Counter-terrorism complexity: identifying opportunities for innovation

COUNTER-TERRORISM COMPLEXITY: IDENTIFYING OPPORTUNITIES FOR INNOVATION

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As a result of the sustained and evolving threat from international and domestic terrorism, Government agendas are seeking to increase the extent to which vulnerable sites such as crowded places are protected from terrorist attacks. Recent events have highlighted the need for crowded places to be considered at higher risk, with plots and attacks in the UK alone focussing on such places in Birmingham, London, Glasgow, Exeter and Manchester. The vast majority of potential targets already exist and are therefore more complex to protect against an attack than by designing in counter-terrorism measures (CTM's) at the design and planning stages, although both result in complex trade-offs and scenarios. The aim of this research is to therefore examine the complexities inherent in ensuring crowded places are appropriately and proportionately protected from terrorist attacks, as well as identifying the trade-offs involved when designing in CTM's and retro-fitting existing locations. The benefits of and opportunities for innovation are also discussed, utilising examples from both the UK and USA where innovative technologies and practices have enabled publicly acceptable and proportionate CTM's to be incorporated into site designs. Empirical research was conducted alongside an extensive literature review. Case studies are used to illustrate the implications for decision makers involved in protecting crowded places. The results highlight that despite vast complexities existing when incorporating CTM's into existing or planned crowded places, a lack of informed and appropriate guidance for key decision makers on best practice is exacerbating this situation. As well as this, there is a lack of understanding of the inter-connectedness of the threats that are faced and the measures that are used to mitigate them. However, examples demonstrate that such complexities can lead to innovative solutions, with the Emirates Stadium in London incorporating a number of effective yet publicly acceptable CTM's into its design. Conclusions state that inherent complexities in such projects can act as catalysts for innovation. With the growing need for more comprehensive guidance on CTM's that are available for protecting crowded places, new research is examining the systemic implications and relative value of those measures. This will produce guidance for key decision makers and inform future legislation, guidelines and codes of practice.

Keywords: Building Design, Counter-Terrorism, Crowded Places, Resilience, Value

INTRODUCTION

A vast array of hazards, threats and potential major accidents pose a significant risk to society. For the purpose of this research, a threat will be defined as any action that is carried out with intent and malice and causes or threatens to cause damage to society and the environment that it operates within (Harre-Young *et al.* 2009). Threats such as crime and terrorism have therefore come to the forefront of political agendas due to their very nature. Hazards; naturally occurring phenomena such as flooding and major accidents, such as the explosion at the Buncefield Oil Depot in the UK in 2005, have also highlighted the fragility and vulnerability of the built environments in which we live and work.

Protecting built environments that are vulnerable to such a wide range of phenomena is a complex task, especially within urban settings that contain crowded and public places. However, the threat posed by terrorism has come to the forefront of modern political agendas, as those involved in planning and carrying out such plots seek to harm those who use crowded places and the infrastructure and buildings that are integral to societal well-being. It is within this context, that this research seeks to identify the complexities involved in preventing terrorist attacks from being carried out in crowded places and how innovation is aiding this task.

Defining Terrorism

There is no universal definition of terrorism. The process of doing so is a major political issue, in which the complexity centres on the context in which the acts of violence were carried out and seen (Hoffman 2004). Despite this, the UK Government has defined terrorism within the Terrorism Act 2000 (UK Parliament 2000: 1) as "the use or threat of action where (a) the action falls within subsection (2), (b) the use or threat is designed to influence the government or to intimidate the public or a section of the public, and (c) the use or threat is made for the purpose of advancing a political, religious or ideological cause. (2) Action falls within this subsection if it (a) involves serious violence against a person, (b) involves serious damage to property, (c) endangers a person's life, other than that of the person committing the action, (d) creates a serious risk to the health or safety of the public or a section of the public, or (e) is designed seriously to interfere with or seriously to disrupt an electronic system".

This research therefore explores the complexity surrounding countering terrorism according to this definition and more specifically, in relation to the threat faced by vehicle-borne improvised explosive devices (VBIED's) and the use of hostile vehicle mitigation measures.

The Threat

Terrorism is not a new threat. Within the UK and according to the UK's Security Service (MI5), the threat derives from three areas, those being Irish-related terrorism, international terrorism and domestic extremism (Security Service 2009a). Irish-related terrorism caused over 3,500 deaths between 1969 and 1998 (HM Government 2009).

Although no terrorist attacks have been carried out on the British mainland since the Belfast Agreement of 1998, it has been widely publicised that a threat from Irish-related terrorism remains, especially with recent events highlighting that there is continued intent to disrupt the peace process, with two members of the Armed Forces and one Police Officer of Northern Ireland being killed in separate attacks in March 2009. The threat faced from domestic extremism encompasses groups who are motivated other than by the situation regarding Northern Ireland and according to the Security Service (2009b), does not pose a significant threat. However, a serious threat is faced from international terrorism, primarily from Al'Qa-ida leadership and their immediate associates (HM Government 2009). Al'Qa-ida is widely known for orchestrating the terrorist attacks in the United States of America (USA) on September 11th 2001. According to the Department of Homeland Security (2007), the threat of terrorism that is faced in the USA primarily comes from Al'Qa-ida as well, although a range of other groups and individuals pose a threat, including domestic groups such as animal rights extremists.

Within the UK however, Clarke and Soria (2009) state that there have been 16 evident cases involving terrorism since 2001. Although Al'Qa-ida became synonymous with the attacks of September 11th in the USA, a UK plot was disrupted prior to these attacks in 2000 and more recently, a major plot was uncovered and disrupted in April 2009. Analysis of Clarke and Soria's (2009) research, as well as these two additional plots, highlights that of the 18 cases, 12 involved actual planned or carried out attacks, with seven focussing on crowded places and 6 involving transport networks (only one involved both). This highlights a trend that focuses on crowded places due to their very nature and that they are perceived to be unprotected targets (Coaffee *et al.* 2008). The UK's counter terrorism strategy (HM Government 2009) proposes that over time a new form of terrorism has emerged, yet it is argued, especially in relation to the terrorist attacks of September 11th 2001, whether this was a "point of change or the moment of realisation of what had been taking place" (Briggs 2005: 10). Nonetheless, the attacks that occurred in 2001 certainly hastened the development of strategies and measures to counter the threat that is faced from terrorism.

COUNTER-TERRORISM

Since 2002, the USA has had a 'National Strategy for Homeland Security' (Department of Homeland Security 2007) and since 2003, the UK has had a strategy, known as CONTEST. In 2006, the strategy became publicly available and showed that the UK's approach was based on four strands, those being 'Pursue', 'Prevent', 'Protect' and 'Prepare' (HM Government 2009). 'Pursue' focuses on the detection, investigation and disruption of terrorist networks and activities; 'Prevent' focuses on stopping people becoming terrorists or supporting violent extremism; 'Protect' focuses on reducing the vulnerability of crowded places, critical national infrastructure and borders; and 'Prepare' involves mitigating the impact of an attack when it cannot be stopped (*ibid*). Under 'Protect', security advice and programmes have been developed and have impacted a small number of construction projects to date, such as football stadia and shopping centres, where Counter Terrorism Security Advisors have become involved in projects

and provided appropriate and proportionate security advice. CONTEST is non-statutory and so there is no legal requirement to ensure that CTM's are integrated into sites. However, CONTEST does have potentially major implications on the UK's construction sector and the built environments, covering areas such as project specification, building design, urban planning and facilities management (Harre-Young *et al.* 2009). With the threat of terrorism being higher for crowded places and CONTEST resulting in the protection of such places, a vast array of CTM's are being used to mitigate the impact and reduce the likelihood of a terrorist attack.

Counter-Terrorism Measures

Particular approaches and practices can lead to a reduction in vulnerability. For example, Elliot (2009) states that in relation to building and site designs, achieving the following objectives can aid in reducing vulnerabilities:

1. **Deflect** a terrorist attack by showing that the chance of an attack being successful is reduced through the layout, security and defences used
2. **Disguise** valuable parts of a site or building so that an attack fails to make its desired impact
3. **Disperse** potential targets so that an attack could not impact all of the possibilities
4. **Stop** an attack from reaching its target through the use of physical measures
5. **Blunt** the impacts of an attack should it reach the target area

Broader design principles, such as the above, can aid in reducing the risk of an attack and mitigating its impact. Specific products or materials are used in order to fulfil these objectives as, for example, vehicle barriers can be used to show that a site has been secured and therefore reduce the likelihood of an attack; can stop an attack by blocking access and/or restricting and controlling movement; and blunt an attack by modifying the structure of a building to mitigate the impact an attack may have. Therefore, for the purpose of this research, a CTM is defined as any product or course of action, where all or part of its specification is to reduce the likelihood and/or mitigate the impact of a terrorist attack. Despite calls for the use of such measures to be halted and for the threat of terrorism to be tackled without such manipulation of the built environment (Lazell 2008), CTM's are being used, especially in crowded public places. CTM's are emblematic as they provide a tangible aspect to countering terrorism and how the public is being protected from the various threats that are faced. However, using such measures to show that the threat and the safety of the public are being taken seriously can have an adverse affect by highlighting that there is a need to feel threatened and unsafe (Boddy 2007; Coaffee *et al.* 2009). This highlights the importance of proportionate and acceptable CTM's being chosen on an individual basis, as the needs of each site or building vary considerably. Other factors that influence the choice of measures include whether they are being retro-fitted or incorporated into designs, the depth and number of utilities, pipelines etc, the cost, public acceptability and the level of vulnerability that is being addressed.

Despite the complexity involved in protecting crowded places, a variety of CTM's can be used to reduce the likelihood and mitigate the impacts of an attack effectively and counter-terrorism intelligence shows that the use of CTM's is having an impact and contributing to the displacement of the threats (Forman 2009a). It is argued that the most

effective way of mitigating the impact and reducing the likelihood of a terrorist VBIED attack is through the use of 'stand-off', which is the distance between a potential explosive device and its target (Little 2004; Regan 2006; Coaffee and Bosher 2008). The 'stand-off' is enforced through the use of CTM's that block vehicles from getting within the defined distance. Whilst stand-off is arguably the most effective CTM for mitigating the impact of a VBIED, it only mitigates that particular threat, as terrorist attacks such as those witnessed on the September 11th 2001 in the USA and the use of person-borne improvised explosive device (PBIED) attacks would not be prevented by using such a measure. Lakha and Moore (2002) argue that it is right to question whether it is "possible to design a building to withstand an impact from a plane not yet invented in a scenario no one can imagine, not once, but twice" and this highlights two issues, those being the innovation of terrorists themselves and the methods and tactics that they use; and the likelihood of scenarios upon which the incorporation and use of CTM's are based. In relation to the innovation of terrorists and their methods and tactics, as Dolnik (2007) argues, no matter what measures are used, the public will have to accept a level of risk, as the methods adopted will evolve to overcome the measures used to mitigate terrorist attacks.

Regarding the probability or likelihood of scenarios, Lakha and Moore (2002) highlight that a scenario such as that seen on September 11th 2001 was never planned for and as Barker (2003) argues, there were no practical building-specific security measures that would have prevented such an attack. To mitigate the impacts of such an unprecedented attack, it can be argued that organisational or 'soft' measures would be the most effective CTM, through incorporating redundancy into systems, incorporating business continuity planning into the organisations to aid in preparedness, response and recovery etc, which would reduce the impacts of an attack. This highlights the need for informed guidance on assessing the threat that is faced at sites on an individual basis and which CTM's are the most appropriate, proportionate and effective considering the threat that is faced.

DESIGNING IN AND RETRO-FITTING MEASURES

Whilst 'stand-off' may be the most effective measure for countering a particular threat, incorporating it, as well as other CTM's, into site designs and retro-fitting them into existing sites presents a number of issues. Some of the key issues include the threat of terrorism itself, varying stakeholder requirements and resulting trade-offs, understanding and knowledge of CTM's, the acceptability of CTM's and the site and local utilities. The threat of terrorism itself is an issue, as perceptions of its nature, permanence and proportionality in relation to addressing the threat can vary considerably. For example, there is widespread criticism that counter-terrorism is being pushed as much more of a priority than other hazards and threats, even though terrorism is distinctly less likely to occur. Not only does this have implications for the design and functioning of public buildings and spaces, but also, arguably, leaves them vulnerable to those hazards and threats that are much more likely to occur (Little 2004; Regan 2006; and Coaffee *et al* 2009). Investigation is also needed to understand whether the use of measures to reduce the likelihood and mitigate the impact of one hazard or threat increases the risk of another

occurring. For example, questions could be asked as to whether the use of barriers, barricades and bollards in order to prevent a hostile vehicle gaining access to a building increase the risk and severity of flooding at neighbouring locations.

The use of certain CTM's can also result in trade-offs that require the demands of multiple stakeholders to be properly understood and negotiated, with a final decision meeting the needs of all those concerned as much as possible. Using 'stand-off' as an example, enforcing a distance between a building and a potential explosive device will require a certain amount of redundant space, which will result in a lower usable floor ratio (Then and Loosemore 2006). This also reflects the differing needs of stakeholders, as the end users of the space will want a high usable floor ratio, developers will want to sell quickly and for as much as possible, which may be hindered by lower usable floor ratios and the evident risk of terrorist threat, whereas security needs will require measures to be put in place to reduce the likelihood and mitigate the impact of such an attack.

Levels of understanding and knowledge regarding CTM's is also a key issue, as no typology exists in order for decision makers to identify what measures are available for their use. There is also a lack of data on the implications of those measures and the value that they bring to a development. If little is known about the most effective ways to protect a site and how to use the most appropriate and proportionate measures, then this could potentially result in inadequately secure or over-protected and obtrusive sites. Acceptability is a key issue, with some sites expecting and requiring the use of obtrusive measures, whilst others, such as crowded public places, needing more inconspicuous measures (Coaffee *et al*. 2009). However, inconspicuous or 'invisible' CTM's could potentially present areas as being insecure (ibid) and reduce the extent to which the measures act as a deterrent.

Local utilities contribute significantly to the complexities involved in protecting potential targets. A number of services can be present under the surface of developed sites, which results in their relocation and/or diversion, the use of CTM's requiring shallower foundations, or the use of temporary, surface-mounted CTM's. Whilst using CTM's that are surface mounted or require shallow foundations reduce the costs and difficulties associated with diverting services, such measures can be less effective against penetrative impact, less publicly acceptable and less effective on undulating ground (Forman 2009b).

THE IMPACT OF INNOVATION

Innovation is having a considerable effect for both terrorists and those responsible for countering the threat that is faced. In relation to the nature of the threat and the methods of attack being used, terrorists are attempting to establish proven methods of circumventing CTM's through the use of explosives (Forman 2009a). However, CTM's are increasingly being tested not only in relation to their ability to stop penetrative attack, but also their responses to explosive charges being detonated on and near them, in order to ensure that CTM's are not only innovative in their ability to overcome the complexities within sites, such as local utilities, but also overcome the efforts of those attempting to

carry out terrorist attacks. In relation to varying stakeholder requirements and resulting trade-offs, public acceptability of CTM's and the issues surrounding site and local utilities, innovations in the development of CTM's is leading to more publicly acceptable and aesthetically pleasing measures, as well as the need for shallower foundations (ibid) and therefore, less disruption to the location of local and site services.

Examples of such innovations are evident in the UK and the USA. In New York, innovations in CTM's have lead to the development of 'tiger traps' in public spaces (Rogers Marvel Architects 2009), which are areas that are constructed to collapse under the pressure of a vehicle, but allow complete access and freedom of movement for the public. Turntables incorporating CTM's have also been developed and enable dense urban spaces to allow complete public permeability through measures, with the additional functionality of being able to rotate in order to let legitimate vehicles through (Rock 12 Security Architecture 2009). The Emirates Stadium in London, UK, is held as a model for designing in CTM's that overcome some of the previously mentioned issues, as large hardened letters spelling out 'Arsenal' have been placed to deny a vehicle-borne attack, as have other ornamental features such as large brass cannons, which are the club's insignia (Coaffee and Bosher 2008). Figure 1 below shows the letters that have been surface mounted and therefore, overcome any potential issues regarding local and site utilities.

Figure 1: Innovative CTMs at Arsenal's Emirates Stadium, London

Whilst CTM's that are 'designed-in' to plans at an early stage cost less and are potentially more aesthetically pleasing than those that are retro-fitted (Coaffee and O'Hare 2008), innovations in measures that need to be designed in and retro-fitted must continue, as the vast majority of targets already exist and can therefore only be retro-fitted with measures, which must conform to the pressures of being publicly acceptable and aesthetically pleasing. Development and innovation in relation to designing in CTM's will allow more effective ways of protecting potential targets from terrorist attack and could potentially lead to lower costs, although little is known about the costs of the measures themselves and to a larger extent, what value they bring to a site and for whom.

KNOWLEDGE GAPS

It has been recognised that counter-terrorism strategy and measures themselves are having a considerable impact on the built environment (Harre-Young *et al.* 2009) and yet, whilst innovations in protective measures are leading to the development of highly effective and more acceptable solutions, not just for counter-terrorism but for the range of other hazards and threats that pose a risk to society, key gaps in knowledge are hindering further progress. Vast complexities exist when incorporating such measures into existing or planned crowded places, which is being exacerbated by a lack of informed and appropriate guidance for key decision makers on the measures that are available, what implications they have and for whom, as well as the value, not just cost, that they bring to a site. Through the investigation of the implications and value of those measures, fundamental knowledge can be gained and used to inform guidance for key decision makers, so that issues such as those identified previously are not frequent occurrences.

As well as this, little is known regarding the inter-connectedness of the hazards and threats that are faced and how mitigating them impacts these complex relationships. The innovations of terrorist methods and tactics must also be taken into consideration, as terrorists' objectives are to cause harm and fear and this will result in determined efforts to overcome the use of CTM's that protect certain buildings and places. Whilst it can be argued that there is little logic in repeatedly attacking a particular target or type of target, as resulting preparedness and security measures will reduce the likelihood of a successful attack occurring and mitigate its impact, types of or individual targets could always be at risk due to their nature, such as crowded public places. It is at these sites that the understanding of CTM's themselves, their value, their implications and both counter-terrorism and terrorist innovations are of fundamental concern and importance.

CONCLUSIONS

Despite considerable complexity existing in the protection of built environments to the array of hazards, threats and major accidents that are faced and a lack of understanding in relation to the inter-connectedness of the phenomena themselves and the measures that are used to mitigate them, the impact that innovation has on the measures that are developed to perform such functions is significant. Such complexity acts as a catalyst for innovation, although key gaps remain in regard to the understanding of CTM's and how they are used. There is widespread scepticism and criticism regarding the use of such measures, however it is argued that informed guidance and knowledge of CTM's will aid in the construction and security of places that are at risk from the threat of terrorism. The threat is said to be sustained and as argued above, will continue to evolve and increase in the use of innovative methods and tactics in order to overcome the measures that have been used to protect certain sites, such as crowded public places. As these sites will always be at risk due to their nature, innovations in CTM's will be crucial. Information on the measures themselves, their implications and their value, through the use of informed guidance for key decision makers, will allow places that require protection to be made more resilient through the use of appropriate, proportionate and acceptable

measures. Innovation will also result in more cost-effective and acceptable measures to be used. Until this occurs, potential targets are prone to the ineffective use of such measures, resulting in under-protected and vulnerable, or over-protected and obtrusive public places.

ACKNOWLEDGEMENTS

Thanks go to the National Counter Terrorism Security Office (UK) for being a partner to this ongoing research. The research for this paper and the three year project of which it forms a part is supported by an Engineering and Physical Sciences Research Council grant, awarded through the Innovative Manufacturing and Construction Research Centre at Loughborough University.

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