FLYSAFE
Bird strike risk mitigation in aviation

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Presentation overview

**Bird strikes**
- the problem, on airfield<->en-route, civil<->military

**Prevention**
- on airfield<->en-route, radar detection

**FlySafe project**
- common user requirements
- bird mobility, prediction

**Follow-on**
- Pre-operational service centre, FlySafe-2

Loss of mission time
- Aborted take-off 10
- Precautionary landing 27
- Returned to base 50

Damage to aircraft
- 15% of BS result in damage

Aircraft grounded
- from 1 hour to 91 days

Loss of aircraft
- 1 F-16
The nature of bird strikes
Bird strikes with jet fighter aircraft over speed EURBASE N-17,732
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Bird strikes with jet fighter aircraft over speed EURBASE N-17,732
Bird Strike Prevention

**On-airfield**, keep birds away from aircraft by
- habitat management
- active harassment

**Civil en-route**: Aircraft fly above birds, not relevant

**Military en-route, keep aircraft away from birds**
- radar detection of high bird intensities
- operational restraint
Existing radar knowledge / experience: the starting point for FlySafe

10 cm pulse
Single bird 65 Km
Flock 120/150 Km

Time laps film October 1980
Dawn effect

Electronic extraction of bird echoes by ROBIN system
BIRDTAM used by pilots in operational environment
Integrated Applications Promotion (IAP) Initiative

Focus on bird mobility in relation to:

- **Human + Livestock Health**
  - Avian borne diseases

- **Migration Ecology**
  - Scientific interest

- **Conservation + Education**
  - Hotspots + Flyways

- **Flight Safety**
  - Bird Strike Problem
FlySafe project partners

Royal Netherlands Air Force
The FlySafe project as an opportunity

- Offering a birds eye view from space, including:
  - Connection of international expert communities
  - Experience in a multi user and multi discipline approach
  - Combining technologies in complex integrated systems
  - Satellite information on bird mobility, enabling forecast modeling
  - Remote sensing data (weather and landscape) essential for forecast modeling

- Convincing by showing

- ESA as an honest broker -> trustworthy for all partners!
FlySafe project activities

Getting to know what is needed

- User driven approach
- Define user requirements that are agreed by all parties
- Define project set-up
FlySafe project activities

Data management

- Central database for information from ALL sources
- Dissemination and storage of individual bird tracks from 2 MPR radars
- Website, including visualisation tools
FlySafe project activities

Development of automatic 24/7 prediction models

- 4 locations (2 B + 2 NL)
- MPR radar history
- weather data
- earth observation
- GPS logging of individual birds
FlySafe project activities

Develop algorithms for weather radars

- 4 radars (2 B + 2 NL + 1 F)
- parallel observation series
- Swiss research radar
FlySafe project activities

Trial of on-airfield avian radar (ROBIN Lite)
- prevention of local bird strikes
- 2 D radar on 1 airbase
Role of space

Satcom for Sensors Remote Locations

Birds with Backpack GPS-ARGOS

Weather & Land Cover
FlySafe System Set-up
FlySafe results

**General:**
- Better co-ordination between D/B/NL
- Interdisciplinary co-operation that created added value

**Services for BAF + RNLAF**
- *Bird mobility forecasts for 4 locations*
- *Automatic extraction of bird information from weather radars*

**For on airfield situation:**
- Potential of small bird radars as “last line of defence”
For 4 locations (2B+2NL)
Prediction (dotted line) +margin (shadow)
Measurements (black dots)
Missing radardata (triangles)
Translation to BIRDTAM values
Hourly predicted and measured migration intensity

- Measured Values
- Prediction Range
- Avg. Prediction

Hourly BirdTAM Intensity

- Day BirdTAM
- Night BirdTAM
- Prediction

2009
May 12  May 13  May 14  May 15  May 16  May 17  May 18  May 19  May 21
Fig. 1 Bird densities De Bilt last week

Bird Density Height Profile

Height-integrated bird density

2 NL weather radars
Density (colours)
Altitude (Y axis)
FlySafe results and project use by RNLAF

Creation of BIRDTAMS:
- More objective, more reliable
- Safer with less operational restraint

Daily use of:
- The models
- The MPR radars
- The weather radars
FlySafe follow-on (military aviation)

Pre-operational services hosted by KNMI (2011):
- Sustainable within existing cooperation between Air Force and KNMI
- 24/7 automatic running of models
  - 2 B + 2 NL locations
- 24/7 automatic extraction from weather radars
  - 3 B + 2 NL locations

FlySafe-2 (2011-2013):
- Building upon FlySafe-1, RNLAF funded
- Additional time-based modelling using weather radar
- New modelling of altitude based on weather radar
- Addition of >6 weather radars in neighbouring countries
- Teaming up with EU Lifewatch program
FlySafe project use and operational impact for Belgian Air Force flying activity

Serge Sorbi (BAF)
Belgian Air Force

Birdstrike prevention “en route”

• Giving information to pilots so that they can avoid high bird density zone.
BIRDTAM

- Information is transmitted by specific message: BIRDTAM
- BIRDTAM also broadcasted via the pilot’s meteorological support software.

- Georef square
- Bird Intensity
- Altitude
- Validity period
FlySafe project improvement

- Necessity of harmonization of BIRDTAM broadcasted by different countries for a common georef square.
FlySafe project improvement

Better altitude information by use of meteo radar.

Simulated echo detection with MPR beams

1000 bird echoes
Max. detection distance: 110 km.
Selected distribution: “Normal”.
Mean altitude: 800 +/- 200 m.
Due to BIRDTAM, the flying operations can be limited (BIRDTAM ≥ 5) or even totally cancelled (BIRDTAM = 8).

It has a direct operational impact on the flying program and can have a financial impact for BAF during bird migration period. During night flight period.
Bird migration above Belgium
Bird migration above Belgium

MPR radar = Robin picture (100 sec)
Bird migration above Belgium

08 March 2011 – 1625z

08 March 2011 – 1655z

08 March 2011 – 1725z

08 March 2011 – 1755z

DUSK

08 March 2011 – 1825z

08 March 2011 – 1855z
Impact of bird migration on F-16 night flight operation

2 F-16 airbases activated
1 diversion airbase activated

=> 3 airbases on duty

30% of night flights affected by BIRDTAM
Impact of lack of forecast in case of night flights cancellation.

Services on duty: Stand-by for nothing!

Flight planning disturbed, time & money lost
BIRDTAM forecast
« For AF’s, a way to save money »

- Better planning of flying activity.
- In case of BIRDTAM 8 forecast: cancellation of night flights
- 48 hrs forward
BIRDTAM forecast
« For AF’s, a way to save money »

- Belgian BIRDTAM forecast developed in the framework of the FlySafe Project

- Better flight planning, better time and human resources management => money saved
QUESTIONS ?