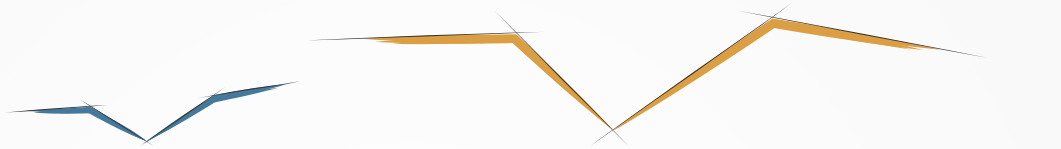


CLEAR FLIGHT

SOLUTIONS

Robirds, Robot Falcons

The Company

Founded in December 2012

2012:	UVS International Innovation Award
2013 & 2014:	STW Research Grants: €225K
2015:	€1.6M investment Cottonwood Technology Fund
2015:	Start-up of the Year – Region Twente
2016:	euRobotics Technology Transfer Award

Currently:	13 employees
	2 interns

Habituation

- Birds have a cognitive ability
  - They can be taught to make a distinction between "*same*" and "*different*"

    AA same as BB different from AB
  - They can learn to make a distinction between "*harmful*" and "*safe*"
  - Recognize objects and situations
  - Recognize "*cause and effect*"
- Birds (like Corvids) share experiences
- Birds have good memory

Response

Only flapping predators hunt

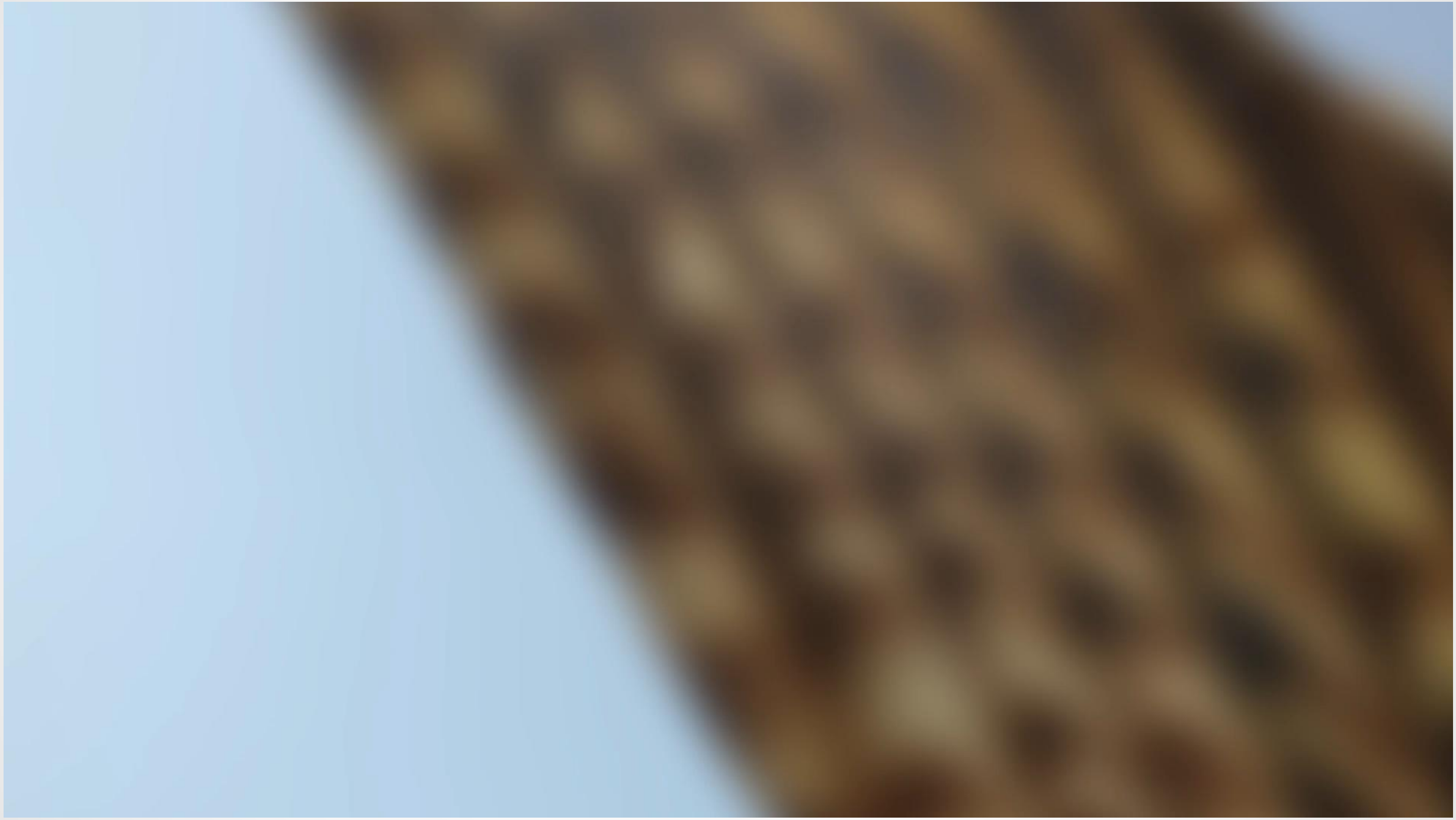
- Flying costs energy
- Gliding predators do not hunt

Birds reaction to a predator

- Fly up
- Flock together
- Outclimb the predator

We create birds

CLEAR FLIGHT
SOLUTIONS



The Robirds

Perceived predation risk: Instinct

- Silhouette and wing movement
- No habituation
- Vectoring

Long-term behavioral change

Completely controlled predator

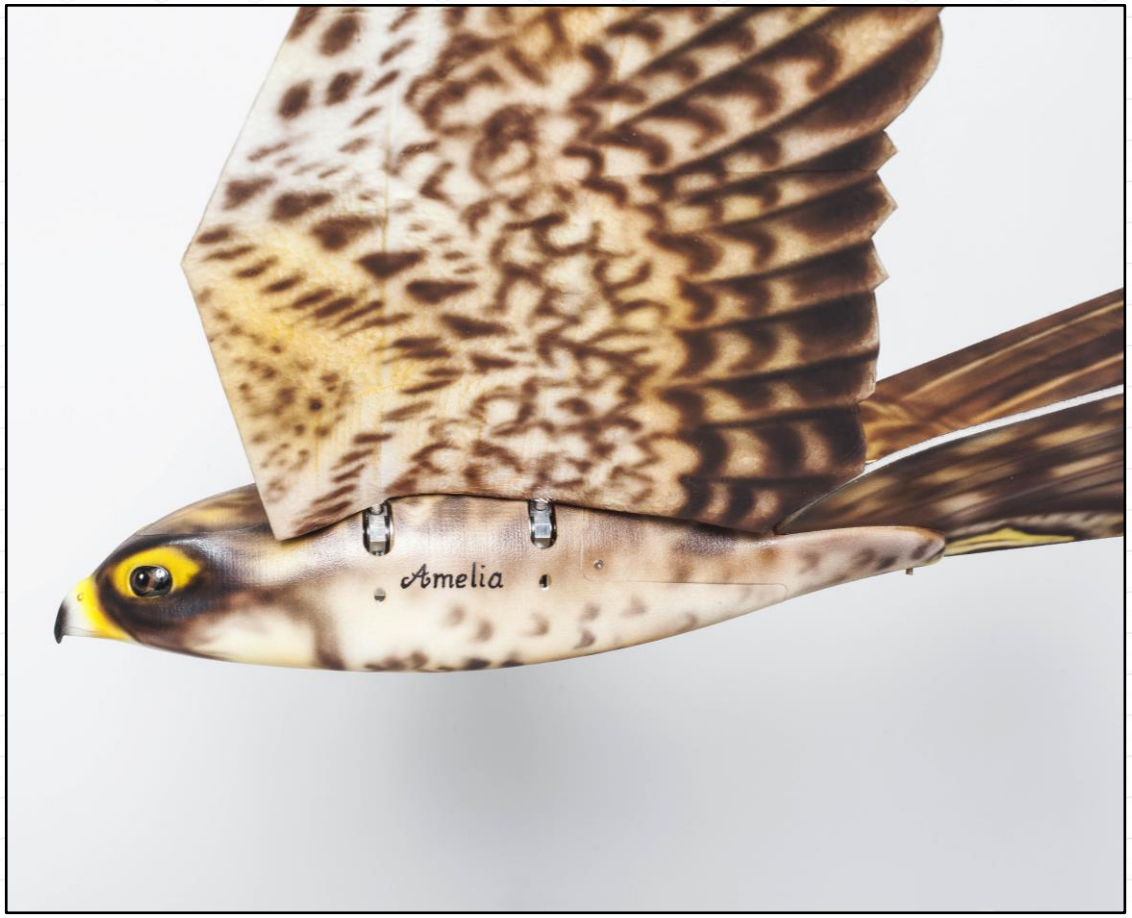
- We are in full control

The Robirds

TOW:	750 gr
Max flight time:	12 minutes
Propulsion:	Flapping wing
Max airspeed:	20 m/s ; 38 kts

Safety procedures:

- Low battery
- GPS loss
- C2 loss
- Geofence
- Catastrophic failure



Bird Control

- Waste management
  - 70 - 95% reductie van populaties
- Fruit sector
  - 60 - 99% reduction of bird populations
  - Up to 20% yield increase
- Offshore artificial island building
  - 98% reduction in nest building
- Airports Start 2016/2017
  - Schiphol Airport
  - Germany/France/UK/USA
- Harbours Start 2016/2017

Safe operations at airports

Safety comes forth out of THREE factors:

The human	The human must be aware of risks
The machine	The technology can help mitigate risks
The procedure	The procedure should minimize risks realistically

Together these lead to trust in eachother: The operation is safe

TRUST is everything: Nobody wants to cause danger!

Düsseldorf Weeze Airport

Procedures

- Cut up the area in sectors of 1 km^2
- 2-way radio and phone (2 numbers): Call in operations in a sector, call out when done
- ATC always knows if and where we are active

Operational limits:

- Altitude 50m AGL (160ft) – Geofence active
- Separation of >100m from active runway – Geofence active
  - Building up trust, built up in steps: 250m – 200m – 150m – 100m
- Special flight patterns: Never fly perpendicular towards a runway

Communication

Explain operations to:

- Airport personnel They love it!
- Airlines They love it!
- Pilots They love it!

There is literally no safer place to fly a drone than inside a CTR

(as long as you've got permission of course)

Important lessons

- No need for continuous radio contact
- No need for transponders: They already know in which sector we are
- **Trust eachother**: No-one wants to cause danger
  - Example: SAR helicopter crossing the airport.
  - ATC did not even notify us in particular. When asked: “The helicopter was way higher, and you don’t come higher than 50m AGL, you guys always stick to the rules. And you have an observer, and you listen to the general radio. There was no need to specifically inform you of the crossing”

With the right, simple, procedures there is no reason not to allow operations of small drones inside a CTR

Locomotive Act 1865

“ […] effectively stopped innovation in powered road transport […] for over a quarter of a century”

Farnborough Airshow 2016

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