



BCMS Bird Concentration Monitoring System



Birds & Drones detection System

Natural innovation

THE EDGE COMPANY S.r.l.

Viale della Repubblica 74 - 47923 Rimini - Italy - Cap. Soc. IV: € 816.327. - R.E.A.: RN-402033. - P.IVA: 04325430405 - www.theedgecompany.net

Background



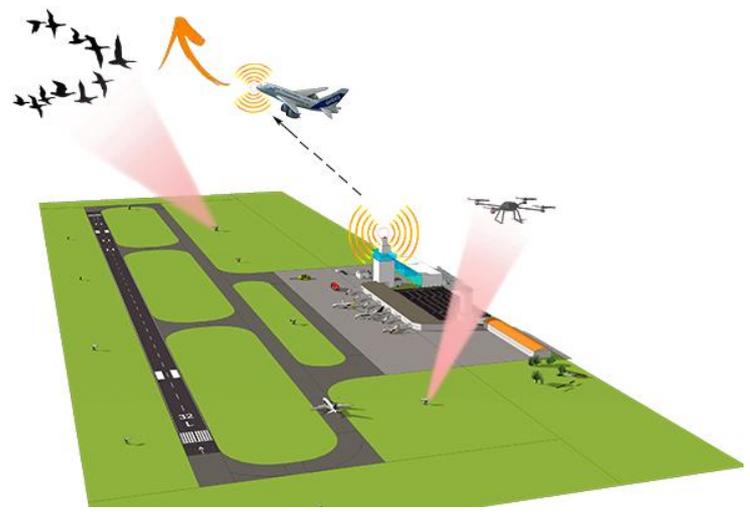
The B.C.M.S.® VENTUR born from a deep knowledge of the specific aerospace domain. Designed by the founder and CEO of the **EDGE** company that Back in 1999, as Chief of Flight safety of the Italian Air Force 5th fighter wing conceived a method to fight the F.O.D. and bird strike issue, establishing a team, so called NFA, entirely focused to this.

After the first 12 months of activity, the bird strikes recorded were reduced by 70% compared to the previous year!

At the beginning of the years 2000, the F 16 was introduced by the Italian Air Force. After one operational year, the US Government sent a letter to recognize the excellent job done since the recorded incident rate (related to F.O.D. & Bird Strikes) was almost the same as the USAF, that was using the F 16 for thirty years. The Italian Air Force extended the method to all its Flying units, subsequently also the Civil aviation introduced the same concept establishing the BCU.

Il Bird Concentration Monitoring System® “Ventur”

The combination between experience and the most advanced technology produced the B.C.M.S.® VENTUR, the first birds and drone's detection system in the world based on artificial intelligence, totally automatic, able to identify, position in 3D space, track, count and recognize the species of birds, and drones. It does what no other system in the world is capable of doing, and that is why it represents a revolution.



VENTUR is a modular and distributed system based on cameras. It was designed to reduce the impact of the bird strike phenomenon, a phenomenon that, as shown by world statistics, is constantly growing. It is evident that current systems fail to give an adequate answer to the problem:

they are ineffective, expensive and, in some cases extremely complex.

	Ventur	Manned	RADAR
Constant coverage	YES	NO	YES
Species classification	YES	YES	NO
# of birds definition	YES	NO	NO
Dispersal system activation	YES	NO	N.D.
Data collection & reporting	YES	YES	NO
CapEx and OpEx	LOW	HIGH	HIGH

VENTUR is absolutely

respectful of the **environment**. It has no emissions of any kind and allows eliminating the bloody activities perpetrated against the birds. We know that it is possible to increase flight safety without sacrificing animal life.

BECAUSE WE HAVE ALREADY DONE IT.

The system is developed in partnership with the University of Verona responsible for the research phase and eVS, a leading company in the field of computer vision that is responsible for engineering. Italsicurezza is the system integrator.



Our goal is to find partners willing to face the challenges we have set ourselves.

AWARDS

The B.C.M.S.® is getting more and more attention. The system has been awarded with several prizes demonstrating the innovation value of the proposal.

- ⇒ Smart & Start Italia. Public tender by the Ministry of Economic Development
- ⇒ Nuove Idee Nuove Imprese. Business competition by Industrial association
- ⇒ Business competition in Skolkovo (RU) during SUV 2018 where we have been ranked second
- ⇒ the **EDGE** company is one of the 10 startups selected worldwide by the French accelerator The Camp de "Le village by C.A."

Moreover, the **WWF** Oasi provided a letter of interest acknowledging the built in ecofriendly distinctive features.

The **Italian Civil Aviation Authority** (ENAC) officially stated its interest to follow and eventually be involved in the testing phase, recognizing the huge step ahead the system represents in the bird strike prevention.

HOW DOES IT WORKS

Up to 10 intelligent cameras, equipped with our proprietary machine and deep learning algorithms, will be positioned so as to cover the entire



area of interest. VENTUR Automatically and continuously observe the area so as to monitor and capture changes in real time. The system is modular, so bigger area may request more modules. Bird classification happens in real time, as well as counting and positioning. On request, VENTUR activates the most appropriate dispersal systems. Beside **AI** algorithms, also "a priori" information – I.E. statistics, orography, system and characteristics of the birds, etc. – are input to the system to significantly increase its accuracy and effectiveness.

System Output

1. The system generates alerts that include:
 - Detection area
 - Species classification for birds
 - Number of objects
2. Warning messages will be archived for at least 7 days
3. The operator will be able to select and recall any recorded sequence
4. The operator will be able to select a specific camera to watch live video
5. The operator will be able to take control on a selected camera. In this case video analysis will be disabled
6. In the event of a false alarm, the operator will insert it into the system as a false alarm and the system will learn from it
7. The system will issue warning messages in case of malfunctions due to:
 - System problems
 - Performance degraded due to external factors

NOTE. By operator we mean anyone that have access to the video management system.
Could be Bioenvironmental team member, as well as control tower operator.



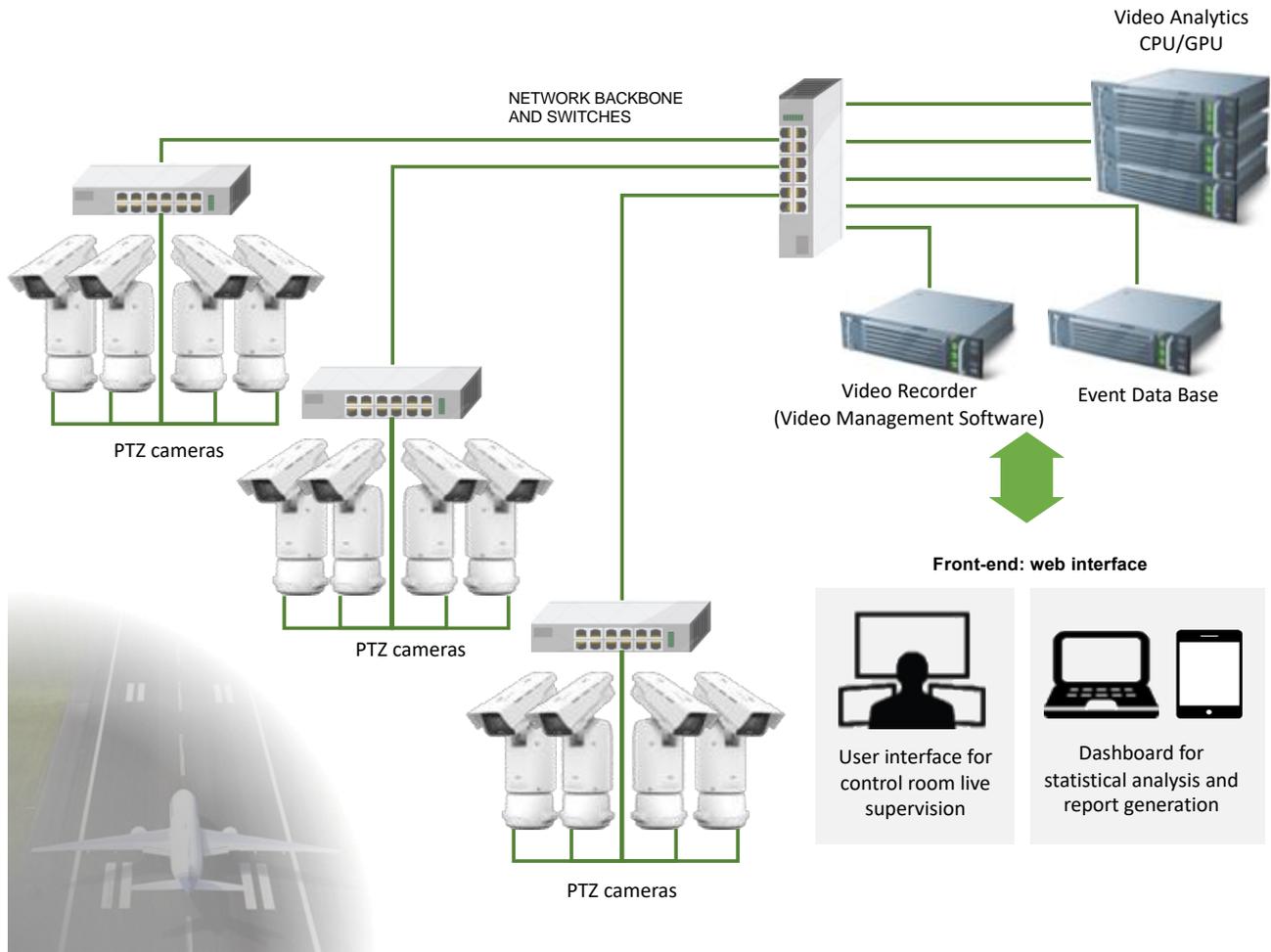
Expected results

Expected performance at the time of installation and before the system training, that would ideally last 12 months.

1. Detection accuracy > 80%
2. Generation of false alarms per camera < 10 E / hour
3. Error counting margin < 30%
4. 30% localization error
5. Classification accuracy > 60%
6. Latency between detection and recording < 180 seconds

Testing carried out as of now show that these results are not only reachable but extensively improved. In fact, we obtained **96%** of **true positive rate** for the detection and tracking module COMPARED TO THE 80% EXPECTED.

Architecture



VENTUR needs, to be effective and efficient of 10 "intelligent camera modules" for an airport with a 3 km Runway.

Future development

1. Cooperative and adaptive cameras. Cameras will be able "to talk" each other to better track and identify objects. Area scanning strategy will be automatically adjusted based on data collected. I.E. if the system detects and recognize an area where concentration is higher than other areas, the scanning pattern will give priority to this specific zone.
2. Connection to weather stations to enable prediction functions
3. Interface with approach radar for calculation of aircraft-bird trajectories and issue alerts according to:
 - Probability of impact due to crossing trajectories
 - Type and number of birds
 - Associated risk

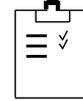
Value proposition

BCMS
Bird Concentration Monitoring System

The Bird Concentration Monitoring System® commercially called VENTUR uses Artificial Intelligence 1st and only system in the world on board of smart cameras to detect, track, position and classify Bird Species _ only system able to do it _ to make take off and landing safer. MORE, differently from a Radar it is able to detect DRONES



Solution



Job to be done

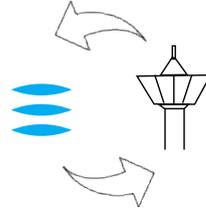
Rife. Regulation (EU) No 139/2014
The aerodrome operator shall:

1. assess the wildlife hazard on, and in the surrounding, of the aerodrome;
2. establish means and procedures to minimize the risk of collisions between wildlife and aircraft, at the aerodrome; and
3. notify the appropriate authority if a wildlife assessment indicates conditions in the surroundings of the aerodrome are conducive to a wildlife hazard problem.

1. **EFFECTIVE:**
 1. Constant coverage of the designated area;
 2. Species classification to increase prevention and dispersal effectiveness;
 3. High accuracy in terms of detection, counting, positioning and classification
2. **GREEN.** No emission at all. Fully respect natural habitat and avoids cruel activities against birds; and
3. **EFFICIENT.**
 1. Automatic. No need for specific supervision or specialized personnel
 2. Automatic reports to better asses wildlife hazard
 3. Prediction



Advantages



Problems

Actual systems are ineffective. Statistics show an increasing incident trend world wide;

1. Radar systems are EXPENSIVE and their efficacy is poor. Rife 29th meeting of the International Bird Strike Committee, Cairns (Australia) 2010; current stage of bird radar system ; and
2. Every time and impact occur or a drone flies over an airport there is a huge mediatic effect with immediate reputation consequences .

1. Incidents reduction;
2. Processes optimization
 1. Objective and automated monitoring
 2. BSRF creation
3. Cost reduction.
 1. Personnel doesn't need constantly survey the area any more
 2. Much much convenient than a Radar



Relieves



Expectations

Incidents reduction;

1. Processes optimization; and
2. Cost reduction.

FAQ

Does it see birds on the ground?

Yes, can see birds in flight and on the ground.

The birds on the ground must be visible to the cameras and move. This is why it is desirable having a grass low cut regime.

Is the system able to classify different species?

Yes. At the beginning the system will be trained on species that statistically represent a greater danger:

Seagull, Pigeon, Hawk, Crow, Magpie.

However, the system is able to recognize different species at the end of its training phases.

Does it see by night?

Yes, thanks to advanced cameras equipped with infrared illuminators.

Does it see with bad weather conditions?

Yes, but with limited performance, as happens to humans and other systems. We emphasize that, however, with the fog and bad weather birds barely fly.ì

Is the system ready?

Yes, it is already available. Given the radical innovation, though we understand that partners could see the system implementation as too risky. This is why, together with our partner Leyton, we offer the possibility, to those who decide to install the system in pilot mode, to take advantage of all the benefits offered by the rules on tax credit for research and development activities.

Does the system disperse birds?

It can **automatically** control the dispersal systems.

The system itself has not been designed to disperse birds but, thanks to the technology used it can control with incredible effectiveness the dispersal systems already in use. Its efficacy is maximized when coupled to distress call systems.

Alternatively, it becomes a powerful force multiplier, as it allows to maximize the effectiveness of the teams in charge of managing the bioenvironmental issue, allowing just in time intervention based on system warnings compared to constant site sweeps. Operationally this translate in Opex Optimization (based on our assumptions to have a 24/7 service would be required just 7 people with a 5-day turnaround. This doesn't take in account local and/or specific labor governing rules). Personnel in excess of that number could be then re-employed and carry out different offices.