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2021 Bird Strike Committee USA Meeting

August 16, 17 and 19, 2021

ROBOTIC FALCONRY

Bird Hazard Prevention

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Committed to safe and efficient airport operations

1. Bringing Innovation into Avian Control.
2. Research in Key Infrastructures.
3. The Shepherd.
4. Safety Features.
5. Emergency Modes.
6. Operation: EVLOS.
7. Current Operating Locations, experiences.
8. Case Study: Ceuta Heliport - Spain.
9. Our Service: Main Features.
10. Conclusions.
11. Extra Feature: Airport Perimeter Security.

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Bringing innovation into Avian Control

Our **Shepherd** UAS provides positive control over all species of birds on and surrounding the airport.

Technology developed by Ornithologists & Engineers, then field tested by Airport Operators.

75% bird removal at Key Infrastructures

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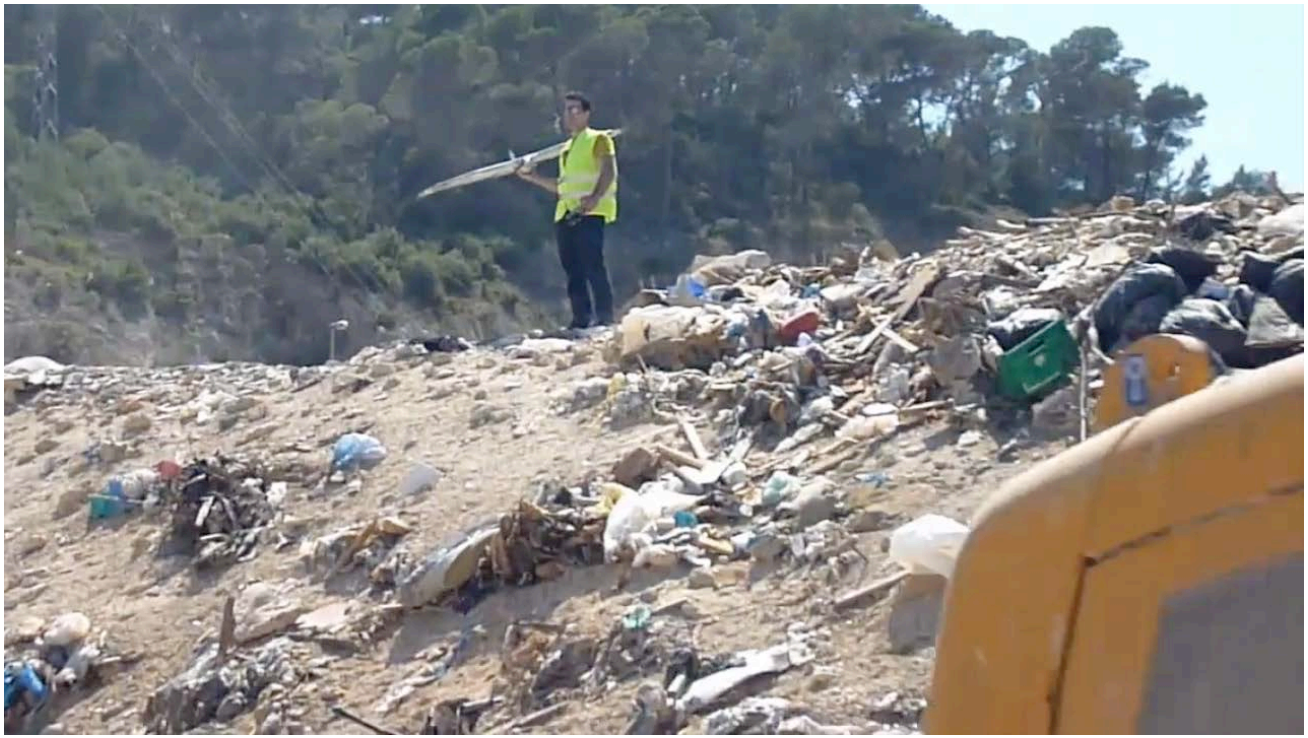
Research at Key Infrustructures

- **Landfill - Ibiza, Spain:** Yellow-legged and Lesser black-backed Gulls (*Larus michahellis and Larus fuscus*).
- **Fish Farm - Vigo, Spain**: Great Cormorant (Phalacrocorax carbo).
- **Port of Vigo, Spain:** Yellow-legged (*Larus michahellis)*.



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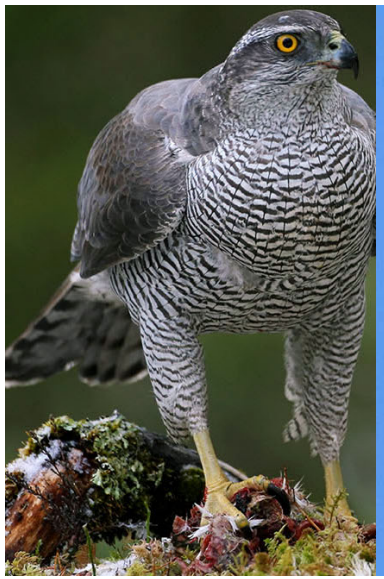
Research on Effective Removal Patterns



Northern goshawk - *Accipiter gentilis*

Species		Hunting Pattern*	Shepherd Pattern*
Gull		< 25%	< 25%
Cormorant		< 25%	
Black kite		< 25%	
Heron		< 25%	
Gannet		< 25%	
Passerine		< 25%	
Vulture			< 25%

*Observation: % of birds that stay in the Shepherd flight Area

- >75%: Only few birds fly away from the Shepherd flight area
- 50-75%: Most birds stay in the Shepherd flight area
- 25-50%: Most birds fly away from the Shepherd flight area
- <25%: Only few birds or none stay in the Shepherd flight area

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Traditional methods

- Proven non-effective
- High Cost
- Short Lifespan
- High Maintenance
- Seasonal/Weather Restrictive
- Time Consuming
- Disruptive to Air Traffic
- Not Wildlife/Eco-Friendly

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Our solution: Robotic Falconry

We've successfully taken Falconry, the most effective method of bird control, one step further.

Enhanced the positive

- Absolute flight control
- Increased endurance
- Piloted or automated flight

Eliminated the negative

- Not affected by illness
- Indefinite lifespan
- Independent of human factors
- No care or feeding

ROBOTIC FALCONRY

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The Shepherd

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Shepherd Specifications

- Water & wind gust resistant: > 25kt
- Average removal time: < 2 min
- Operation: Day/Night
- Maximum Operational radius: 10 Km (5,4 NM)
- Endurance: 55 min (rechargeable batteries)
- Length: 0,85m (2,8 ft)
- Wingspan: 1,65m (5,4 ft)
- Weight: 2,9Kg (6,4 lbs)
- Speed: 30-42 knots
- Range: 10 km
- Deployment time: <6 min
- Typical operating altitude: 65-985 ft AGL

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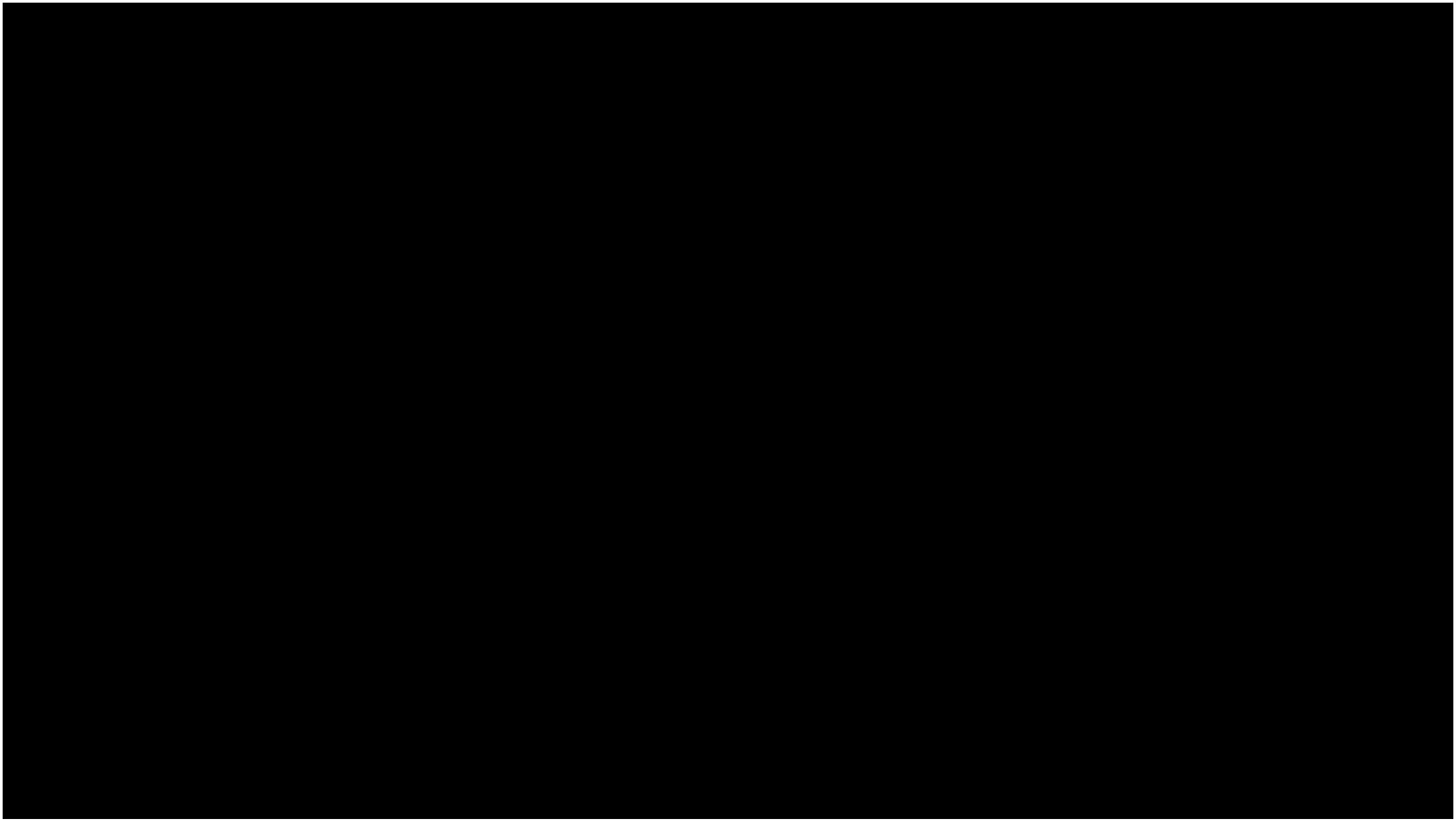
Safety features

- Autopilot
- Fail-safe
- ADS-B Transponder transmitter/receiver
- Sense-and-avoid
- Front Camera
- Lateral camera
- No-fly Zones
- Emergency Modes
- Encrypted Communications



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Emergency modes

Loss of GPS signal

- Orbit until GPS is recovered. Pilot may disconnect the autopilot and fly it manually Home.

Loss of Communication

Following Options to be set before the flight:

- Established Flight Plan / Emergency Flight Plan and land Home.
- Fly Home and Land, avoiding Prohibited Zone (runways, etc.).
- Our UAS Orbits until Communications are recovered.

Joystick fail

- Established Flight Plan and land Home.
- Land Home.

Low Battery and Loss of Communications

- Avoid Prohibited Zone and land Home.

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EVLOS Operation

- Extended Visual Line of Sight.
- The Airport Personnel and the ATC Personnel will be in touch with the UAV operator whenever it is necessary.
- The pilot will be able to see all aircraft at and near the aircraft (to be configured as desired) on his screen, as the transponder is able to receive the signal from other transponders, as well as transmit.

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Current Operating Locations and Experiences

- Sevilla Airport – AENA, Spain.
- Ceuta Heliport – AENA, Spain.
- Jose Martí, La Habana and Varadero International Airports, CUBA.
- Jorge Chavez International Airport, Lima, PERU.
- DEMO for Seattle Tacoma Airport – SEA, US.
- DEMO in Baltimore, US, at WBA North American Conference.
- DEMO in Rota and Moron – USN and SAF Bases in Spain.
- DEMO in Panama – PTY.

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Case Study: Ceuta Heliport - Spain.

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Case Study: Ceuta Heliport – Spain.
Problem Description.

- Great amount of birds in the approach routes.
- Special attention to the Audouin's gull mating season
- Local ecologist organizations do not allow shot guns or noise to be applied.

Case Study: Ceuta Heliport – Spain. Objectives.

Demonstrate we are able to operate safely and efficiently, so that an annual contract is signed with Spanish Airport operator AENA (World's leader airport management company: 46 airports and 2 heliports in Spain and has direct and indirect shares in another 23 airports: one in Europe (London Luton airport, of which it owns 51% of the share capital) and 22 in the Americas (6 in Brazil, 12 in Mexico, 2 in Colombia and 2 in Jamaica). Next step will be signing an annual contract to operate in Seville International Airport: 7,6M passengers in 2019.

The local wildlife in Ceuta is:

- **Yellow-legged Gulls (Larus michahellis)**
- **Lesser black-backed Gulls (Larus fuscus).**
- **Great Cormorant (Phalacrocorax carbo).**
- **Audouin's gull (Larus audouinii)**
- **Black kite (Milvus migrans)**
- **Heron (Ardea cinerea)**
- **Gannet (Morus bassanus)**
- **Passerine species**

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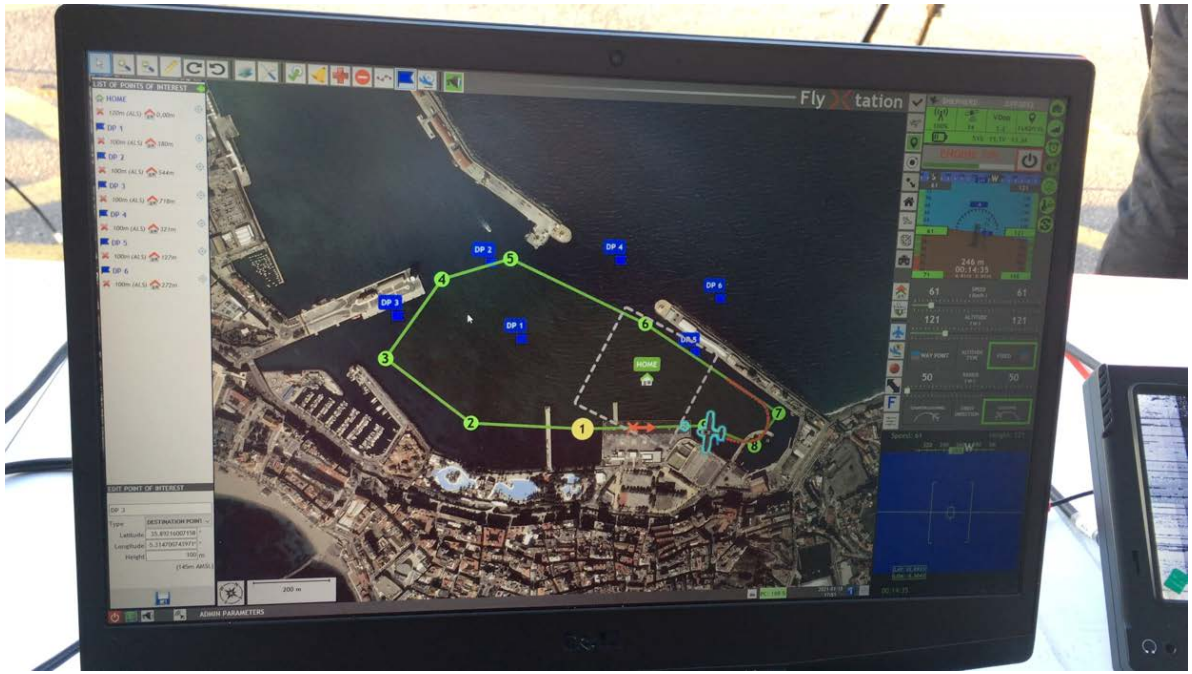
Case Study: Ceuta Heliport - Spain.
Operation Details.

- Approximately 6 flights a day, 45 minutes per flight, assuring 10 minutes extra endurance just in case an emergency occurs.
- 6 weeks operation and 1 week bird census
- Our team: Arquimea VP Safety, 3 pilots, 2 ornithologists.



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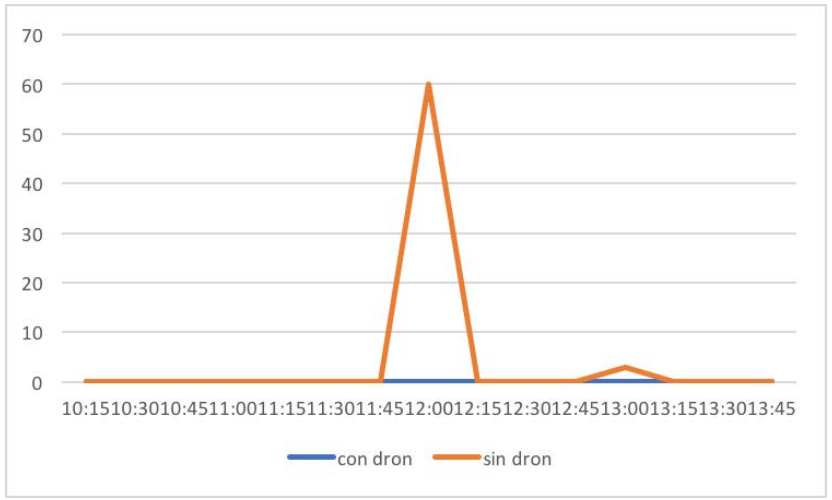
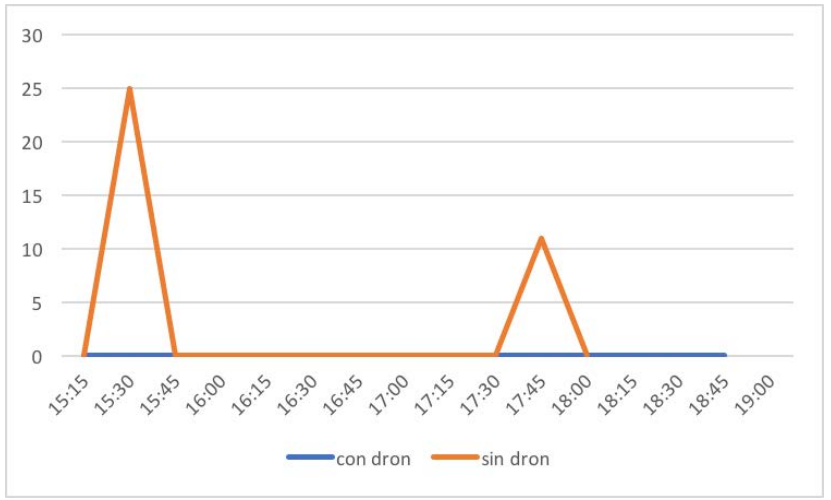
Case Study: Ceuta Heliport – Spain. Results. Birds at Final Approach and take-off Area.





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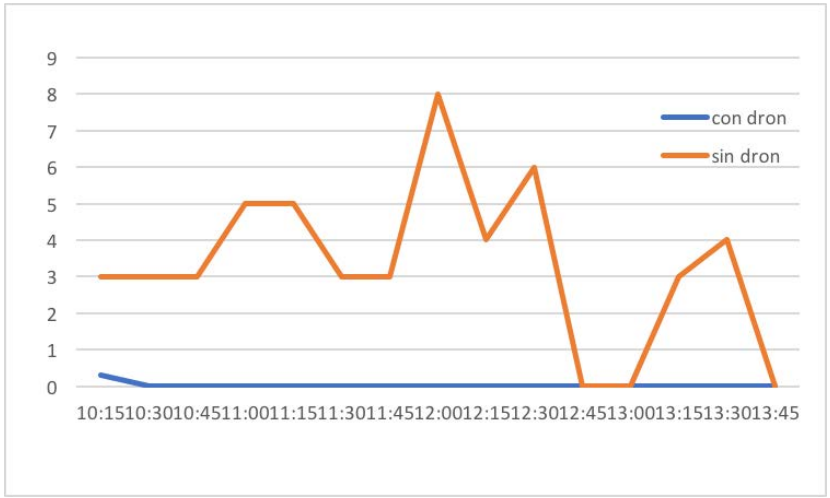
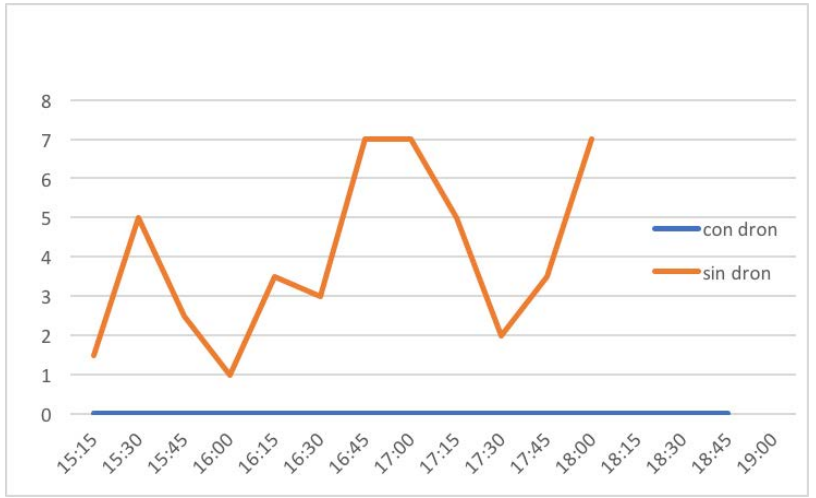
Case Study: Ceuta Heliport – Spain. Results.
Birds at runway aftwr UAS flight.



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THE WORLD´S FIRST EFFECTIVE ROBOTIC FALCONRY
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Our Service: Main Features

- Airport Avian Wildlife Analysis.
- Recruitment, Evaluation and Training of Drone Operators.
- Bird Control Service 24/7 or as required.
- Provide Airport Authorities with Regular Reports and Updates IAW SOPs.
- Assured Flight Readiness of Drones.
- Regular and Recurrent Training of Operators and Maintainers.
- Technical Upgrades.
- Other services as required.

Partnerships

ICAO
TECHNICAL CO-OPERATION BUREAU

aena

ferroNATS

World Birdstrike Association

COPAC
COLEGIO OFICIAL DE PILOTOS DE LA AVIACIÓN COMERCIAL

AAAE

IATA | Strategic Partner

ACI AIRPORTS COUNCIL INTERNATIONAL

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Conclusions

- **Safer.**
- **Innovative.**
- **Cheaper:** less accidents, lower insurance rates, etc.
- **Animal friendly.**

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Extra Feature: Airport Perimeter Security

1. Securely established flight plan.
2. Double camera precision.
3. Natural, biological look, performing discreetly.

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