White paper

Perimeter protection for airports with intelligent video surveillance

Reflections on the service rendered and the return on investment

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AXIS COMMUNICATIONS

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1. Introduction

The protection of a critical site rests on two pillars: design and protection. Aerodromes, a critical infrastructure, must limit intrusion risks by implementing suitable solutions such as physical systems coupled with guard patrols and potentially the additional use of electronic systems.

The methods used to protect the airside reserved area must take into account the aerodrome's operating requirements, in particular aeronautical easements (limits defining obstacles of any kind in the vicinity of aerodromes), the topography of the terrain, specific climatic conditions of the region or site, environmental constraints. This whitepaper aims to explain the current options for protecting aerodromes and the technology used in the solutions.

2. Traditional perimeter protection solutions

2.1 Physical solutions

The solutions usually set up as the first rampart are physical fences in wire or welded mesh, in welded panels or in concrete panels. For the areas nearing radio navigation and communication elements, non-metallic (or "non-magnetic") fences are used. These fences are essential, not only to define the aerodrome boundaries, but also to prevent any intrusion of people or animals. Additional features such as anti-climbing devices, vehicle access routes, anti-crossing devices, foundations, and fence screens can also be added to meet the client's needs.

To enhance security, however, these fences should be equipped with automatic intrusion detection solutions as well, to send an alarm to a monitoring station for further investigation if breaches occur.

2.2 Intrusion detection on fences and gates

There are different types of cable "detectors" available to secure large perimeters. These redirect real-time alarms to a supervisor. Some suppliers offer fences that are equipped with an automatic detection solution.

These solutions, however are not foolproof, often being triggered by animals or bad weather conditions. Without video surveillance, it is impossible to tell if it is a real or false alarm without personnel being dispatched to investigate. Recurring false alarms may lead to the system losing credibility and apathy amongst staff could result in real threats being missed.

2.3 Intrusion detectors outside fences

Other intrusion detectors, such as microwave sensors, infrared barriers or lasers are positioned at strategic locations around the perimeter of the aerodrome. Again these can be constrained by issues such as false alarms and limited detection on distances and heights if the strict installation rules are not followed.

3. How to address the new perimeter protection challenges of aerodromes

3.1 New intelligent video surveillance solutions

The combination of video surveillance cameras and motion detection software solutions, has expanded the capabilities of perimeter protection to range from simple detection to complex intrusion analysis.

One example is thermal (or infrared) cameras, which coupled with video analysis software, can protect an area at any time of the day, irrespective of the lighting conditions. This is perfect for aerodromes as they not interfere with the Air Traffic Management's equipment, but they also respect the installation constraints: installation on existing fences, on buildings or even within the airside zone.

Images from thermal imaging cameras are created from the infra-red radiation emitted by an object, a vehicle or a person. Real-time image analysis can detect any suspicious activity, 24 hours a day, 7 days a week, at distances ranging from 100 to 400 meters. Thus, a few cameras equipped with analytical solutions are enough to monitor the perimeter of an aerodrome, up to several kilometers.

Thermal cameras are formidable and perfectly reliable, even in difficult conditions (rain, snow, fog, smoke, glare, shade), and, coupled with video analysis software solutions, they provide reliable alerts. False alarms are greatly reduced thanks to powerful filtering algorithms.

Cameras can also observe the outskirts of the aerodrome, meaning alarms can then be anticipated by a few seconds or minutes, which can sometimes be decisive in the treatment of an incident. Analytical solutions also make it possible to trigger an alarm according to set rules, for example if a person approaches within 50 meters of the fence it sets an alert, followed by a higher alarm level if that same person breaches the 10 meters zone.

Thermal cameras can also identify the type of intrusion into the aerodrome (vehicle, number of people). Provided there is a suitable level of lighting, facial recognition can then be used to identify the demographics of potential intruders.

4. Costs and service rendered

4.1 Evaluation and measuring the return on investment

To evaluate a perimeter protection solution, it is necessary to consider the global protection of the aerodrome airside, namely physical barriers, associated or not with sensors and software, and to take into account all the costs and services rendered.

4.2 Cost evaluation

The cost estimate is based on the Total Cost of Ownership (TCO). It includes all the costs of the solution throughout its life cycle: the material and human costs, even the possible financial costs. These are the costs of studies, purchase, installation costs of the system, the operating costs, maintenance costs, decommissioning and recycling costs.

4.3 Evaluation of the service rendered

The evaluation of the service rendered must take into account the study of the threat, risks and vulnerability of the aerodrome. If no threat or risk is identified, the service rendered by a technical solution will be relatively small. Conversely, for high-risk sites, technological solutions perfectly complement physical protection solutions and rounds.

Even if the need for the Air Transport Gendarmerie or the Airport Police's daily patrols is not called into question, it is clear that this presence is not enough when 24-hour surveillance is requested on a perimeter of several kilometers. Electronic and computer systems must therefore be added to increase the level of protection. The operators dealing with the video perform a visual check without having to leave their stations, retaining their surveillance capacity throughout the site and only dealing with real incidents. In some cases, the intrusion is avoided by broadcasting messages on speakers to repel the intruders or deploying on-the-ground security services.

4.4 Measuring the return on investment of perimeter protection by technical solutions

A theoretical return on investment is not easy to calculate as all infrastructures are organizationally and operationally different. Therefore it is necessary to assess the future investment and operating costs (cf. above) and to estimate the increase or decrease of future expenses.

First, take stock of all the current expenses related to perimeter protection, which are often spread over different aerodrome services and budgets: safety, operational and financial services. Then assess the installment payments of the current facilities, theoretical future investments and degradation caused by the intrusions happening over several years. By studying the risks and threats to the aerodrome, it is possible to estimate potential expenses.

Investment and operating costs of a perimeter protection solution can be estimated by the project management assistant, specialized consultancy firms, technical solution providers or integrators.

These new expenses can seem quite high at first, as they increase not only investments, but also maintenance and operating costs. However, they reduce other recurring costs, such as fence repairs, consequences of intrusions on the aerodrome and the investment in additional physical protection solutions.

5. Axis Communication's proposal

At Axis, we are convinced that our thermal network cameras, combined with our video analysis solutions, help aerodromes augment a high-security, high-reliability and high-performance overall perimeter protection solution. We believe that the services rendered by such solutions make aerodromes safer, as evidenced by our current references in perimeter protection of critical infrastructures.

In smaller or difficult areas where thermals don't make sense, our radar technology can also will help enhance an overall perimeter protection solution. The Axis Radar technology and intelligent algorithms can detect trespassers who may have breached the first line of defense to enter the aerodrome. Radar Detector detects movement and nothing but movement, 24 hours a day with minimal false alarms as it is not sensitive to common triggers such as moving shadows or light beams, small animals, raindrops or insects, wind, and bad weather. It can therefore accurately raise the alarm, in any weather and at any time of the day or night. Cost savings are made over time as no false alarms means fewer unnecessary investigative costs and a reduced security team as they can focus on real threats. Additional cost savings can also be found by investing in Radar technology, for example, it can trigger a light when something is detected, so there's no need to light the perimeter at night, and Power over Ethernet (PoE) supports fast and easy installation with a single cable.

At a technical level, our cameras are equipped with very sophisticated functions: an Electronic Image Stabilization (EIS) function that manages low and high amplitude movements, several alarm input-output ports in order to connect to external equipment, an advanced compression function (Zipstream) to limit video streams. Our cameras also feature Axis processors with a large capacity, allowing perimeter protection video analysis solutions to be embedded. Several cameras can therefore track multiple events occurring simultaneously in different locations. This so-called distributed technical architecture makes it possible to extend the solution to as many cameras as necessary, while eliminating investments in analysis servers.

Four different types of events are detected, whether for one or more individuals or vehicles:
> intrusion into a predefined area,
> crossing zones in a predetermined order and direction,
> conditional zone crossing,
> the presence of prowlers.

Axis thermal cameras also work with IP speakers to emit automatic messages upon intrusion detection to repel any ill-intentioned person, thus avoiding infrastructure damage.

Axis also offers IP radars, with a horizontal coverage of 120 to 150 degrees. These complement the perimeter protection solution by detecting any movement up to a distance of 50 meters. When connected to a PTZ camera, it is possible to point the camera directly at the detected movement for situation analysis.

All these solutions can be combined. They are integrated directly into the software commonly used on airport platforms (GENETEC, MILESTONE, SEETEC, PRYSM...).

To establish the equipment needed to enable a heightened perimeter protection solution and define the installation cost, both a desk study and an on-site visit are required. Axis also provides installers and design offices with some powerful design software to carry out the complete study of perimeter protection. The global assessment is completed quickly and provides a precise number for the pieces of equipment needed, which is very useful in the case of a preliminary study of cost analysis and return on investment.

Axis remains at your disposal to experiment these solutions on your sites. For more information, please contact Vincent Paumier (vincent.paumier@axis.com, 06 49 40 20 19).

Product references:

IP Thermal Cameras: AXIS Q19
www.axis.com/global/fr/products/axis-q19-series

Analysis Software: AXIS Perimeter Defender
www.axis.com/global/fr/products/axis-perimeter-defender

External IP Speakers: AXIS C3003-E
www.axis.com/global/fr/products/axis-c3003-e

IP Radar
www.axis.com/global/fr/products/axis-d2050-ve

71990/EN/R1/1805

About Axis Communications

Axis offers intelligent security solutions that enable a smarter, safer world. As the market leader in network video, Axis is driving the industry by continually launching innovative network products based on an open platform - delivering high value to customers through a global partner network. Axis has long-term relationships with partners and provides them with knowledge and ground-breaking network products in existing and new markets.

Axis has more than 2,700 dedicated employees in more than 50 countries around the world, supported by a global network of over 90,000 partners. Founded in 1984, Axis is a Sweden-based company listed on NASDAQ Stockholm under the ticker AXIS.

For more information about Axis, please visit our website www.axis.com.

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