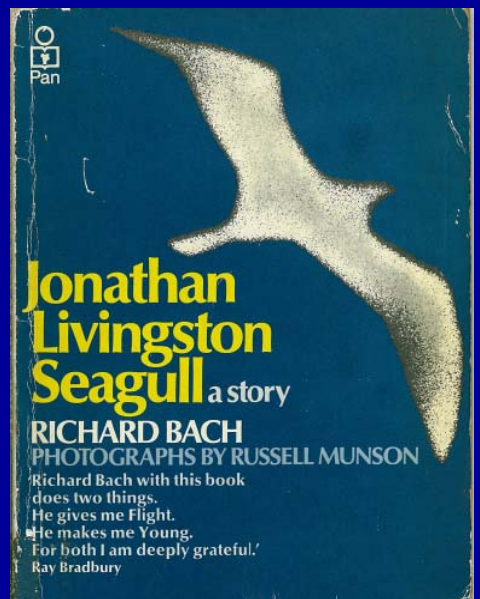
Both species spent ±1% time flying

This is in line with figures from other studies on other species with up to 10% of time flying

Taken from:
Bouten et al. 2009

But…….
flying can well be worth the energy:

- It increases the available food resources
- It increases the chance to find a mate
- It provides a way to escape predators
- It is fun

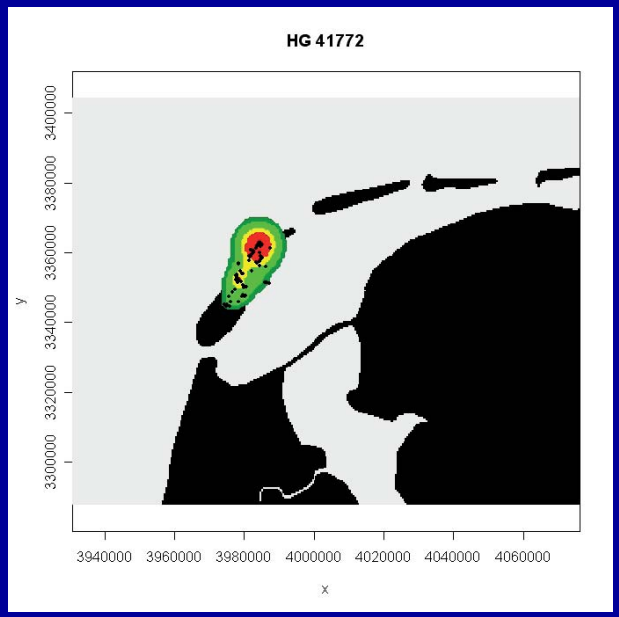


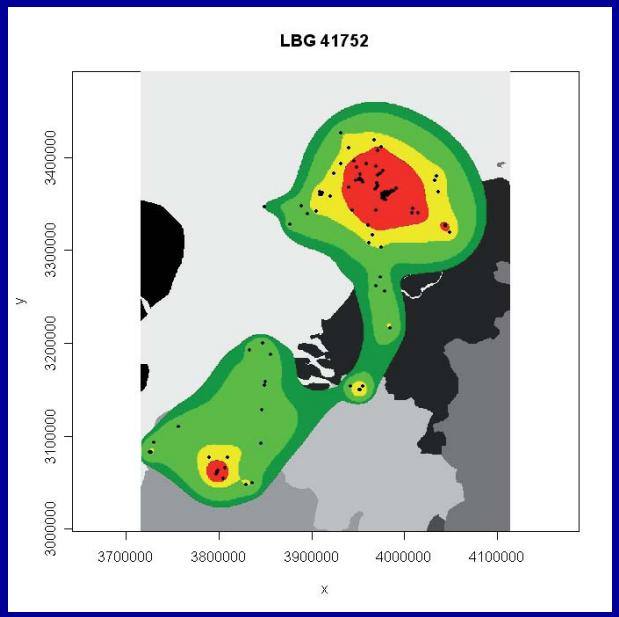
"For most gulls, it is not flying that matters, but eating. For this gull, though, it was not eating that mattered, but flight. More than anything else, Jonathan Livingston Seagull loved to fly"

Richard Bach in: Jonathan Livingston Seagull

Birds do fly

Foraging flights may be up to over 50 Km (gulls)



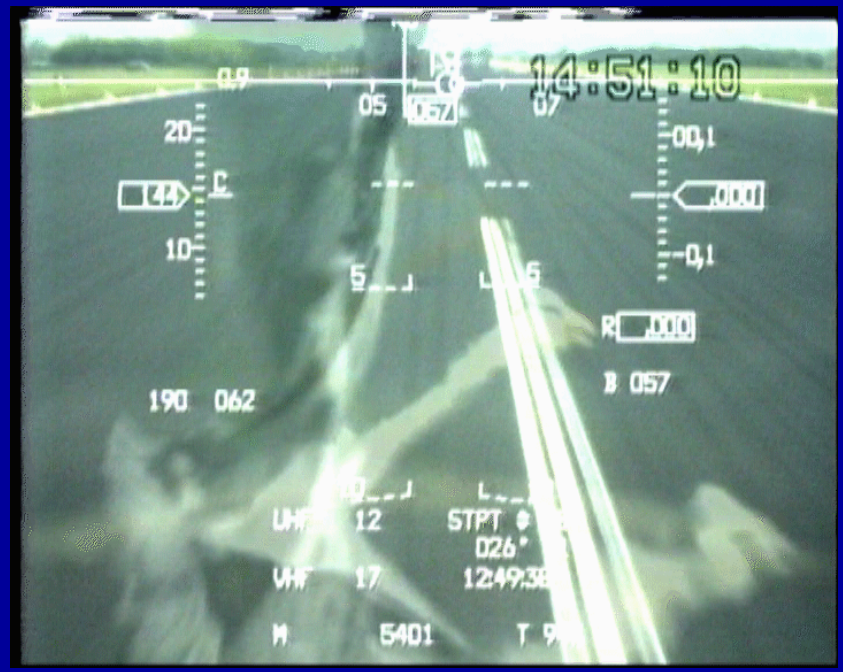


Left: Smallest home range of 8 Herring Gulls breeding on Vlieland
Right: Largest home range of 13 Lesser Black Backed Gulls breeding on Vlieland
Dark green 95%;green 90%; yellow 70%; red 50%
Taken from Ens et. al. 2008

Aircraft do hit flying birds and cause bird strikes

Birds try to avoid collisions and make evasive movements:

- Trauma study from T. Kelly
- Visible on HUD footage



But they are too late

Ideal bird strike prevention
increases the available reaction time for birds,
enabling them to avoid a collision.

For birds this means:
- Timely detection (spectral sensitivity, auditory range, other sensory abilities)
- Cognition (getting the message, memory and learning)
- Computing “the time to collision”
- Activate muscles to make evasive movement

Already mentioned by:
- T. Kelly; IBSC25 Amsterdam 2000
- Robert C. Beason; IBSC26 Warsaw 2003

But unclear what happens at this front

Getting the message across needs more than this

As long as we cannot make flying birds avoid the aircraft more knowledge about bird mobility is needed.

This requires:

- **3D detection of birds flying towards projected A/C flight path**
- **Recognition of hazardous (heavy, flocking) species**
- **Extrapolation techniques to project birds flight path**
- **Relation between non-migratory flying activity and weather and/or ground conditions**
- **Relation between migratory and non-migratory flying activity**

With more knowledge on bird mobility new opportunities for next generation bird strike prevention dawn on the horizon. This could include:

Observing / modelling the use of regional airspace by birds which should lead to:

1. Better spatial planning around airfields
2. Tailored measures against problem species in the airport vicinity

Pro:

- No operational impact
- Aimed at flying birds
- Includes off-airfield birds

Problems

- 3D sensors
- Species recognition
- High resolution (in time and space) modelling techniques
- Long term strategy, not dealing with ad/hoc problems
- Support regulator and regional authorities needed

Observing / modelling the use of regional airspace by birds which should lead to:

3. Adapted RWY assignment
4. Changes in departure and arrival procedures

Pro:
- Aimed at flying birds
- Includes off-airfield birds
- Mid term strategy, deals with known situations

Problems
- 3D sensors
- Species recognition
- High resolution modelling techniques
- Operational impact, mid term flexibility needed
- Noise abatement versus safety

Observing the current use of regional airspace by birds which should lead to:

5. BCU action against flying birds

Pro:
- Aimed at flying birds
- Includes off-airfield birds
- Active strategy, deals with ad/hoc situations

Problems
- **Real time** 3D sensors
- Species recognition
- Dispersion of flying birds to be developed
- Time needed

Observing the current use of regional airspace by birds which should lead to:

6. Informing pilots (through ATC?) to hold starts for one or two minutes
(only relevant for starts, but all critical BS occur then)

Pro:
- Aimed at flying birds
- Includes off-airfield birds
- Active strategy, deals with ad/hoc situations

Problems
- **Real time** 3D sensors
- Species recognition
- Cooperation ATC needed
- Operational impact
- Capacity impact
- Liability issues

In summary

Traditional bird strike prevention, based on a “bird free airfield” is at its limits and is not able to further decrease the BS risk

Additional bird control techniques are needed and have to be aimed at flying birds

Making birds actively avoid A/C flight paths is the ultimate solution. But still beyond the horizon?

Possible other approaches are:

- Better spatial planning and tailored measures in airport vicinity.
- Adapt RWY assignment and departure / arrival procedures
- Provide BCU with info on flying birds and develop deterring techniques for these birds
- Hold starts for one or two minutes

Acknowledgements:
Royal Netherlands Air Force for 30 years in the exciting bird strike arena and giving me the opportunity to chair this AB
Employers of all the other AB members to make their expertise available
ESA for initiating the study and inviting us on the Bird Strike Risk Reduction Advisory Board

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