

**CPNI**

Centre for the Protection  
of National Infrastructure

# **Considerations in Control Room Security Personnel Capability for Major Events:**

## **A Human Factors Perspective**

## **Background**

This document is primarily informed by data collected from venue locations of the Olympic Games and the Paralympic Games of London 2012. Key issues were collated and further informed by feedback following a short training course that was delivered to the CCTV operators at these venues. The training course offered a brief insight into overcoming common Human Factors issues in control room operations and interactions. In addition to the data drawn from these high profile events, comments are informed by control room knowledge drawn from previous experience in control room domains as diverse as rail, security, road and retail. This document is therefore presented from a real world, evidence driven perspective.

## **About this document**

CPNI commissioned User Perspective Ltd to write a quick reference guide for staff responsible for the set up and management of security at major events. The guidance aims to improve the effectiveness of security operations, by recognising the human factors considerations in the design and management of control rooms and security personnel.

It is essential to consider the human element within security operations, and how your security personnel will work considering the limits of human performance. By fully appreciating this, mitigating actions can be taken to improve performance.

## **About other advice in the series**

Other guidance is available on the [CPNI website](#), such as "Human Factors in CCTV control rooms: A best practice guide", which goes into more detail about the human factors considerations for the set up and management of a CCTV control room. There is also a checklist to assist evaluation of the CCTV control room set up. An eLearning package is also available that introduces the concept of human factors and how human limitations impact the effectiveness of security personnel in controls rooms. For more information, see the CPNI website [www.cpni.gov.uk](http://www.cpni.gov.uk)

## **About User Perspective Ltd**

User Perspective Ltd is a Human Factors company working in diverse industries, including security. Our work is strictly guided by robust theory and evidence drawn from the fields of Psychology, Human Factors and Ergonomics. Much of our work is undertaken in safety critical environments.

# Introduction

This concise reference guide highlights key considerations and recommendations for new start-up control rooms involved in proactive security monitoring. It is intended for central planners of control room and security officer capabilities for major events.

This guide focuses on control room operators, however, the nature of their role and responsibilities has a direct impact on the security officers on the ground, and this is noted through additional comments.

It is of note that this document primarily refers to protective security rather than safety. Further guidance should be sought for any questions regarding the safety of major events. This document refers to control rooms where English is the primary language.

**Key considerations** for control room planning include:

- Communications;
- Situational and spatial awareness;
- Training;
- Team building;
- Technology and environment;
- Human limitations.



Figure 1: Interconnectivity of the Key Considerations VIA the Human Element

None of the considerations exists or operates in isolation as the human element greatly influences their interaction within the control room. Each consideration can impact the others on a continual basis. For example, poor communications may affect situational and spatial awareness; human limitations may affect all five other elements; and so on.

Consequently these considerations should be addressed holistically during control room planning. Failure in considering the holistic view could result in a failure of the control room itself.

## Understand your starting point

It should be noted that there may be large differences between new start sites for major events and sites with existing permanent security. These differences may stem from the inexperience of the new site staff compared to an established site staff, which could impact effective

communication, training requirements, the ability to work as part of a cohesive team and familiarity with technology.

## **Recommendations**

This document highlights several key recommendations for major events. However, the primary recommendation is the need to conduct exercises, both within the control room and in conjunction with security officers on the ground, as well as other agencies operating on the whole site. These exercises should support all key consideration areas and seek to address any relative inexperience within the environment and should be considered by major event planners as a priority task to be factored into the security planning from the outset.

## **Further information**

If you have any further questions or queries, please contact CPNI

# Key Recommendations

## Top things to make happen

- Carry out exercises, under different situations, different times of day, and with multiple stakeholders to ensure common understanding of requirements and behaviours, and team building.
- Carry out shift handover/briefing/debriefing to maintain situational awareness within the control room.
- Ensure all stakeholders have a common map view.
- Carry out key skills training in situ in the relevant control room environment.
- Any perceived inequalities in reward between security officers on the ground and control room operators should be addressed early to reduce the impact on motivation and reporting.
- Develop a cohesive, consistent, appropriately trained team to mitigate individual variations in performance.
- Help staff to gain a familiarity of the environment in order to understand what is 'normal' for the environment.
- Enable control room operators to 'walk the plot', to help orientation.

## Things to teach

- Operators and security officers on the ground will see things differently (both visually and cognitively) and this needs to be considered when giving and receiving information.
- 'Suspicious' is anything that does not 'fit' or produces a level of discomfort or interest.
- Logging is a constant, continuous process as human recall is flawed.
- Maintain a holistic view of all key considerations when training, rather than dealing with them as separate entities.

## Things to encourage and enable

- Foster an environment of checking and verifying as information received may be inaccurate and can be influenced by biases of interpretation and personal perception.
- Establish open communications and good relationships within the control room, and between the control room and the security officers on the ground to reduce barriers to reporting.
- Encourage the team to understand human and technical limitations, and work together to ensure maximum coverage of eyes and ears on the ground.
- Don't rely on technology; for example, if logging technology does not enable all relevant information to be captured ensure that an alternative logging repository is available.

# 1 Communications

Communication affects how an operator or a security officer on the ground understands, interprets, and acts on any situation, and is an essential component of a successful control room.

## 1.1 Clear communications

- **Clear communication.** Communications between the control room and security officers on the ground need to be clear and unambiguous in order to quickly and efficiently identify a person or place at risk.
- **Common language.** Establish the standard of English of security personnel at the recruitment stage. When passing information, lack of vocabulary and pronunciation can be problematic, and such issues are exacerbated when using radio communications.

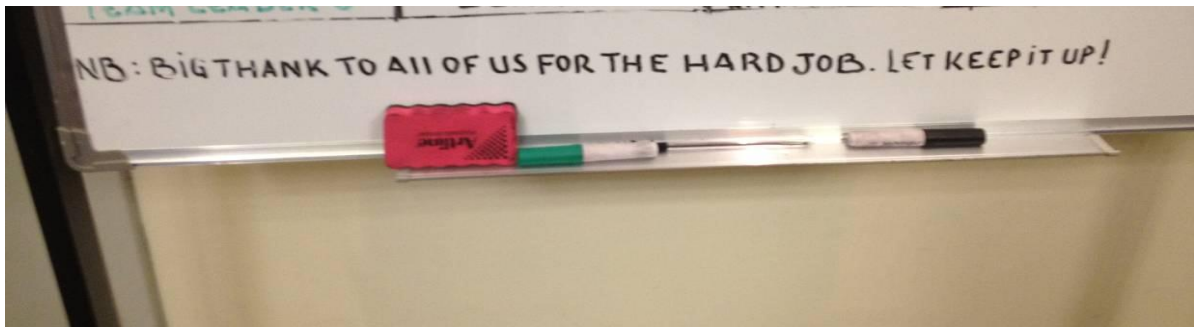


Figure 2: Message observed on whiteboard at an Olympic venue. Whilst this message is understandable and does not have a procedural impact, it should be noted that small errors may lead to larger misunderstandings in control room communications.

## 1.2 Communication skills

- **Questioning.** Encourage operators to question communications they do not understand.
- **Radio etiquette.** Ensure operators and security officers on the ground understand how to begin and end radio communications, and when to speak and when to listen.
- **Information requirements.** Establish a common understanding that the view of the security officers on the ground is very different to the CCTV view so their information requirements will differ when reporting.
- **Shift handover/briefing/debriefing.** This is an essential communication tool that also links with situational and spatial awareness. ([see section 2.5 Communications](#))

### 1.3 Chain of command

The following need to be established and communicated to ensure an unambiguous chain of command in a control room. This is particularly pertinent for control rooms with more than one management position, or multiple stakeholders (e.g. Armed Forces, Police or Fire Service):

- **Communication routes** to avoid multiple, mixed messages and instructions.
- **Escalation routes** for incident management, to avoid confusion.
- **Roles, process and procedures** to prevent misperception of status or authority.
- **Interaction** between operators and activities is encouraged.
- **Questioning** requests to carry out actions outside of, or contrary to, an operator's normal duty is supported.

### 1.4 Multiple control rooms

It is essential to establish good communications when a new control room is established on a site with an existing control room. This can be facilitated by ensuring:

- **Common maps.** Ensure all stakeholders have a common map view.
- **Camera positions.** Understand the camera positions and views available to each control room to establish areas of support, for example when tracking an individual behaving suspiciously.
- **Cross control room working.** Enabling an operative trained for the new control room to work within the existing control room can help communications between control rooms.

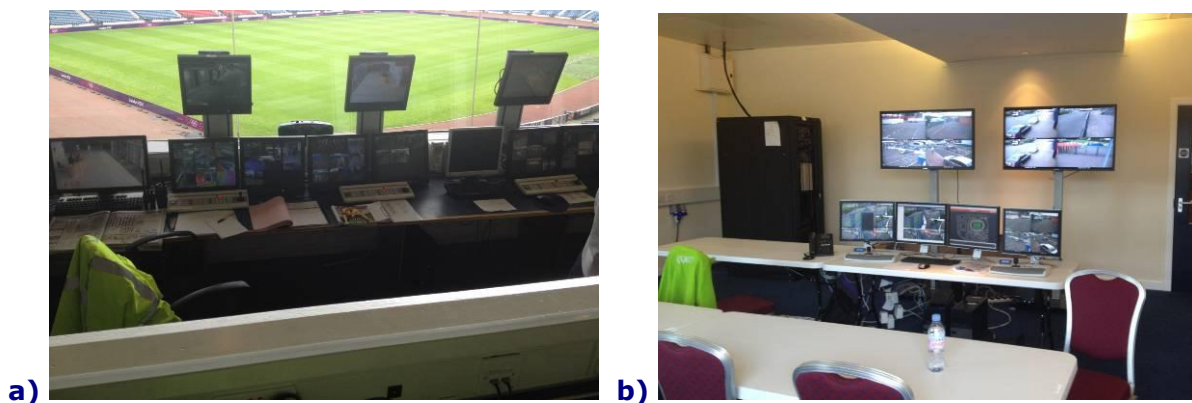


Figure 3: Established (a) and new start (b) control rooms within same site

## 1.5 Inter-agency working

It is essential to develop and use a common language, particularly when working across agencies (such as with the Police, Fire Service, or Armed Forces). The following can facilitate effective inter-agency working and communications:

- Minimise or remove the use of acronyms and abbreviations to avoid misunderstandings between different stakeholders.
- Encourage sharing information and providing feedback (where appropriate) in order to build links between groups.
- Carry out training for inter-agency working. Staff can be intimidated by the status or uniform of people from other agencies, and may feel uncomfortable asking for clarification. ([See section 3.3 Inter-Agency working](#)).
- Ensure staff have a clear understanding of the situations where requests from other agencies will take precedence over their role and job tasks (primacy).



Figure 4: Control room with stakeholders from the Armed Forces

## 1.6 Reduce barriers to reporting

The following are implementable tools that may reduce barriers to, and increase likelihood of, reporting suspicious behaviour to the control room:

- **Contact names.** Reporting is enabled when people are given a name or direct contact within the control room. For example, event services teams, cleaners, concession stands, or on site entertainers may observe something that security personnel have missed.
- **Introductions.** Enable control room operators to introduce themselves to the security officers on the ground, in order to promote reporting.



- **Reporting chain.** Reduce the length of the reporting chain, as each person in the reporting chain reduces the likelihood of the information being passed on, and increases the likelihood of the information being distorted or changed.
- **Clear reporting process.** Ensure understanding of the reporting process to remove indecision and increase reporting by the security officers on the ground.
- **What and when to report.** Make it clear what security personnel should report and when.



Figure 5: For areas which may present a risk to supply of the infrastructure but due to the site size are not frequently patrolled, there is benefit in encouraging reporting of suspicious or unusual activity from other users of the particular environment

## 1.7 Leadership

Many issues in a control room can be overcome with effective management and leadership:

- Supporting staff in training;
- Maintaining and promoting clear objectives and goals;
- Enabling clear communications between groups within the control room;
- Ensuring staff are focussed on delivering goals within their role;
- Giving clear direction in order to fulfil the stated aims of the control room.

## 2 Spatial and situational awareness

Spatial and situational awareness are two separate and distinct categories, however, numerous observations of control rooms in multiple environments and domains have suggested that failure in one area of awareness invariably impacts on the other. Accordingly, for the purpose of this document, spatial and situational awareness are considered together. For more information see [Supporting Information](#).

### 2.1 Different perspectives

Ensure a common understanding within the security team, that the perspective of the security officers on the ground is markedly different to the perspective of the control room operator. Security officers on the ground have a 3D view from 'inside the map', whereas the control room have a 2D 'overhead' view 'onto the map'. Being aware of these differences in perspective is beneficial when giving or receiving information.

### 2.2 Maps

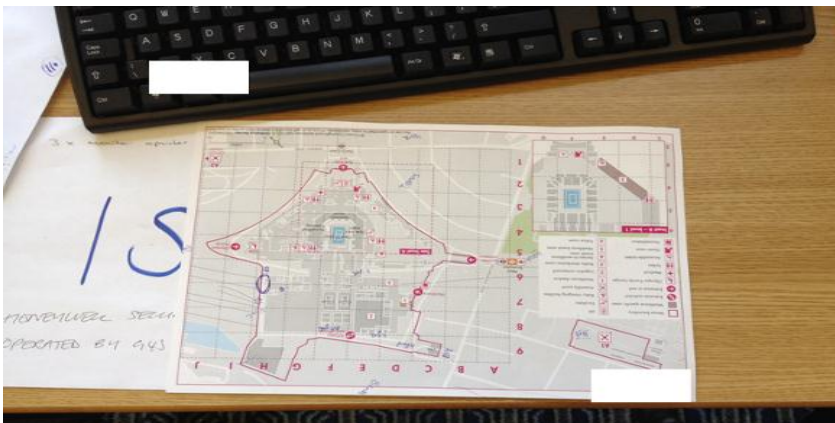


Figure 6: In this real example, the map orientation on map with grid references was different to the orientation to the map available on the computer system. In order to obtain a common view the user had to display the printed map upside down – as shown.

- **Same maps.** A simple way to ensure commonality is to provide all stakeholders with the same map. At the very least ensure:
  - **Consistency.** It is essential that map views are consistent to maintain common points of reference. This applies to printed and computer map views.
  - **'North Up'** is a common convention that people expect. A different orientation may make for a better picture, but it will cause confusion.

- **Search area** divisions are consistent (common) across all maps.
- **Guard points** should be marked on all maps.



Figure 7: This particular map caused some confusion before being withdrawn and replaced by a map with the accepted 'North up' convention

- **Simple maps** with only relevant detail are recommended. For example basic information such as roads, pathways, buildings and style of terrain (woods/green space/urban landscape), rather than those showing finer detail such as contour lines and tourist information.
- **Common reference points.** CCTV operators are urged to establish common landmarks and points of reference with security teams 'on the ground'.

## 2.3 Site environment

- **Walk the plot.** Enable control room operators to 'walk the plot', and to note landmarks (preferably on their map view). This improves individual spatial awareness, and helps orientation, particularly whilst conducting searches by camera.
  - With large scale sites 'driving the plot' may be necessary. Simply identifying key points from the ground and comparing with how they are viewed via CCTV is useful.



Figure 8: Large scale complex sites benefit from walking the plot - an 'on the ground' observation to augment the CCTV view of the site

- **Camera positions and numbers** should be marked on control room operator maps. Ensure camera numbers are marked on the actual camera pole/support/structure to give a point of reference for security officers on the ground when communicating with the control room.
- **Camera patrols** help operators practise the skills required when tracking a person of interest on camera, and improves familiarity with the site and spatial awareness.

## 2.4 Technology

- **Direct contact** with security officers on the ground improves situational awareness. Information received one step or more removed from the source is less likely to be trusted, and is open to distortion, and the effect of 'Chinese whispers'.
- **Map technology boundaries.** Conduct a patrol with security officers on the ground and note any areas where technology might be compromised, (e.g. where the cameras have blind spots or the radios have dead spots).
  - Ensures a shared understanding of the limitations in their equipment.
  - Enables collaborative working to establish how the areas will be covered by alternate means (e.g. eyes on the ground in the case of camera issues or obtaining mobile phone numbers as back ups to radio dead spots).



Figure 9: Mapping the extent of the technical boundaries in terms of lack of camera coverage is a useful exercise that identifies areas where extra ground coverage may be advantageous

## 2.5 Communications

- **Shift handover/briefing/debriefing** are essential in maintaining situational awareness within the control room. Ensure an understanding is achieved between the departing and incoming operator of:
  - Any incidents that may have occurred during the shift and are 'closed'.
  - Any incidents that are ongoing.
  - Anything that is 'out of the norm' for the environment.
  - Any changes in brief that they need to be aware of.
  - Any changes in contact numbers that they need to be aware of.
  - Any personnel changes or issues to be aware of during the shift.
  - Any technical/site issues that they need to be aware of.
  - Ensure you have a current understanding of the security personnel numbers and positions on duty.

## 2.6 Roles and responsibilities

- Ensure all staff have a clear understanding of the roles and responsibilities within the team, as this will support situational awareness.
- Communicate any change to roles and responsibilities to the whole team as soon as possible to avoid compromising situational awareness.

## 2.7 Human limitations

- **Shift working** is commonplace for security personnel. However, be aware that a security operative who mainly works night shifts may have difficulty in orientation or site knowledge when asked to undertake a day shift.
- **Transition from underload<sup>1</sup> to overload<sup>2</sup>** occurs when individuals or teams suddenly need to deal with a critical situation. This can cause confusion as they are unable to cope with the sudden increase in demand for human cognition<sup>3</sup>. This leads to stress and reactive, unreasoned decision making. This is more often observed with less experienced security personnel.

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<sup>1</sup> Underload refers not only to the times where there isn't a great deal to do, but also to activities which through numerous repetitions, are tedious and of little obvious benefit to anyone whilst the user waits for a situation to happen.

<sup>2</sup> Overload is the difference between the demands within the operator's environment and their ability to complete these demands.

<sup>3</sup> Of or pertaining to the mental processes of perception, memory, thinking, reasoning and deciding.

## 3 Training

### 3.1 Train and practise key procedures

Train, and practise, key processes and procedures within the environment in which they will be used. People are not good at transferring knowledge from one context to another (see [Supporting Information](#)).

### 3.2 Logging incidents and calls

- **Enable logging.** The process for recording information should be easy to access and easy to use, and should facilitate accurate and appropriate logging.
- **Logging.**
  - **Relevant information.** Ensure information recorded is relevant, accurate and appropriate to all those who may need to take actions and decisions either at the time or retrospectively.
  - **Timely recording.** Human memory is fallible and easily influenced so record information as the incident develops where possible.

### 3.3 Inter-agency working

- **Primacy** needs to be trained so team members understand the situations where the requests of an external agency take precedence over their role and job tasks.
- **Feeling intimidated** is common, especially when team members perceive other stakeholders as a higher status than themselves (e.g. the MOD, Police, etc). This may affect the ability of team members to operate effectively, or understand who has overall authority in a given situation.
- **Common training sessions** enable a common understanding of roles, role boundaries and processes.

### 3.4 What is suspicious?

Operators may have a limited understanding of what is 'suspicious', particularly outside of the regular occurrences for their environment (e.g. pickpockets and ticket touts). This is a barrier to identifying and reporting potential suspicious behaviour, as indecision may lead to a fear of embarrassment or looking foolish. The following actions can overcome this:

- **What is 'normal' for your environment?** Terrorists or those with criminal intent *may* behave in a way that is contrary to the 'norm'<sup>4</sup>, so investigate anything that is not normal.

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<sup>4</sup> Norm in this context refers to expected and previously observed patterns of human usage in a particular environment  
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- Anything unusual that does not 'fit' with what the operator understands of their environment or passenger/customer flow.
- Anytime an operator or security officer on the ground does not feel comfortable with what they see.
- If the operator or security officer on the ground has a gut instinct.
- **Lower the threshold** for reporting to increase reporting.
- **Labelling the behaviour** is unnecessary. Requiring a threat to be quantified and identified introduces a barrier to reporting.

### 3.5 Optimisation of training

- **Factor in onsite training as soon as possible in the planning stages.** As major events are often temporary in nature it is not uncommon for there to be a large number of relatively inexperienced recruits with little or no experience. This is because there is often limited opportunity for the security supplier to build, train and deliver the required security capabilities.



Figure 100: Training and exercises on site may often be limited by site access and/or degree of completion on major event new starts. This picture shows workman still in evidence on site despite event start.

- **Mentoring temporary employees** with limited operational experience is an effective way to improve control room performance. Effective control room management allows temporary staff to be motivated and confident in knowing and understanding their roles whilst being supported through a period of intense learning (for more information see [Supporting Information](#)).



- **Exercises** are strongly recommended, within the control room, as well as with security officers on the ground and other stakeholders outside of the immediate confines of the control room.
  - Factor in exercises from the outset, as access to staff and venues is limited for major events.
  - Use different time frames and different conditions.
  - Ensure that lessons learned are captured after exercises.
  - Ensure accepted standard operating procedures are assessed as a result of any learning.
  - Use feedback as a positive training tool.
  - Encourage an atmosphere of reporting and response.



Figure 111: Example of a new start site where the schedule for completion allowed little or no time for training on site.

## 4 Team building

### 4.1 Consistency

One of the strongest factors in building a cohesive team is consistency in staff. Consistency and stability in numbers within the control room together with consistency and good definition of roles and responsibilities gives clarity within the control room.

### 4.2 Trust

Encourage an open and honest atmosphere where issues may be discussed and resolved rather than where blame is apportioned. Such an atmosphere leads to the development of trust and confidence within the team, which in turn lowers barriers to reporting and encourages team cohesiveness.

### 4.3 Roles and responsibilities

Consistent staff and staffing levels allow a team and its team leaders to form an understanding of the 'who, what and where'. Namely, *who* is in which post, *what* their role within that post is, and *where* they 'sit' within both the day to day working of the control room and in the escalation process. This understanding is not only useful for within the control room but also gives a clear understanding of structure that may be communicated outside of the control room, for example to security officers on the ground.

### 4.4 Appropriateness of staff in role

Ensure staff have the necessary skills, for example:

- Clear command of the English language;
- Ability to work as part of a team;
- Have been appropriately trained for their role.

### 4.5 Feedback and motivation

- **Positive feedback** builds confidence and morale, and ensures the continuing development of the team.
- **Clearly defined goals**, expectations, and feedback ensure that staff have a way of measuring their success against these goals.
- **Address perceptions of inequality** before it affects performance, such as team cohesion and response. A security officer on the ground may feel that they are inequitably rewarded in comparison with control room operators, particularly during periods of inclement weather when the security officers on the ground are exposed to the elements in comparison with the operators who may be sitting in a warm control room.

## 5 Technology and environment

Technology is a highly useful tool and a natural part of the control room environment. For example, radios may be used to work with the security officers on the ground for proactive patrolling and to maintain alertness of security personnel during night shifts. Additionally, cameras may be used to conduct sweeps of an area in conjunction with a security officer patrol. However, it should be noted that there can be issues with technology and human interaction.

### 5.1 Limited experience with technology

- Provide training WITH the technology to be used, in addition to pen and paper or PowerPoint exercises ([see section 3.1 Train and practise key procedures](#)).
- Enable practice with technology to improve familiarity.
- Provide training that encompasses the holistic role of an operator.
  - Include training in observing and understanding what is suspicious from a CCTV perspective, as this can be difficult for operators.
  - This enables operators to use other methods to augment their capabilities with technology.



Figure 122: Where there are a number of different technologies, time to practise and 'play' with equipment will increase familiarity

### 5.2 Technical issues

- **Provide technical support details** to ensure operators know the technical callout assistance available, for example for non-operational cameras.
  - Provide operators with the procedures followed by technical assistance when first contacted. This enables the operators to correct simple issues, without contacting support (e.g. 'turn it off and turn it back on again'), thereby improving operational response.
- **Establishing physical boundaries of technology** e.g. limits of radios/dead spots, and backup means of contact such as mobile phone.

- **Note camera placement problems** e.g. limited/blocked views
  - Locate alternative camera views to enable 'eyes on' the area.
  - Make security officers on the ground aware of the limitations of the view of the area.



Figure 133: Blocked camera view. This particular example shows a temporary structure that was erected in front of a working camera

- **Avoid a mix of technology**, as differing types of console for the CCTV systems may lead to forced error when switching between technologies.
- **Log all camera issues** for engineers to work with, and to inform operators of existing capability problems.
- **Frequent false alarms** often result in the alarm being turned off, resulting in a gap in security coverage.
  - Ensure responsibility to investigate all alarms is understood by all operators. Either:
    - Flag as a fault and monitor as necessary. Ensure the security officers on the ground are aware of a gap in coverage, or;
    - Remedy the cause of the false alarm. For example, vegetation can lead to false alarms on Perimeter Intruder Detection Systems (PIDs) (See Figures 14a and 14b).



Figure 144a & b: Vegetation growing through fences (circled) triggering false alarms on the Perimeter Intruder Detection System (PIDs)

### 5.3 Over reliance on technology

- **Back-ups** should be available in case technology fails e.g. manual logs, mobile phones.
- **Discard** process and reliance on technology when they are clearly not working.
- **Employee KPIs** (Key Performance Indicators) should measure human performance, rather than the performance of the technology.

### 5.4 Environment considerations

Several considerations for the physical aspects of security for major events are worth noting.

- **Minimise lines of sight** into the event to prevent hostile reconnaissance.
- **Entry point design** can provide the perception of robustness and impenetrability, therefore acting as a deterrent to criminal, or terrorist activity.
- **Entry and perimeter barrier design** can minimise trespassing.
- **Verification** of tickets for entry needs to rely on more than one check to minimise the opportunity for fraudulent entry.
- **Search and screen** is an essential part of event entry. Consideration needs to be given to the procedure and route to take when someone has been rejected.
- **Control room location** should be carefully considered to ensure its security and operability should an incident occur on site. Back up procedures should be planned for should the control room become inoperable.

## 6 Human limitations

### 6.1 Understanding that operators cannot, and do not, see everything

- **External factors** reduce the likelihood of an operator spotting suspicious behaviour:
  - Number of screens monitored.
  - Method of monitoring (split screens vs single screens views).
  - Level of alertness.
  - Room environment (too hot, too cold, too bright, too dim).
  - Field of view of cameras.
  - Refresh rate/bandwidth issues on cameras.
- **Internal factors** minimising the detection of suspicious behaviour, or potential problems:
  - Limitations in observation due to divided attention, fatigue and distraction;
  - Limitations in recall for an event;
  - Personal beliefs and biases;
  - Previous experience and knowledge;
  - Human recall is heavily susceptible to misinformation.



Figure 155: Monitoring multiple screens may prove a particular challenge to some new operators

- **Maximise** the opportunity of suspicious behaviour being detected:
  - **Encourage teamwork** between operators and security officers on the ground, with the security team on the ground acting as an extension of the eyes and ears of the control room.
  - **Encourage reporting anything suspicious** from other stakeholders in the environment (e.g. cleaners, catering, event services). This is especially important on sites that cover a large area as the more 'eyes on the ground' the better.

- **Log details as soon as they are received**, from radio messages or phone calls, not after an incident has played out. Humans have limitations in memory and their recall is easily influenced and tainted, making logging *during* evolving incidents an essential training task ([see section 3.2 Logging incidents and calls](#)).

## 6.2 Staff welfare

Proactive CCTV viewing is a difficult cognitive task for humans to undertake for any length of time. To help ensure effective staff performance, the following should be considered:

- **Environment.** Follow approved guidelines for control room heating, lighting, auditory environment and man-machine interface (e.g. HSE).
- **Fatigue.** Be aware of fatigue especially with operators who are new to shift working or the shift length. Consider forward rolling shifts to minimise the effects of shift work induced fatigue.
- **Breaks.** Ensure adequate welfare breaks.
  - To reduce eyestrain;
  - To ensure the operator's physical needs are met;
  - Ensure the security officers on the ground can get to a refreshment point at prescribed intervals, especially on a large site.
- **Individual issues.** Be aware of any religious or cultural issues that may impact on the welfare of security personnel, e.g. fasting during Ramadan.

## 6.3 Cognitive lapses/boredom

**Rotate security officer positions** within a site, not across sites. This ensures that the security officers on the ground maintain an understanding of 'norms' for site, without viewing the same area for 12 hours a day which would lead to gaps in cognitive awareness due to boredom.

## **Supporting Information**

This section provides descriptions of terms used in this document as well as a brief outline of some of the underpinning theory, research and approaches

### **Spatial Awareness.**

An understanding of our location in space and the organisation of objects/things around us. What does this mean for a control room? When receiving information from the ground, establishing an understanding of where they are relative to the environment, their colleagues and the incident.

### **Situational Awareness.**

Being aware of, and understanding, the relevant aspects of a dynamic environment in order to facilitate an appropriate course of action. What does this mean for a control room? Knowing what's going on, where your resources are and what to do about it.

### **Inert knowledge**

Inert knowledge is a knowledge that remains un-accessed and unused even in important work contexts, despite evidence from debriefs showing the knowledge is clearly held. We assume that if a person has specific knowledge in one context and situation, then this knowledge will be accessible in all situations and locations. However, repeated studies have shown that this is not necessarily the case and in some cases may be reliant on contextual cues that may not be available in other locations, (Bransford et al, 1986; Gentner and Stevens, 1983)

It is particularly noteworthy that in numerous observed live environments, there appears to be a limited transfer of knowledge from one location to another and often from the classroom to the real world environment. This is exacerbated when there is a delay between training and deployment.

### **Scaffolding learning**

Scaffolding provides a structured learning environment in which a task is set that builds upon the knowledge of the student but is approached jointly by the teacher and student as a collaborative effort. As the student becomes more proficient the teacher takes less of a role and the student more (see Applebee & Langer, 1983). An effective way of achieving this style is by mentoring operators on site.



## **The Equity Theory of Motivation** (Luthans, 1998)

This theory suggests that a major input into job performance is the degree of equity that people perceive in their work place. It has been noted in a number of environments that when security officers on the ground feel that they are inequitably rewarded in comparison with operators in the control room, team cohesion and response have suffered. This feeling may be exacerbated during periods of inclement weather when the security officers may perceive themselves to have the harder job whilst being exposed to the elements in comparison with the operators who may be sat in a warm control room. It is therefore important for a company to address any perceptions of inequality before it can affect performance in role.

## References

Applebee, A.N & Langer, J.A. (1983) Instructional Scaffolding: Reading and writing as natural language activities. *Language Arts*, 60/2.

Bransford, J., Sherwood, R., Vye, N. & Rieser, J. (1986) Teaching and Problem Solving: Research Foundations. *American Psychologist*, 41, 1078-1089.

Gentner, D. & Stevens, A.L. (eds) (1983) *Mental Models*. Hillsdale NJ: Lawrence Erlbaum Associates.

Health and Safety Executive. (2011) Control Room Design. Retrieved from <http://www.hse.gov.uk/comah/sragtech/techmeascontrol.htm>

Jackson, K. & Langham, M. (November, 2007) Eyewitness Testimony, the good, the bad and the downright ugly. Paper presented at the ITAI 8<sup>th</sup> International Conference, Watford, UK.

Jackson, K., Langham, M., Sharpe, S. & Turner, S. (2010) Seeing, deciding and acting – a meta-analysis of end users needs in control rooms and commentary on the latest research findings: maintaining spatial and situational awareness in commanders. Paper prepared for OSCT.

Luthans, F. (1998). *Organizational Behavior*. New York: McGraw Hill Publishing.

Sarter, N.B. & Woods, D.D. (1994) Pilot Interaction with Cockpit Automation II: An Experimental Study of Pilots' Model and Awareness of the Flight Management System. *The International Journal of Aviation Psychology*. Vol. 4, Issue 1.