

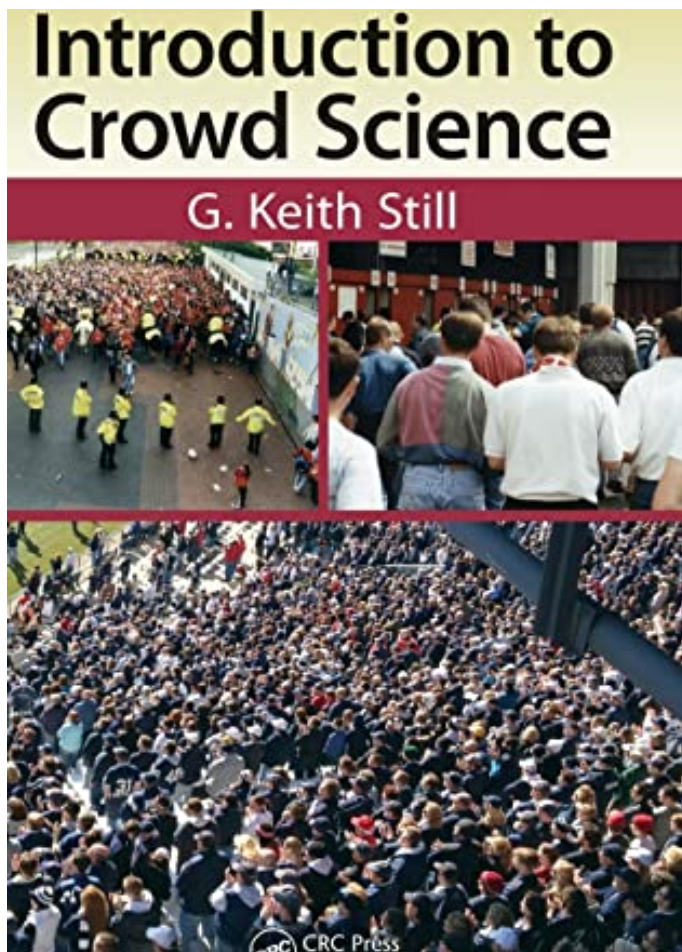
Bulletin:

Understanding Crowd Risks and Major Incidents

September 09, 2025

About the Speaker

Prof. Dr. G. Keith Still FIMA FICPEM SFIIRSM FIPM FHEA MAE, author of "Introduction to Crowd Science", and "Applied Crowd Science", has consulted on some of the world's most significant and challenging crowd safety projects. He was a Special Advisor to various Government Agencies for Hajj Projects (Jamarat Bridge/Makkah/Al Haram). He teaches short courses on crowd safety around the world, from entry-level risk awareness up to Level 7 (MSc). Dr. Still was an expert witness in over 50 international cases involving crowd injuries and fatalities.



Key Takeaways

- **Crowd Risk Analysis Tools Overview:** Dr. Keith presented on crowd risk analysis, highlighting his extensive background and the development of predictive tools for major incidents. He explained the concept of crowd science, which combines mathematics and psychology to understand behaviour and safety. The session explored past crowd disasters, stressing the importance of analysing their causes to prevent future tragedies. Several tools were introduced, including the DEMICE model, Crowddynamics, ramp analysis, congestion mapping, and decision support analysis, each designed to assess and manage crowd risks.
- **Crowd Management: Principles and Applications:** Dr. Keith discussed the application of the DEMICE model as a matrix framework for managing crowds in venues such as the Holy Mosque and Wembley Stadium. While each venue has unique local characteristics, the principles of ingress, information, and management remain consistent. He illustrated how assumptions must be questioned, drawing on past crowd incidents where perceived issues differed from actual causes. Rigorous risk analysis and simulation tools were highlighted as essential for preventing disasters.
- **Jamarat Bridge Evolution and Analysis:** The evolution of the Jamarat Bridge was traced from its modest structure in 1953 to its 2001 expansion to accommodate larger crowds. Dr. Keith detailed the use of modelling and simulation to analyse risks, culminating in a 75-page study with Dr. Sad Al-Gadi and Dr. Ephraim Kazani. He shared experience from Saudi projects, including design input for the Holy Mosque and analysis of Hajj movements. Notably, he predicted the 2001 incident at Jamarat Al-Kubra and later confirmed this analysis after investigating the 2004 mass fatalities.

- **Hajj Crowd Flow Safety Improvements:** Capacity mismatches created dangerous bottlenecks as observed in the flow of pilgrims from Mustelafa to Jamar Al-Kobra. Analysis showed that 135,000 pilgrims per hour were arriving at a site with a capacity for only 100,000. To resolve this, the team designed an elliptical bridge with a capacity of 168,000 per hour, introduced wider areas and barriers, and cleared tents to free space. These improvements, implemented in 2005, enhanced safety and throughput during Hajj.
- **Religious Event Crowd Safety Challenges:** Attention turned to the challenges of managing safety during major religious gatherings, including a tragic 2015 incident where hundreds died. Issues identified included poor signage and communication difficulties within multilingual and elderly crowds. A new bridge design launched in 2015 accommodated 600,000 people per hour, but this shifted pressure to Mina Valley, where infrastructure had not kept pace. The session emphasized that expanding capacity in one area must be matched across the wider system.
- **Crowd Management and Risk Modelling:** Dr. Keith explained Bray's Paradox, noting that unnecessary interconnecting routes often reduce efficiency and increase risks. Five risk modelling tools were discussed, including DEMICE, crowd dynamics, ramp analysis, and area definition. These tools provide insights into density, flow, and safe spaces. A practical example from Hajj showed how simple measures, such as painted yellow lines, could guide movements and improve safety.
- **Crowd Management and Safety Strategies:** The importance of crowd demographics, flow analysis, and risk mapping in shaping management processes was highlighted. Dr. Keith shared an example from a Taylor Swift concert at Murrayfield Stadium, where police, local authorities, and transport agencies collaborated on safer movement planning. Clear communication with multilingual crowds was underscored, with AI-driven translation technology introduced as a tool to enhance crowd communication.
- **Crowd Safety and Management Strategies:** Dr. Keith discussed wider safety concerns, focusing on heat-related risks, women's safety, and the role of drones. He advised preventative measures such as Saudi coolers and consulting medical experts for heat thresholds. Initiatives like Ask for Angela were highlighted as ways to create safe spaces for vulnerable individuals, with cultural sensitivity playing an important role. Parallels between traffic engineering and crowd safety were drawn, supported by an online training programme on Level 3 crowd safety awareness. The session closed with an invitation for further questions, feedback, and group membership.



Jamarat Bridge, 2015

Questions

Are there practical guidelines or benchmarks for preventing heat-related issues in dense crowds, particularly in queuing areas?

Once temperatures go beyond the body's tolerance, the risk of thermal runaway sets in. At major concerts, this is tracked with infrared, and cooling measures like water sprays are applied when thresholds are exceeded. In Saudi Arabia, Saudi coolers or fine mist systems are widely used to lower body temperature through evaporation. The best advice comes from medical research, and it's always important to consult medical professionals when events involve strenuous activity in hot climates.

What about the use of drones for crowd monitoring?

Drones can be useful, but I strongly advise against flying them directly over crowds because of the risks of malfunction or interference. We've already seen incidents where drones have crashed into performance areas. They should only be used by trained operators, and in many cases, there are safer and more reliable monitoring methods available.

Are there cultural considerations in crowd safety, particularly for women and girls?

Cultural practices can influence crowd dynamics. During Hajj, for instance, African groups often form protective cordons around women in their party. Recognising and respecting these dynamics is vital for designing effective and culturally sensitive crowd management strategies.

You mentioned women's safety in crowded environments. Can you elaborate, especially in the context of festivals?

Harassment at festivals in Canada and the UK prompted the Violence Against Women and Girls (VAWG) initiative. This introduced safer spaces, staff training, and the Ask for Angela campaign, which allows women to discreetly seek help in bars or events. These initiatives are now part of safety guides such as the Green Guide and the Purple Guide. The goal is always to provide safe, monitored environments for women and girls, supported by properly trained staff.

Can safe spaces also support vulnerable groups such as pregnant women or disabled attendees?

Yes, safe spaces have been extended to include women, disabled individuals, and pregnant attendees. At Green Day concerts and Expo events, for example, we made sure these spaces were part of the crowd management plan. Pre-event briefings also included training for staff, and initiatives like Ask for Angela are now a standard part of steward and bar staff preparation.

How do traffic engineering principles relate to crowd safety analysis?

There are many parallels between traffic and crowd flow modelling. Thresholds of density and volume tell us when a detailed crowd analysis becomes essential. It's a complex area, with in-depth coverage during the five-hour online Level 3 training course on crowd safety awareness. The advanced Level 5 course goes further, requiring case study applications of these tools.