TITAN™

Total Situational Awareness (With No Blind Spots)

What is Situational Awareness?

Situational awareness is a concept closely involved with physical security information management (PSIM, see other white papers on this subject on our website). It is usually defined as being aware of what is happening around you, at or near your physical location, or at some other location where you are supposed to be or where there are assets or people that you must protect. It is an important idea in the context of both safety and security and is especially relevant where there is a possible risk or threat to the security of assets or the safety of people.

Situational awareness depends on perspective: if you don't have a view of what is around the corner / beyond the fence / out there in the dark, then you cannot be aware of any imminent threat located there. So situational awareness varies from person to person depending on their location and also the perceptive tools available to them. Such tools include radio contact with observers at different locations, vision enhancement such as thermal imaging or binoculars, statistical data regarding the probability of a given type of incident at a particular location (e.g. crime stats by post code), CCTV, radar, intelligent fence, and video analytics.

There are two major contexts in which to consider situational awareness: firstly personal safety and secondly the physical security of people and assets for which you have a safeguarding responsibility. The focus of this white paper is the latter and the overall context is that of Physical Security Information Management. In this sense situational awareness is the result of an effective surveillance system.

> **Situational awareness is about important security questions such as:**
> **What's going on right now?**
> **What's coming this way?**
> **What's near me?**

The goal of this white paper is to present a model to help you use the situational awareness concept to improve your own organisation's security. We offer a practical method to plan improvements.

Surveillance is about Risk Management

The correct approach to designing a surveillance system for maximum situational awareness is to start with a robust analysis of risk. There are several popular methodologies that you might consider as a starting point to analyse and manage risks and the most helpful in terms of designing a surveillance system is known as the Bowtie Model (although a Fault Tree or even a simple list-based risk assessment is also a useful starting point).

A risk model based on the bowtie places the unwanted event as the knot at the centre of the tie. To the left we see a list of potential causes of that event and to the right we list potential consequences. The best way to understand this is to consider an example: let's say that the incident we want to prevent is an incursion by an unauthorised individual onto an airport runway. We can start by listing potential causes and consequences:

Causes	Consequences
Break in the fence	Harm to the intruder
Fence is easy to climb	Harm to airport staff or the public
Lag time between alert and response	Damage to airport property
No alert or visual in night time darkness	Damage to airline property
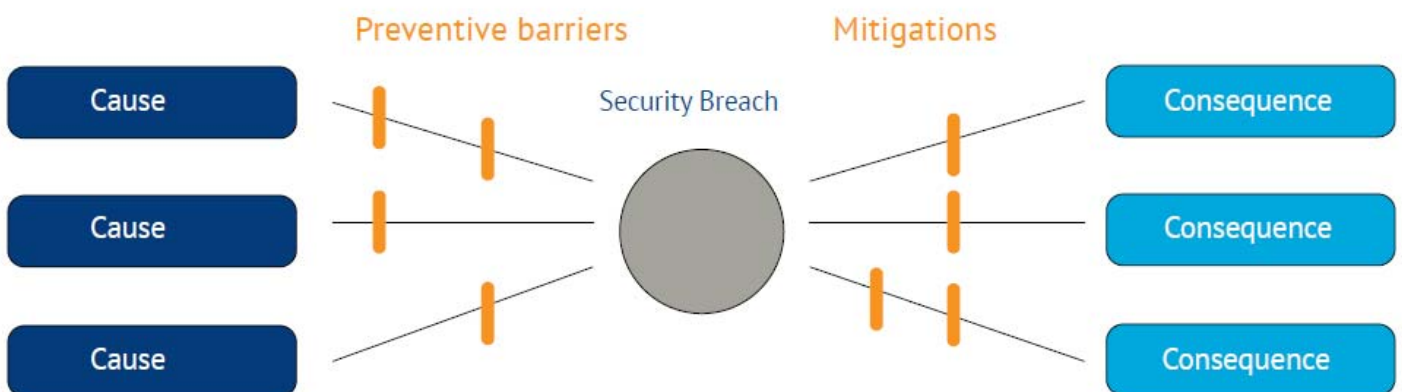
From here we can really start to build out the bowtie model of the risk by adding in the preventive barriers and mitigating control measures. For example, preventive barriers to some of the causes listed might include video analytics that scan the perimeter for zone breaches, intelligent fence that automatically reports integrity flaws, infrared cameras that can see in the dark, and so on. Similarly on the consequence side of the bowtie model, mitigating responses would include such cause-effect automation as workflow management for responders, automatic alarms linked to the video analytics, automatic paging alert system for airport police.

In the context of surveillance, the most effective preventive barriers are those that increase situational awareness by giving very early notice that an event is occurring or, better still, about to occur: CCTV, video analytics, radar, infrared thermal imaging, PIDS, especially when these are integrated through to the command and control centre in a PSIM system such as Titan Vision.

Essential technologies for total situational awareness

- An integrating PSIM system that is open protocol.
- A range of camera types including PTZ, fixed dome, 360 and thermal.
- Advanced video analytics / VCA.
- Radar.
- PIDS.
- Human surveillance (patrols, system operators) optimised via technology.

Perimeter Intrusion Detection Systems

PIDS, also known as intelligent fence, works by vibration sensing where the frequency range of intruder activity falls within the alarm bandwidth of the fence's built-in sensors.

Where to use it:

- Where the terrain and length of the perimeter suits a fence.
- Where a fence needs to deter by simply being there.
- Where the perimeter is long enough to require automated cause and effect (a small guarded area might only need VCA).

Range of Cameras

Systems needs to include cameras that suit the scenario and that can be integrated effectively so that they form part of the automated response to a breach. All cameras should be compatible with video analytics and thermal cameras should be included for night time vision, especially to cover sensitive areas like an airfield or the marginal zone around a petrochemical processing plant.

Essential technologies for total situational awareness (continued)

Radar

RAdio Detection And Ranging is the radio spectrum equivalent of sonar: a radio wave is transmitted into the field and is reflected from objects in its way. Those reflected signals are used to model a real time picture of the terrain.

Radar usually requires a fairly flat terrain which is why it is associated with maritime and aviation uses. Radars have historically been of the large, very expensive magnetron variety, but new developments in solid state radar technology has increased portability, reduced costs and extended the applicability of radar as a sensor in many new locations, including for example mobile military patrols, temporary camps and small areas such as around a piece of critical infrastructure.

Radar is particularly relevant for:

- Very large areas.
- Flat areas with minimal obstacles.
- There is a serious need for advance warning of approaching threats (fence breach is too late).
- Terrain not suitable for a fence.

Video Analytics

Video Analytics (also known as VCA or Video Content Analysis) is the real time analysis of a digital video stream by programmable computer software that looks for events in zones of interest. VCA can also be applied retrospectively to existing video data in order to locate particular events, objects or people. In terms of situational awareness, we are talking about live or real time VCA that can be used in a predictable way to raise alerts in response to programmable triggers.

The key element is this cause and effect based system automation which allows the owner of an asset to push out the boundary of situational awareness with the only limit being locations to site cameras. Essential VCA functions are:

- Zone breeches – a person or object enters a forbidden zone.
- Suspicious objects (that were not present before).
- Loitering people in marginal zones.

Video analytics is more effective than human eyes watching monitor displays because VCA never becomes tired, distracted or bored.
And can monitor hundreds of reliable cameras 24/7.

Summary: some quick wins to prevent the unthinkable

Review the integrity and reliability of your situationa awareness using the bowtie model for risk management.

Consider in particular the risks inherent in reliance on security guards either watching monitors or patrolling a perimeter.

Consider measures that might increase the effectiveness of your human operators such as equipping them with mobile access to CCTV feeds.

Look for causes of trouble in your bowtie model for which you do not have adequate barriers or mitigating response controls.

Identify preventive barriers for each possible cause of the incident you want to prevent.

Common gaps in situational awareness:

- Reliance on human security.
- No thermal imaging.
- No automation (cause and effect).
- Ineffective command and control and workflow automation.
- Lack of integration.
- Preventive controls do not allow enough response time once triggered.

Contact Visual Management Systems Limited for more information on any of this paper or the technology mentioned in it.

We supply complete, bespoke PSIM solutions that include PIDS, thermal imaging, radar and automated response management.

Visual Management Systems Limited
15 Cambuslang Road, Cambuslang Investment Park.
Glasgow G32 8NB. United Kingdom
Tel. +44 141 643 3070 | Fax +44 141 643 3079
Email info@titan-vision.com | www.titan-vision.com