dtbird® dtbat®

AUTOMATIC & REAL-TIME PROTECTION

BIRD & BAT MONITORING COLLISION RISK REDUCTION

Onshore & Offshore

Liquen Consultoría Ambiental S.L.

Mission

We develop, manufacture & install technologies to make Wind Energy compatible with Wildlife preservation through automatic & real-time protection.

Vision

Become a global reference in the wind energy sector.

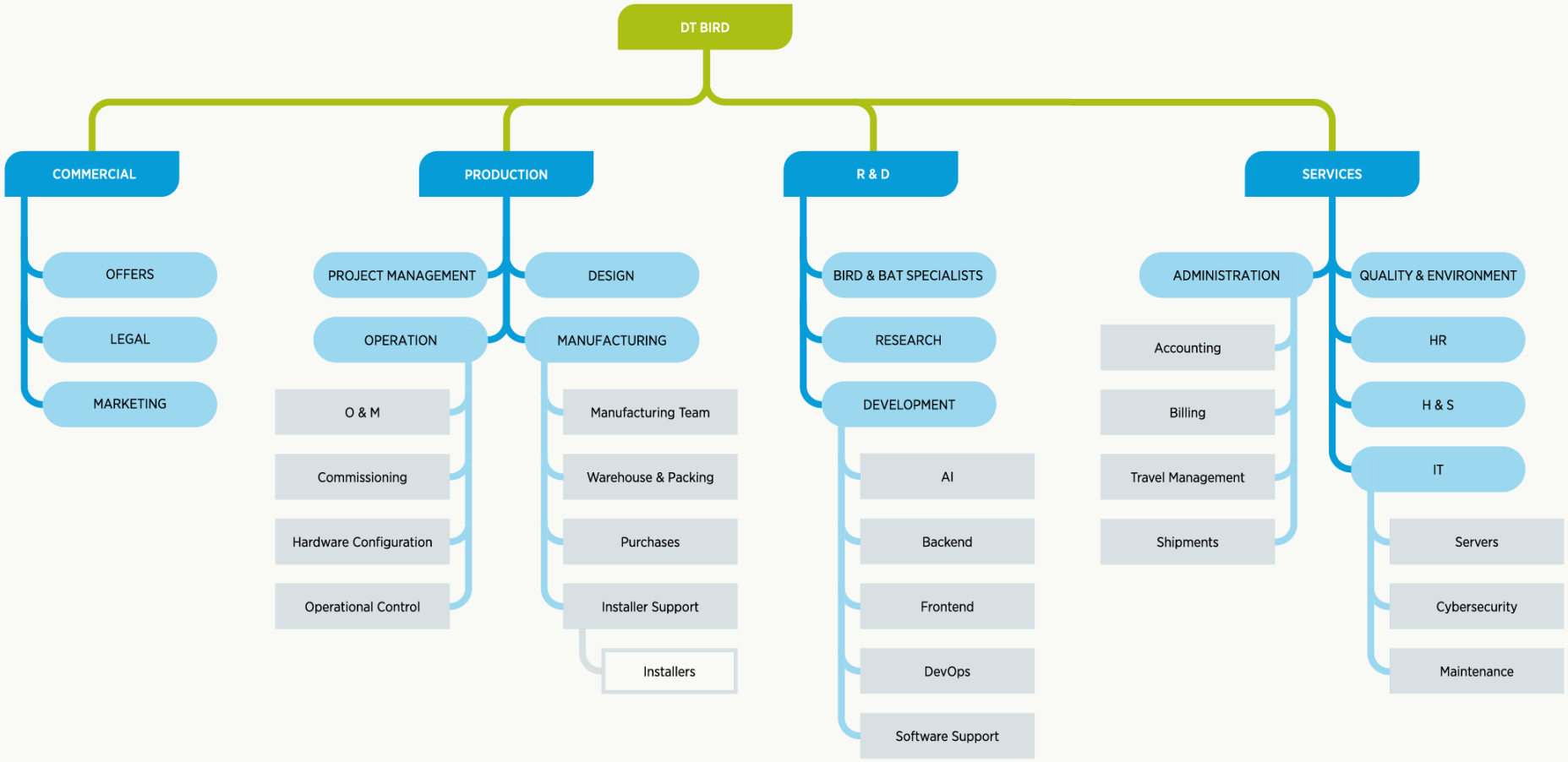
Support the renewable energy transition.

Preserve avian and chiropter wildlife in the long term.

dtbird® dtbat®

AUTOMATIC & REAL-TIME PROTECTION

Organizational Chart

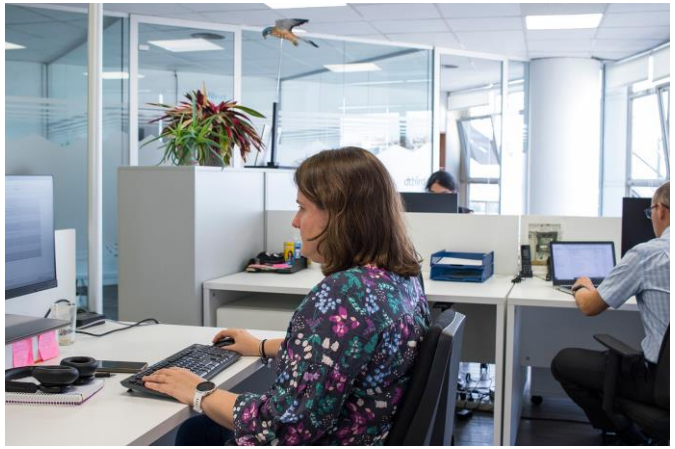


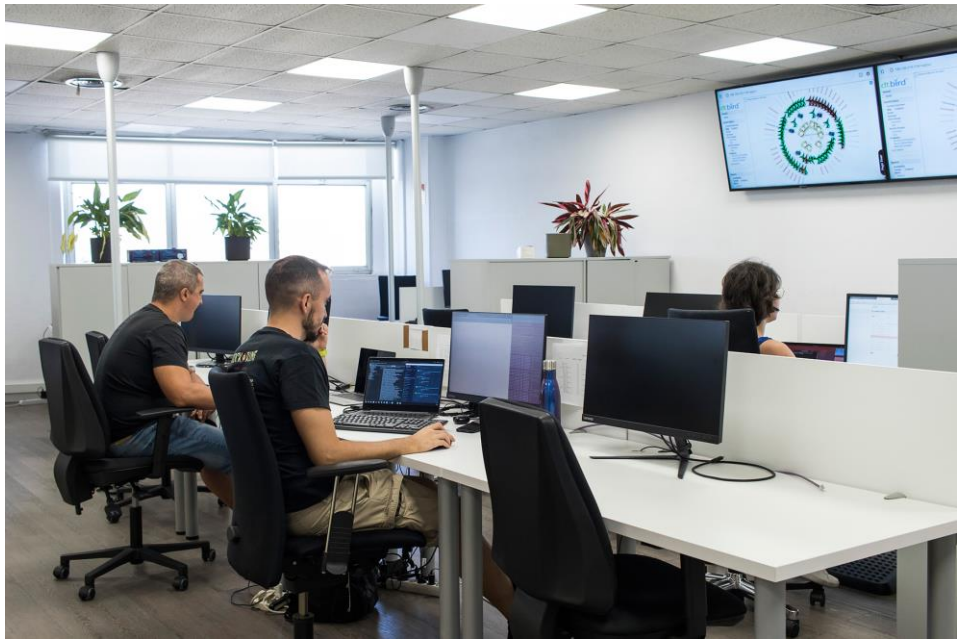
Liquen Team

50+ technicians devoted for bird & bat monitoring and mortality mitigation at wind farms.

dtbird® dtbat®
AUTOMATIC & REAL-TIME PROTECTION

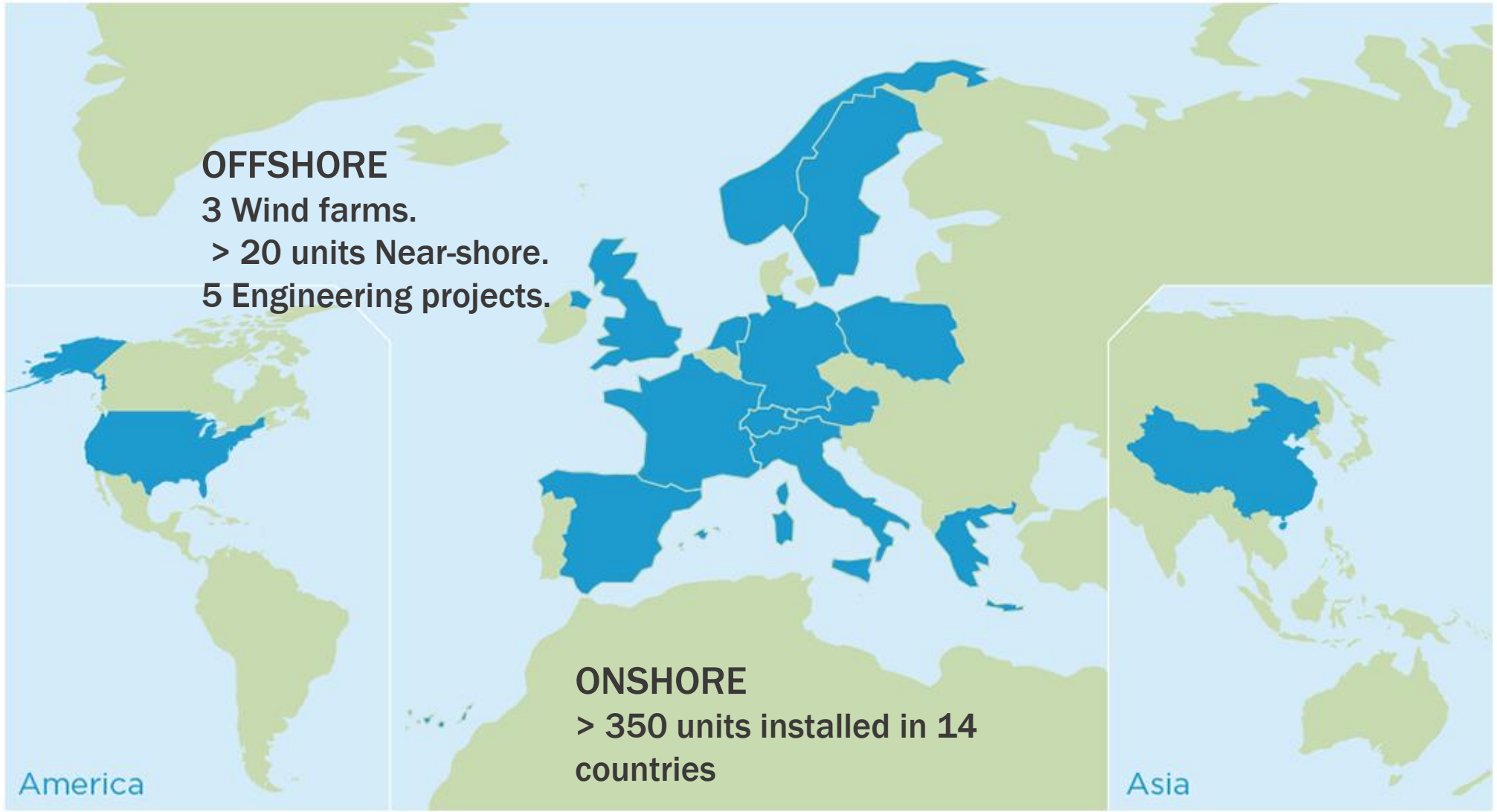
Office and Manufacturing area





dtbird® dtbat®
AUTOMATIC & REAL-TIME PROTECTION

DTBird® & DTBat® installations



Operating onshore

2009

Current day

Operating offshore

2016

Current day

dtbird® dtbat®

AUTOMATIC & REAL-TIME PROTECTION

EU Declaration of Conformity (ISO/IEC 17050-1:2004)

CE

DECLARACIÓN DE CONFORMIDAD UE
(de acuerdo con la norma ISO/IEC 17050-1:2004)
EU DECLARATION OF CONFORMITY
(according to ISO/IEC 17050-1:2004)

Fabricante del producto: LIQUEN CONSULTORÍA AMBIENTAL S.L.
Product manufacturer

Dirección: Av. De la Democracia, 7, nave 406, 28031, MADRID
Address

Modelo/Referencia: DTBird & DTBat
Model/Reference

dtbird dtbat

CUMPLE LOS REQUISITOS DE LAS DIRECTIVAS:
CONFORMS WITH THE REQUISITES OF THE DIRECTIVE

Directiva 2014/30/UE de Compatibilidad Electromagnética
Directiva 2014/35/UE de Baja Tensión
Directiva 2011/65/UE sobre RoHS
Directive 2014/30/EU relating Electromagnetic Compatibility
Directive 2014/35/EU relating LVD
Directive 2011/65/EU relating RoHS

NORMATIVA APLICABLE:
APPLICABLE STANDARDS:

UNE-EN 55032:2016	*UNE-EN 55035:2017*	*UNE-EN 61000-3-2:2014*	*UNE-EN 61000-3-3:2013*
UNE-EN 62233:2008 + AC:2008	*UNE-EN 62368-1:2018*		

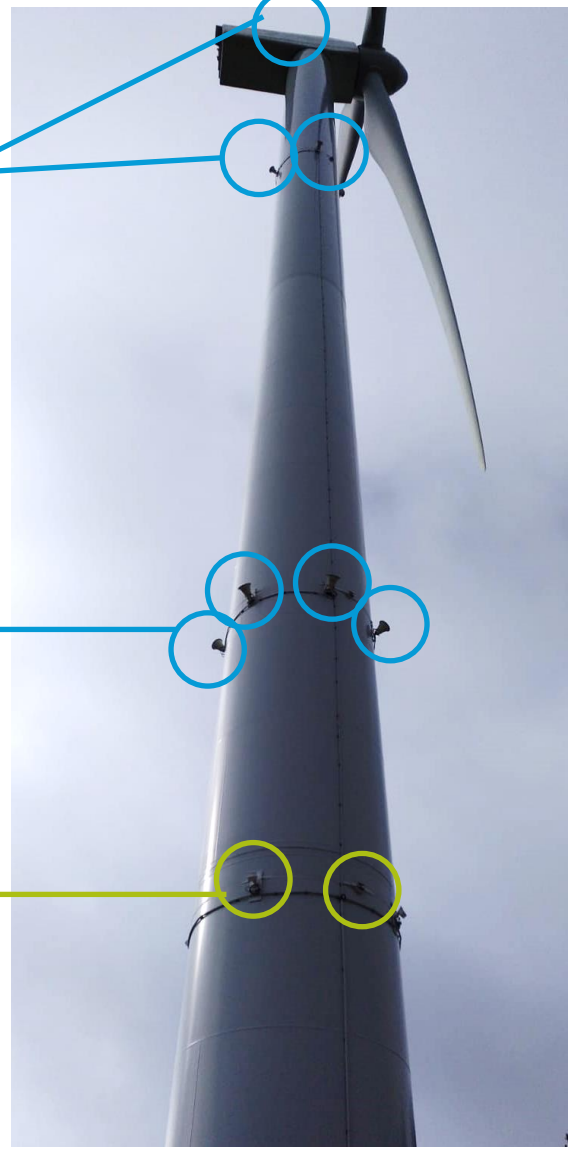
LIQUEN Consultoría Ambiental
Avda. de la Democracia 7, N209 - 28031 Madrid - Spain
Tel: +34 91 341 90 86 - CIF: ESB83521732
info@dtbird.com - www.dtbird.com

Fecha: Diciembre 2019
Date: December 2019

Javier Díaz (Technical Manager)
Nombre, cargo y firma
Name, position and signature

dtbird dtbat
AUTOMATIC & REAL-TIME PROTECTION

DTBird® System modules



- Bird Monitoring
- Mortality Mitigation

- Target Species
- WTG Dimensions
- Weather Conditions

Detection/Collision Control Module

Collision Avoidance Module

Stop Control Module

dtbird® dtbat

AUTOMATIC & REAL-TIME PROTECTION

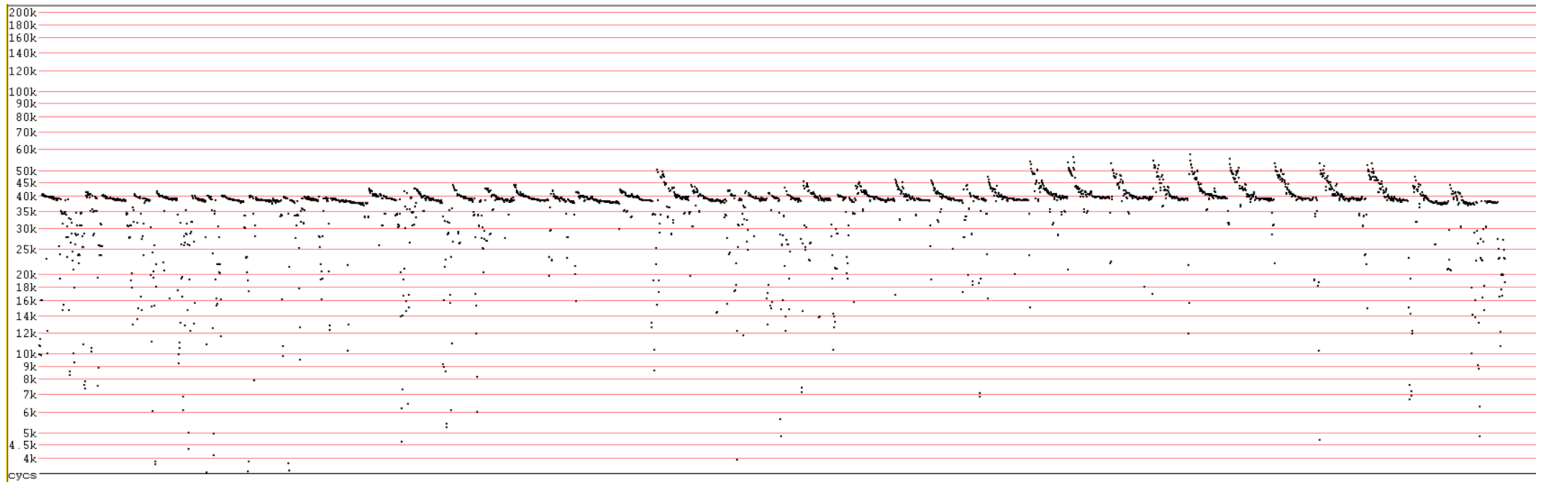
DTBat® System modules

- Bat Monitoring
- Mortality Mitigation

- Target Species
- WTG Dimensions
- Weather Conditions

Detection Module

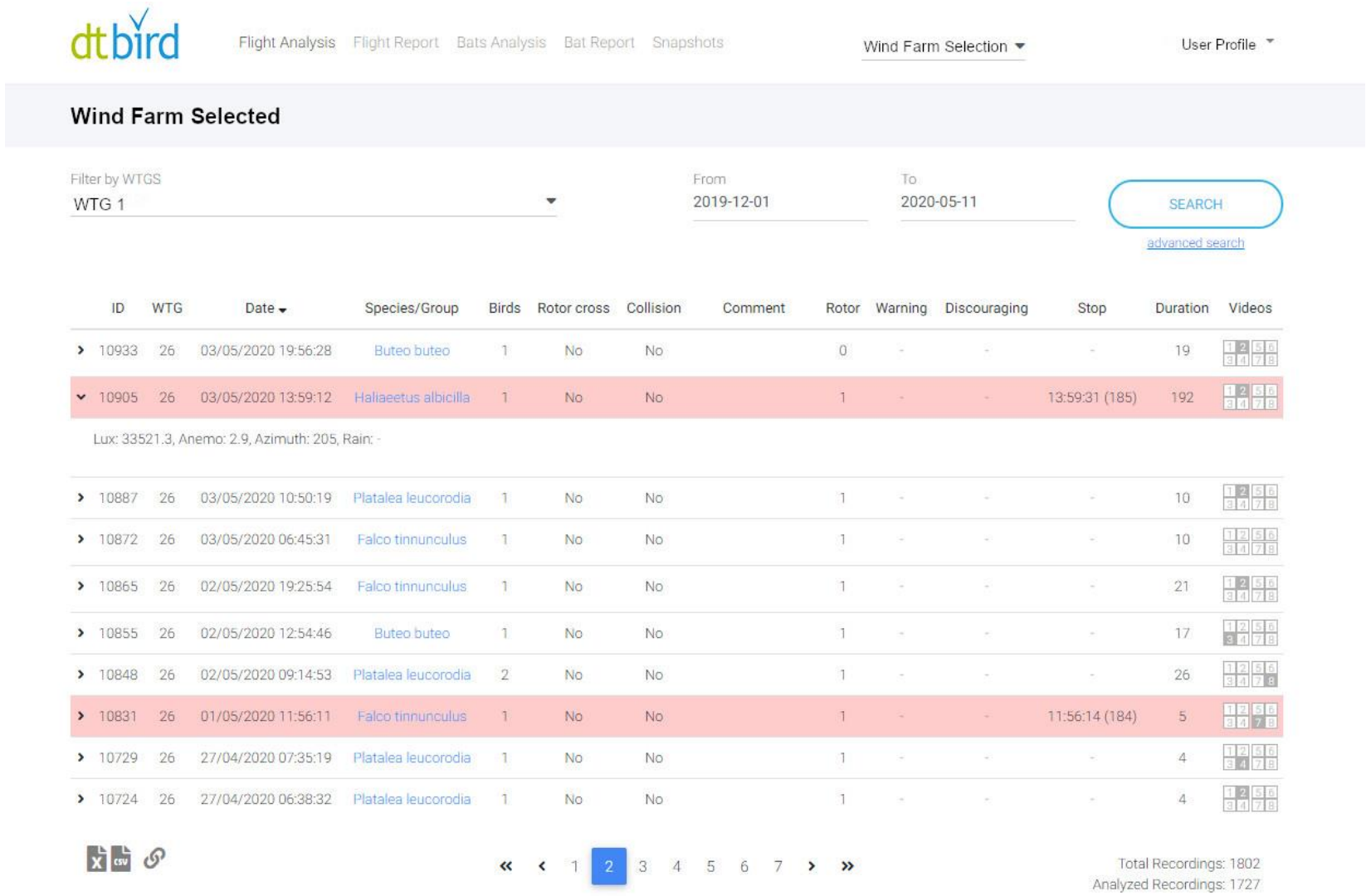
Stop Control Module



Nathusius's pipistrelle
(*Pipistrellus nathusii*)

dtbird® dtbat®
AUTOMATIC & REAL-TIME PROTECTION

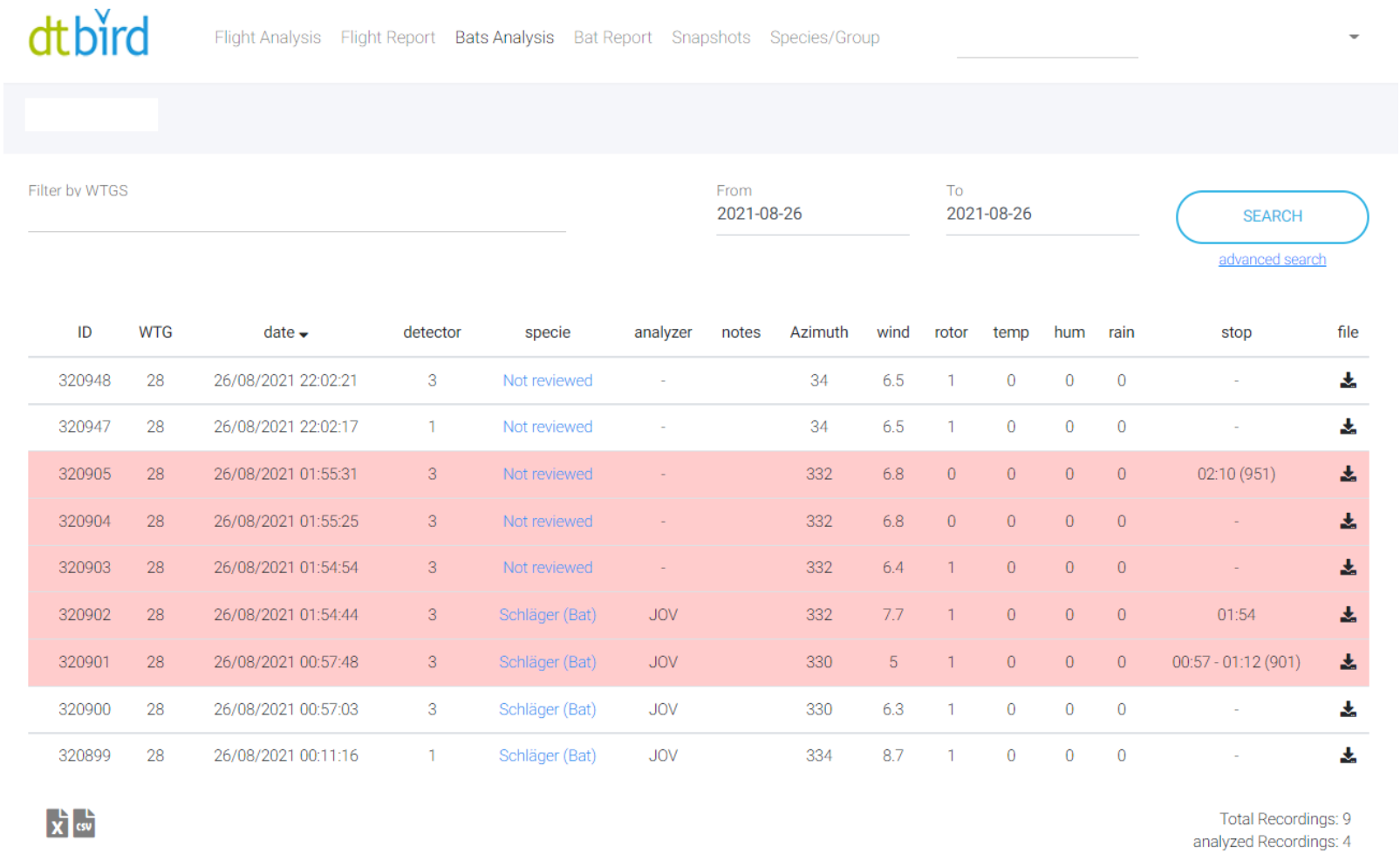
DTBird Online Data Analysis Platform Access



- Available remotely.
- 2 access levels.
- WTG operational parameters.
- Bird flight data.
- Videos with sound recorded (DTBird).

dtbird® dtbat®
AUTOMATIC & REAL-TIME PROTECTION

DTBat Online Data Analysis Platform Access



ID	WTG	date	detector	specie	analyzer	notes	Azimuth	wind	rotor	temp	hum	rain	stop	file
320948	28	26/08/2021 22:02:21	3	Not reviewed	-		34	6.5	1	0	0	0	-	
320947	28	26/08/2021 22:02:17	1	Not reviewed	-		34	6.5	1	0	0	0	-	
320905	28	26/08/2021 01:55:31	3	Not reviewed	-		332	6.8	0	0	0	0	02:10 (951)	
320904	28	26/08/2021 01:55:25	3	Not reviewed	-		332	6.8	0	0	0	0	-	
320903	28	26/08/2021 01:54:54	3	Not reviewed	-		332	6.4	1	0	0	0	-	
320902	28	26/08/2021 01:54:44	3	Schläger (Bat)	JOV		332	7.7	1	0	0	0	01:54	
320901	28	26/08/2021 00:57:48	3	Schläger (Bat)	JOV		330	5	1	0	0	0	00:57 - 01:12 (901)	
320900	28	26/08/2021 00:57:03	3	Schläger (Bat)	JOV		330	6.3	1	0	0	0	-	
320899	28	26/08/2021 00:11:16	1	Schläger (Bat)	JOV		334	8.7	1	0	0	0	-	

- Available remotely.
- 2 access levels.
- WTG operational parameters.
- Bat flight data.
- Sonograms (DTBat).

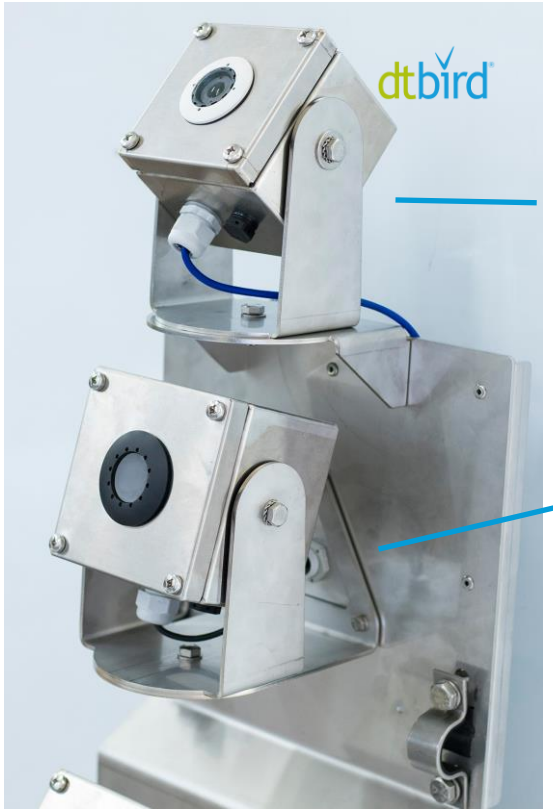
dtbird dtbat
AUTOMATIC & REAL-TIME PROTECTION

DTBird® Detection / Collision Control Module. Models

- Models: Day (360º surveillance): DTBirdV4 / V8
  Night: DTBirdN2 / N6
- Bird Flight Detectability > 80% at ½ of MDD.
- FP rate/day: 0,2 – 5,5 DTBirdV4 // 2 - 9 DTBirdV8
- Ornithologists, through video review, can note: Species/groups, high collision risk flights or collisions.

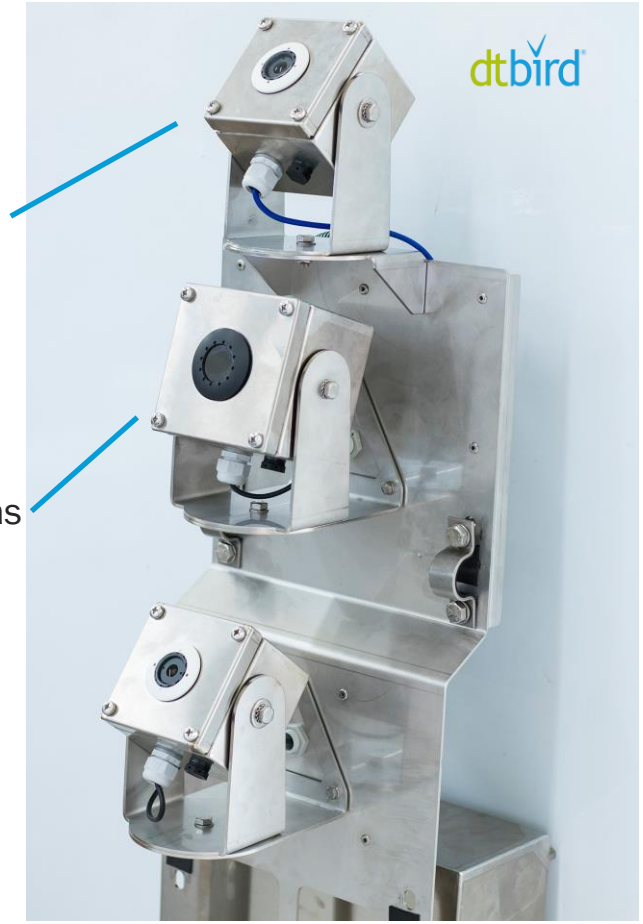
dtbird® dtbat.
AUTOMATIC & REAL-TIME PROTECTION

DTBird® Detection / Collision Control Module. Models



Daylight Cameras

Thermal Cameras



Main Cabinet

Collision Avoidance Cabinet

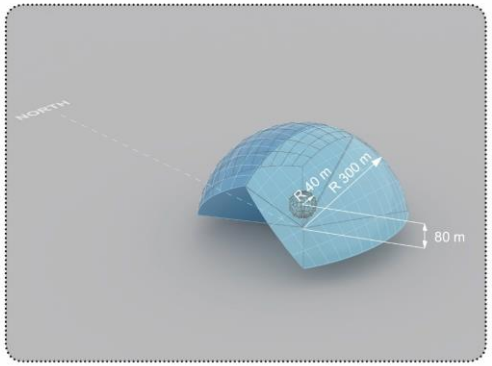
dtbird® dtbat

AUTOMATIC & REAL-TIME PROTECTION

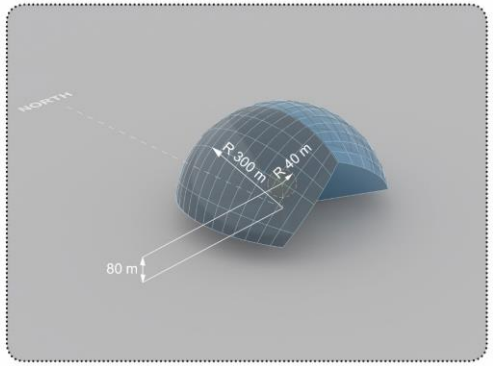
DTBirdV4 & V8 Detection Module Surveillance Areas: Golden Eagle (*Aquila chrysaetos*)

DTBird Detection Module V4
WTG: Tower height 80 m, Rotor diameter 80 m.
Projection of the Surveillance Area at the Maximum Detection Distance.
Target Species: *Aquila Chrysaetos*

3D Projection
Cameras 1 & 3



3D Projection
Cameras 2 & 4

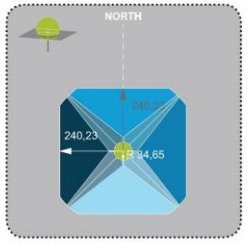


Camera 1 Camera 2 Camera 3 Camera 4

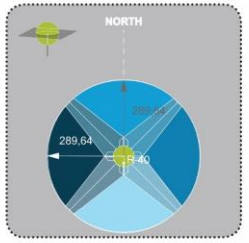
Rotor Swept Area (RSA)

2D Sections
At ¼, ½ and ¾ of the Rotor Swept Area height (RSA)

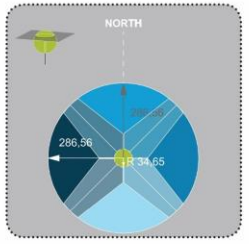
2D Section at ¼ RSA (60m)



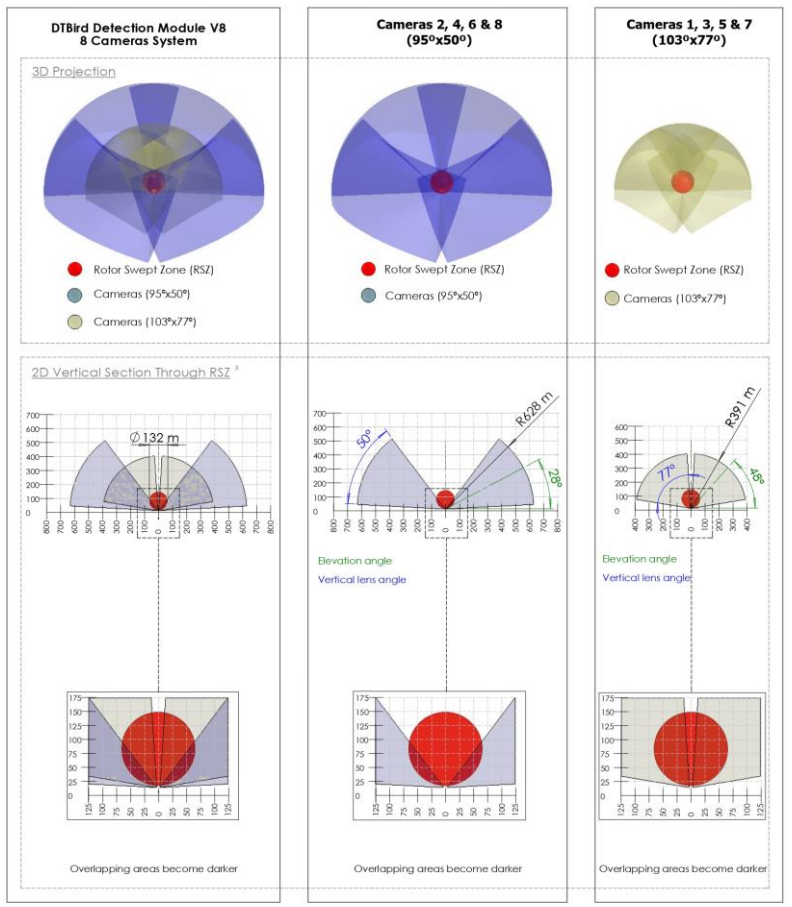
2D Section at ½ RSA (80m)



2D Section at 3/4 RSA (100m)



DTBird Detection Module V8			
WTG		Projection of the Surveillance Area [1]	
Rotor diameter (m)	Tower height (m)	Target Species	Wingspan (m)
132	84	*Aquila chrysaetos*	1,80-2,30 [2]



[1] Projection based on the Theoretical Maximum Detection Distance (T-MDD) for a bird entering the exterior edge of the Surveillance Area in ventral/dorsal position toward the HD Camera, with wings fully extended (maximum wing span), and occupying completely the width of the minimum objet size detectable. In other bird positions, the detection distances can be shorter, and directly related with the bird profile offered to the Camera's sensors. Birds can fly into the Surveillance Area from above and below the Surveillance Area, at shorter distances than the T-MDD.
A field study of DTBird Detection Module V4 (manufactured in 2016), evaluating the detection distance by means of random UAV flights simulating a Golden Eagle, found that the actual MDD was 39% greater than the T-MDD, with a flight detectability at this furthest distance range of 51% ("American Wind Wildlife Institute (AWWI). 2018. Technical Report: Evaluating a Commercial-Ready Technology for Raptor Detection and Deterrence at a Wind Energy Facility in California").

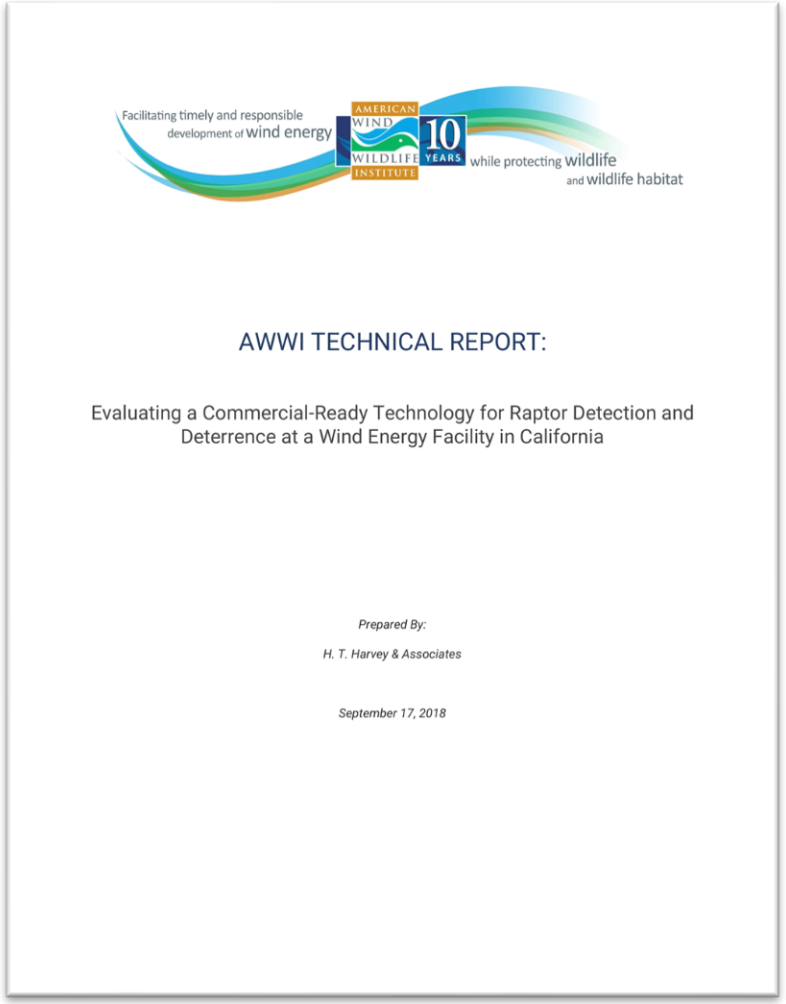
[2] Projection based on the upper limit of the wingspan range

[3] RSZ: Rotor Swept Zone, spherical area that could be swept by the blades regardless the location of the blades at any time.

dtbird® dtbat.
AUTOMATIC & REAL-TIME PROTECTION

DTBird® Detection / Collision Control Module. Evaluation

DTBirdV4 Model of 2016


Facilitating timely and responsible development of wind energy
AMERICAN WIND WILDLIFE INSTITUTE 10 YEARS
while protecting wildlife and wildlife habitat

AWWI TECHNICAL REPORT:

Evaluating a Commercial-Ready Technology for Raptor Detection and Deterrence at a Wind Energy Facility in California

Prepared By:

H. T. Harvey & Associates

September 17, 2018

- 63% Mean Detection Rate per distance band (7 distance bands established: >230; 230-200; 200-170; 170-140; 140-110; 110-80; <80 m to the RSA).
- Cumulative Detectability > 80 % in 2 distance bands and > 90 % in 3 distance bands.
- 169 and 179 m average distances for detection and warning respectively.
- 375 m Maximum Detection Distance (MDD). DTBird Theoretical MDD 270 m.

Ongoing evaluation DTBirdV4 Model of 2019.

dtbird® dtbat
AUTOMATIC & REAL-TIME PROTECTION

Maximum Detection Distances – Models 2021

MODEL	V4 103ºX77º LUZ >50 LUX	V8 95ºX50º LUZ >50 LUX	N 56ºX42º 24/7	WINGSPAN (M)
Maximum Detection Distances (m)	391 - 450	628 - 724	355 - 409	2,30 - 2,65
	163 - 197	262 - 317	148 - 179	0,96 - 1,16
	112 - 122	180 - 197	102 - 111	0,66 – 0,72

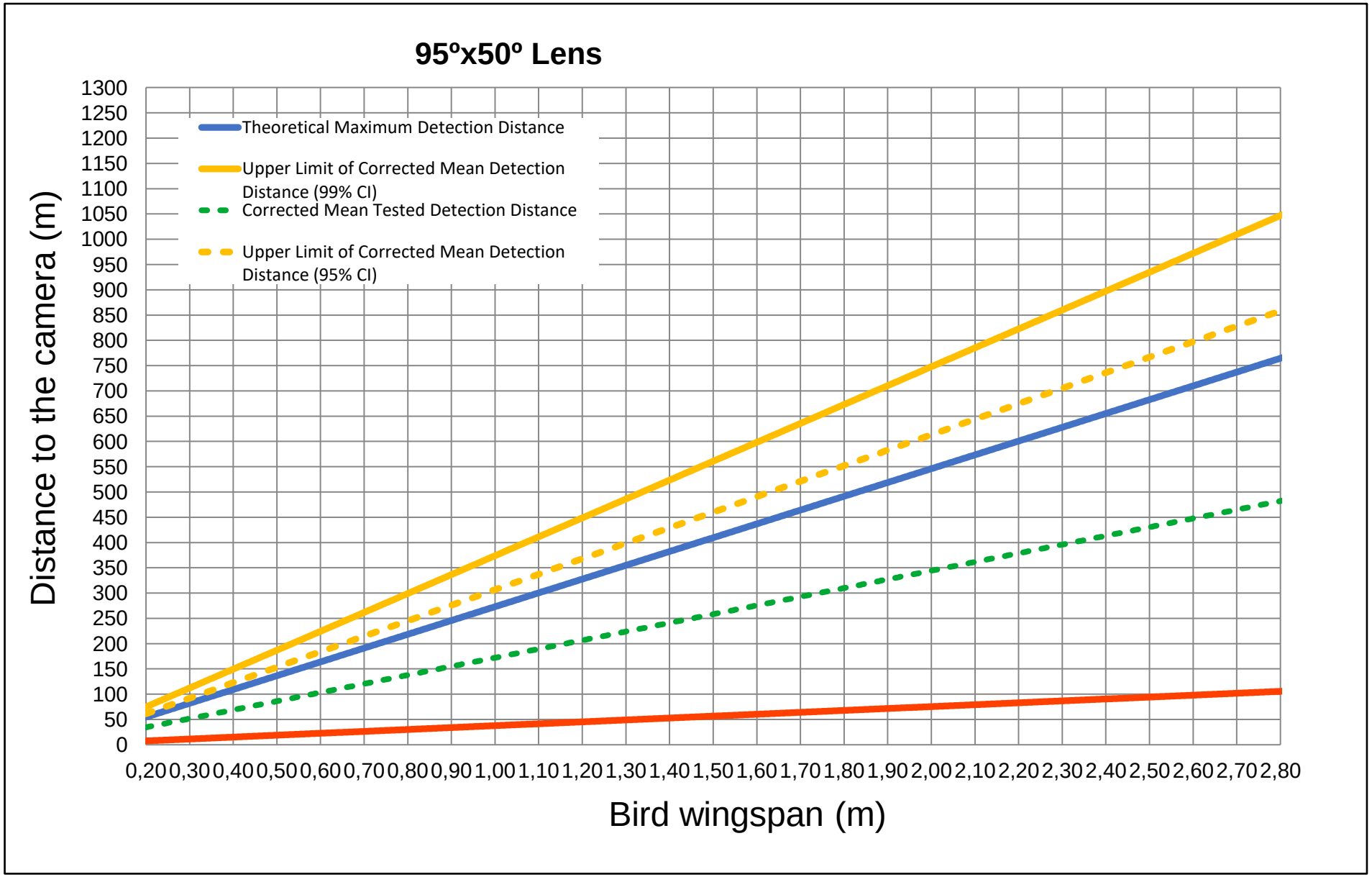
Griffon Vulture
(*Gyps fulvus*)

Montagu's harrier
(*Circus pygargus*)

Lesser Kestrel
(*Falco naumanni*)

dtbird® dtbat®
AUTOMATIC & REAL-TIME PROTECTION

Maximum Detection Distances – Models 2021

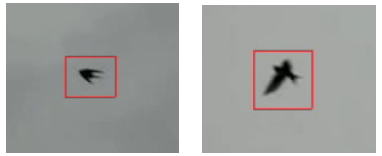


dtbird dtbat
AUTOMATIC & REAL-TIME PROTECTION

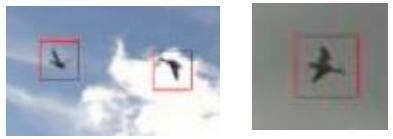
Examples of Detected Bird Species

Daylight images

European Robin
(Erithacus rubecula)



Barn Swallow
(*Hirundo rustica*)



Ducks
(Anas sp.)

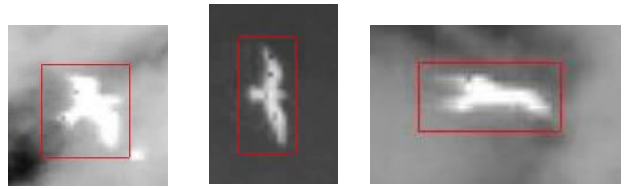
Common Kestrel
(*Falco tinnunculus*)

Common buzzard
(Buteo buteo)

Red Kite
(*Milvus milvus*)

Griffon Vulture
(Gyps fulvus)

Thermal images



Gull
(Larus sp.)

dtbird® dtbat®
AUTOMATIC & REAL-TIME PROTECTION

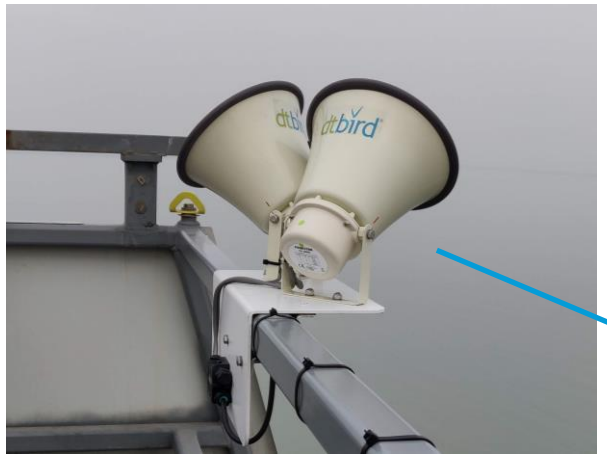
Examples of bird flights detected – V8 Model

dtbird® dtbat®
AUTOMATIC & REAL-TIME PROTECTION

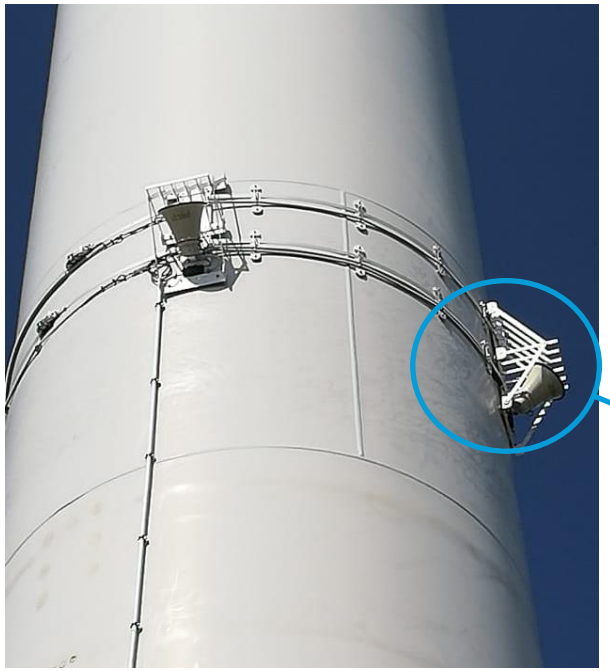
Examples of bird flights detected - Night

dtbird® dtbat®
AUTOMATIC & REAL-TIME PROTECTION

DTBird® Collision Avoidance Module



Nacelle speakers



Speakers with ice protection

Sound Types

- Warning
- Discouraging

FP / Day

- 0.2- 5.5

(0.1 – 2.5 min/day)

Customization

- DTBirdD4
- DTBirdD8
- DTBird10

Adjustable settings

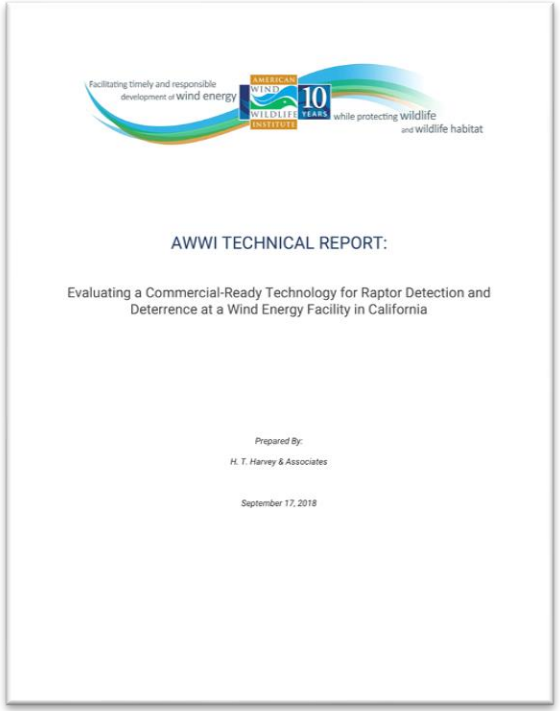
- Sound Type
- Emission Levels
- Operations

dtbird® dtbat

AUTOMATIC & REAL-TIME PROTECTION

DTBird® Collision Avoidance Module. Evaluation

DTBirdV4D4 Model from 2016



Deterrence Response Rate

- Golden Eagles: 52-83%
- Buteos: 36-76%
- All raptors: 39-78%

DTBirdV4D4 Model from 2015

Bird Avoidance Behavior

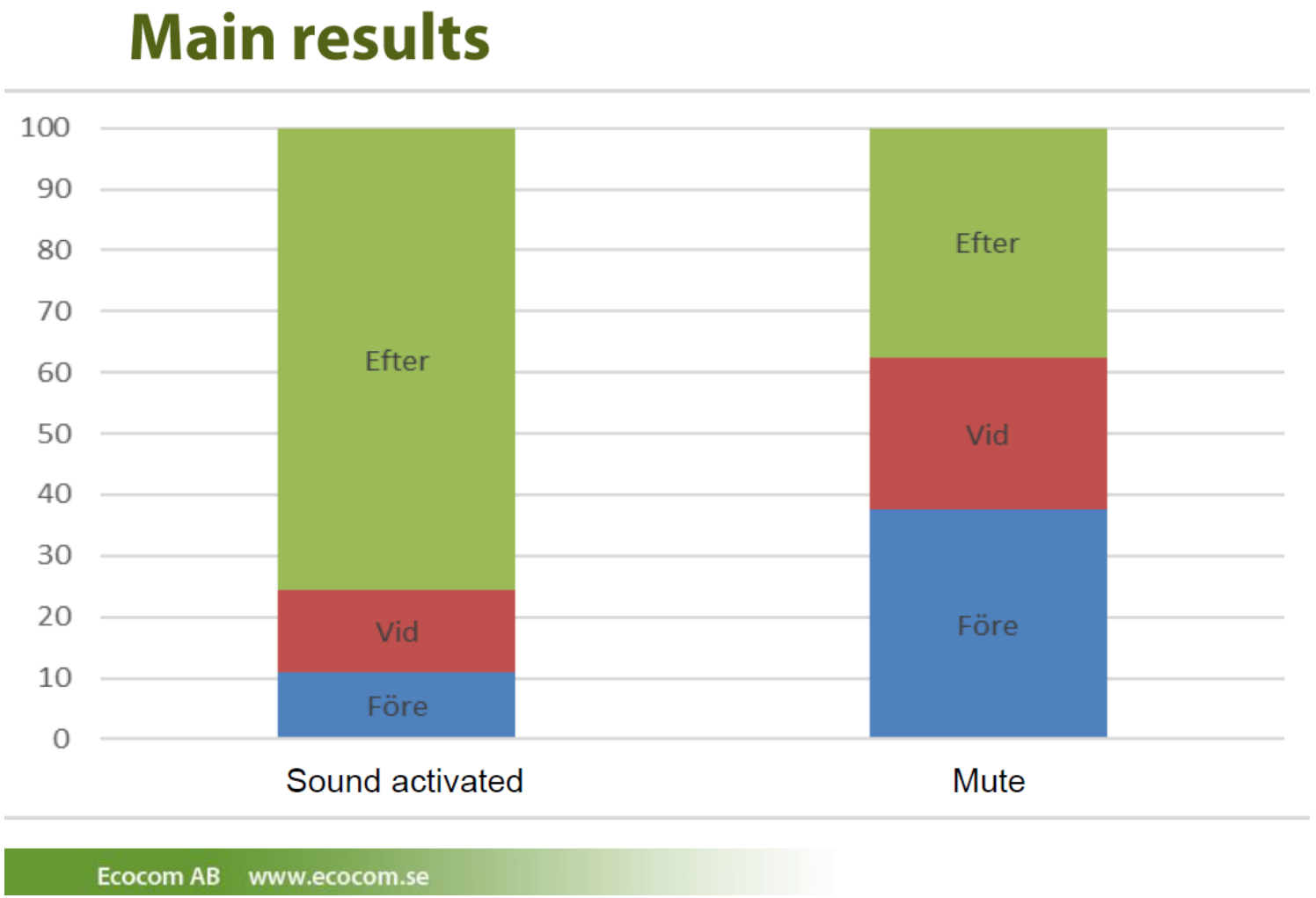
- Reduction Flight Time in Risk Area: 61-87%
- Increase in Bird Avoidance Behavior: 42% (From 46 to 88%)
- Bird Avoidance Behavior: 1.9 times higher (88 / 46%)

Ongoing evaluation DTBirdV4D8 Model of 2019.

dtbird® dtbat
AUTOMATIC & REAL-TIME PROTECTION

DTBird® Collision Avoidance Module. Evaluation

Distribution of bird flight avoidance behaviors with the sound muted and activated.

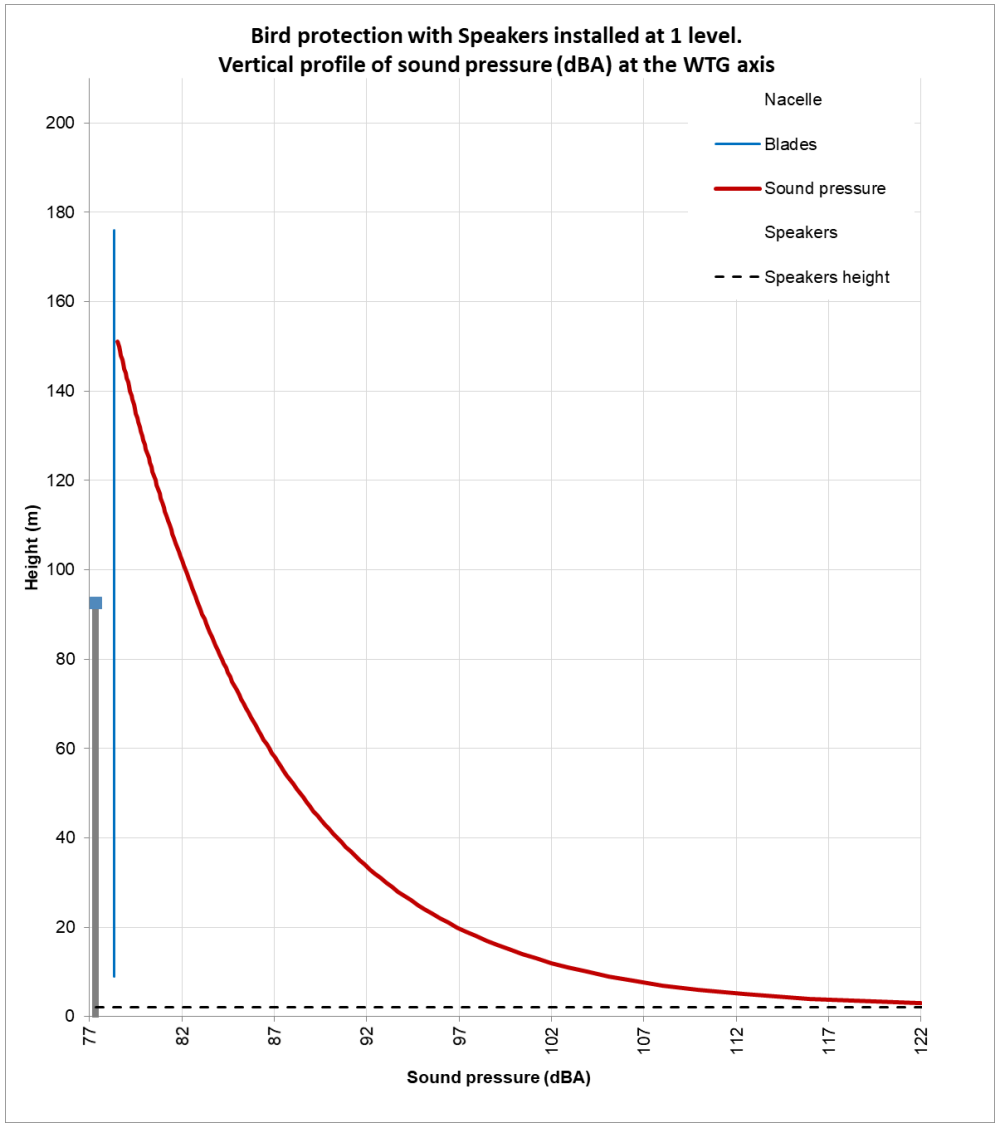


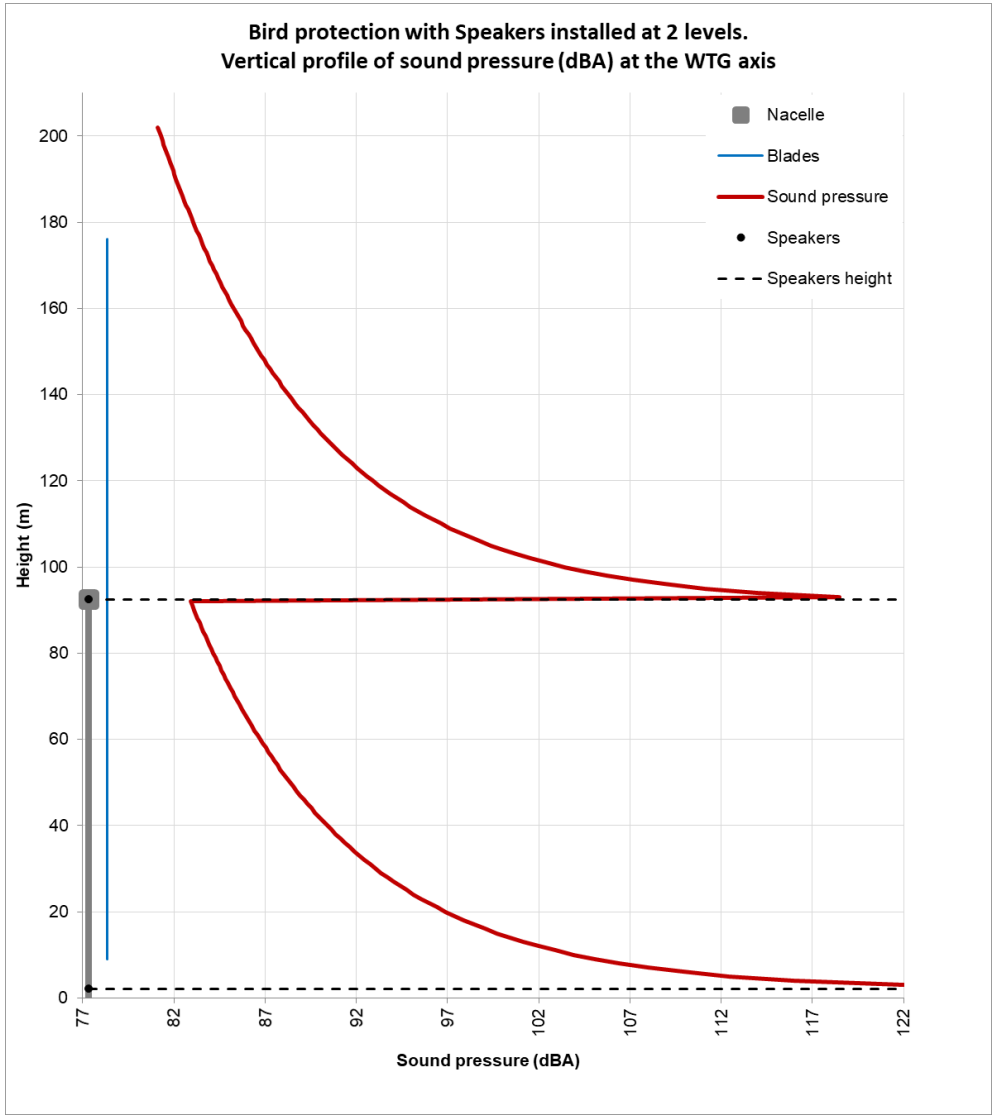
dtbird dtbat
AUTOMATIC & REAL-TIME PROTECTION

Examples of White-tailed Eagle showing avoidance behavior after DTBird® Collision Avoidance Module sound emissions

dtbird® dtbat.
AUTOMATIC & REAL-TIME PROTECTION

DTBird Collision Avoidance Module. Speakers' location and Sound Pressure





Sound Pressure:

Sound pressure (dB) from a source is reduced by ½ as the distance is doubled.

dtbird® dtbat.
AUTOMATIC & REAL-TIME PROTECTION

DTBird Collision Avoidance Module. Technical proposals on the market

- **1 unique ring of Speakers at low height:**

  Damage to bird's hearing > 120 dBA

  Lack of efficiency < 120 dBA

versus

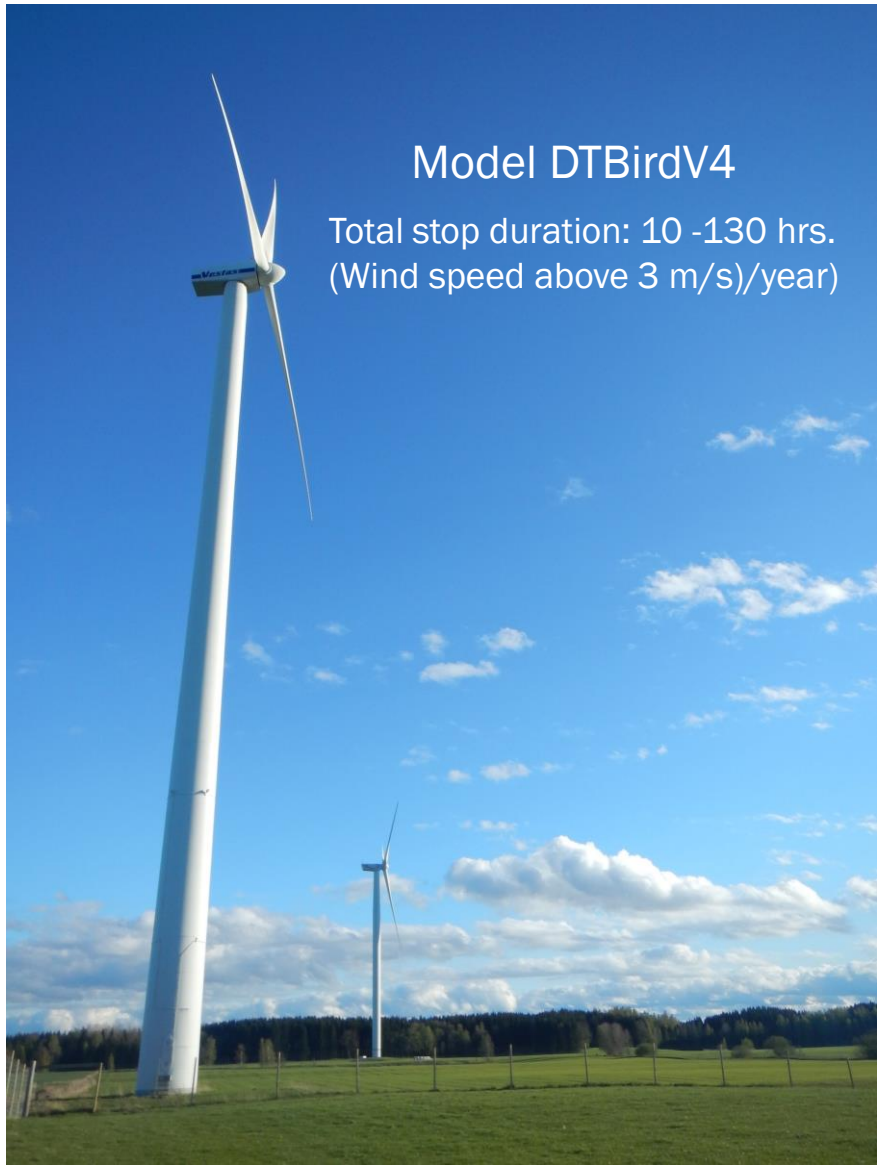
- **2 rings or more of Speakers**

To Highlight

For large WTGs, technical proposals with 1 unique ring of speakers do not fulfill minimum scientific requirements.

dtbird® dtbat®
AUTOMATIC & REAL-TIME PROTECTION

DTBird® Stop Control Module



- Automatic Stop & Restart
- Stop Control Protocols Customization
- FP rate/day: <0,25
- Efficiency Bird Collision Risk Reduction: 10 - 80%
  - WTG Communications protocols
  - WTG Stopping time
  - DTBird® Stop Control Protocol
  - DTBird® Model Detection Distance for Target species

dtbird® dtbat
AUTOMATIC & REAL-TIME PROTECTION

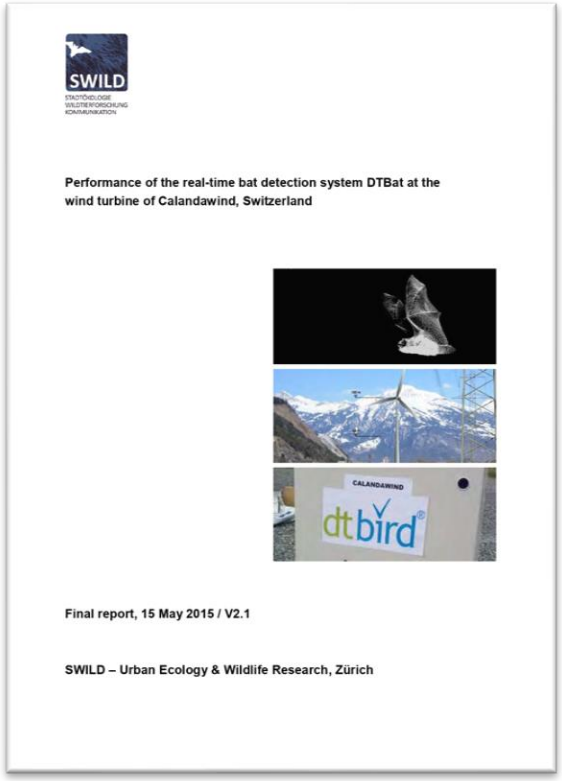
Example of WTG Stop with DTBird® Stop Control

dtbird® dtbat.
AUTOMATIC & REAL-TIME PROTECTION

DTBat® Stop Control Module. Evaluation

- 89,2 – 92,1% Bat activity within the Automatic Stops

DTBatD2 Model from 2014


SWILD

Performance of the real-time bat detection system DTBat at the wind turbine of Calandawind, Switzerland

Final report, 15 May 2015 / V2.1

SWILD – Urban Ecology & Wildlife Research, Zürich

Upgrades

- Dynamic stop time: eg. >1 Detection in last 15 min
- FP Detection rate: <4%

dtbird® dtbat®
AUTOMATIC & REAL-TIME PROTECTION

Latest Upgrades

300% increase in MDD

200% increase in videos quality in DAP

Species identification improvement in video review up to 85%

New housing for cameras

24/7 Thermal cameras

<0,25 False Positives Shutdowns per day < 3min/stop

Cybersecurity standard IEC-62443

Improvement of Automatic failure alerts system

dtbird® dtbat®

AUTOMATIC & REAL-TIME PROTECTION

Coming in 2022

Detectability

Reduction of False Positives

Detection pictures. Height and distance estimation

Automatic species/group identification

dtbird® dtbat®

AUTOMATIC & REAL-TIME PROTECTION

Thank you for your attention

Contact: arioperez@dtbird.com

Visit us

www.dtbird.com

www.dtbat.com

DTBird & DTBat

@DTBirdSystem

DTBird & DTBat

DTBird & DTBat