



# A QUESTION OF TIMING

Brian Michael Jenkins and Bruce R Butterworth reveal the findings from their latest study about the safest times to travel on public transport

**T**he one question police and security officials responsible for public transportation want to know is: when are attacks on passenger rail or city bus systems most likely to occur? It turns out to be a complicated question. It needs to take into account whether or not attacks are random or if there is a specific time of day when the likelihood of an attack is greater? Is there a historical pattern indicating greater risk of

passenger fatalities or injuries resulting from terrorist or criminal activity at certain times and what that activity is?

Some extremist groups want to cause disruption that brings attention to themselves and their causes while imposing an economic cost on society. Others seek to advance their cause by killing large numbers of people. Ordinary criminals may care only about vulnerable targets or easy escape. In each case, their calculations affect timing.

Large numbers of passengers during rush hour provides attackers with greater opportunities to blend into and can also facilitate escape

In order to try and answer these questions, we decided to analyse patterns of terrorist and criminal activity over a period of 50 years of attacks on passenger trains and regularly scheduled buses, including train stations, bus depots and staff. We drew our data from the Mineta Transportation Institute's proprietary database of terrorist and other serious criminal attacks on surface transportation.

This database is maintained by MTI for government use, primarily by the US Transportation Security Administration, but reports drawing from the database are publicly available. The entries include targets, tactics, techniques, weapons, descriptions of devices, perpetrators, casualties and other operational details, where available.

Our previous reports have addressed the sophistication of terrorist attacks, terrorist use of explosives, deliberate derailments, vehicle ramming attacks, suicide bombings, stabbings and the usefulness of "See Something, Say Something" programmes. Other reports offer detailed case studies of specific attacks or campaigns.

This peak hour inquiry focused on incidents in economically advanced countries. Of the nearly 4,000 attacks currently in the MTI database, 88 percent of the incidents resulting in 93 percent of the deaths occurred in developing countries, such as South Asia and South-east Asia. We excluded these, not because lives matter less in developing countries, but because there are on-going insurgencies in a number of them which distort the overall statistics. Attacks in these countries are more than twice as lethal as those in more economically advanced countries. The second reason for setting them aside in this inquiry was that what we refer to as "peak hours" often differ, which makes it more difficult to discern statistical patterns.

Our aim was to create a universe for analysis that would be most relevant for transportation operators in comparatively peaceful environments, but that might include terrorist events – in other words, environments similar to that in the United States, Canada, countries in the European Union, the United Kingdom, Japan, the Republic of Korea, the Republic of China (Taiwan), Australia and New Zealand.

We included attempts to derail passenger trains, but excluded attacks designed only to damage tracks, tunnels, bridges or sabotage of other rail infrastructure. It is difficult to know exactly when explosives were placed or when they were intended to detonate. We also excluded attacks on tourist trains along with attacks on tourist, charter, school, government and company buses. These are normally not the responsibility of transit agencies and they operate according to different schedules or no particular schedules at all. Finally, we excluded the very few attacks on ferries and ferry terminals.

Excluding these left us with 504 attacks with 720 fatalities and close to 10,000 injuries, giving us an average of 1.4 deaths per attack. As the principal concern of the research is the threat to people, lethality – the number of fatalities per attack – is a critical issue. The analysis specifically considers the effect of timing on lethality.

We defined peak hours as 6-10am and 4-8pm, a broad definition reflecting national differences. We realise that these periods do not precisely match rush

hours in all cities of the world. For example, during the October 2019 campaign of sabotage and arson in Chile's Santiago subway system, attacks took place during a noon rush hour and also in evening rush hours that extended beyond 8pm. In these attacks, roughly 80 subway stations were damaged by arson and 11 were completely destroyed.

Our analysis shows that 63 percent of attacks in all countries occurred in off-peak hours. The timing of 18 percent of the attacks is unknown. (With two-thirds of the day falling into the non-peak category, that is pretty close to what would be expected in a random distribution. However, only 19 percent of the attacks occurred during peak hours.)

But if we consider only the 168 weekday attacks for which the specific time is known or can be estimated, the proportions shift significantly. The difference between the proportions of attacks in peak and non-peak hours is far narrower for these attacks than it is for *all* attacks: 55 percent in off-peak hours and 45 percent in peak hours.

**ANALYSIS SHOWS THAT 63 PERCENT OF ATTACKS IN ALL COUNTRIES OCCURRED IN OFF-PEAK HOURS**

It seems logical that terrorists seeking to cause maximum disruption or mass casualties would launch their attacks during times of day when passenger traffic is at its height. Large numbers of passengers during rush hours also provide attackers with greater opportunities to blend into crowds just prior to an attack and can also facilitate escape (if escape is part of their plan). The dark hours before the morning rush hour, when surveillance is less intense, can also provide time for last-minute preparation.

Not all attacks, however, reflect these objectives. Different categories of attackers have different motives.

## AVOIDING FATALITIES

Although the Provisional Wing of the Irish Republican Army (PIRA) was capable of carrying out deadly attacks, PIRA bombings of public transportation systems, especially in the Seventies, were aimed primarily at disruption. ETA, the Spanish Basque terrorist group carried out night-time bombings and arson attacks to get media attention and frighten off foreign tourists. They generally avoided fatalities, although their violence escalated over time. In contrast, bombings by right-wing extremists in Europe and jihadist groups worldwide were aimed at causing mass casualties and, statistically, they were the most lethal attackers.

Attacks by mentally unstable individuals, which accounted for 16 percent of the cases and 25 percent of the fatalities, may have no discernible pattern. We wish to emphasise that the term "mentally unstable" is not a clinical assessment, and we are making no independent judgments. This is a broader societal issue that should prompt help and preventive intervention, not punishment.

The critical factor is not the volume of attacks during peak hours, but the bloodshed that results.



Overall, peak hour attacks were 4.5 times more lethal than non-peak hour attacks. Total fatalities resulting from attacks during peak hours were almost 2.5 times greater than attacks during non-peak hours.

The differences do not simply reflect a handful of large-scale incidents. Mindful of possible distortions, we deliberately omitted from the first cut of our analysis four major events that occurred during weekday peak hours: a 2003 arson attack on a subway in Daegu, South Korea, which killed 198; the 2004 bombing of commuter trains in Madrid, which killed 193; the 2005 bombing of transportation targets in London, which killed 52, and the 1995 Sarin attack on Tokyo's subways, which resulted in 12 deaths, but caused 5,000 injuries. The total of 455 fatalities was enough to skew the statistical results of the research.

## IT IS VERY DIFFICULT TO KNOW EXACTLY WHEN EXPLOSIVES WERE PLACED OR MEANT TO DETONATE

If these outliers are included, their combined death toll would increase the lethality of all weekday attacks by more than five times, from 0.6 deaths per attack to 3.2 deaths per attack, and would increase the lethality of all morning rush hour attacks by more than 13 times, from 0.9 deaths per attack to 12.2 deaths per attack.

Terrorists time their attacks to occur not only during weekday rush hours, but also during peak travel times associated with holidays and vacation travel. The most dramatic example of this is the 1980 bombing of Bologna train station, which occurred on a Saturday at the beginning of the traditional August vacation. The station was predictably filled with holidaymakers and 85 people were killed in the attack.

Even without the Bologna attack, the 10 holiday peak attacks caused 4.4 deaths per attack – the highest of any time period. Including it increases the lethality by more than 2.5 times, to 11.7 – about the same as the lethality of weekday morning rush hour attacks with the four outlier attacks included.

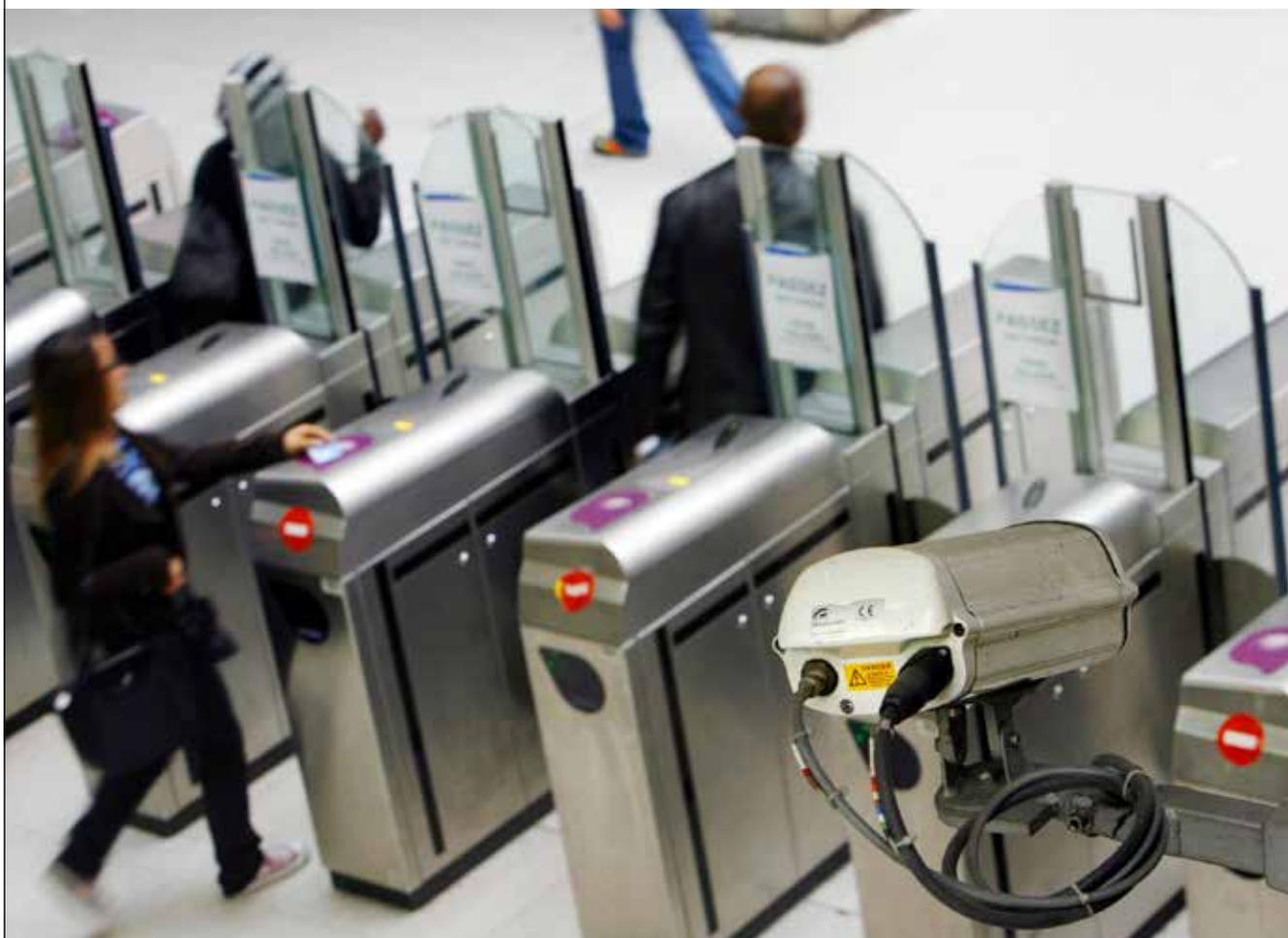
The pattern of attacks on bus targets differs from that of attacks on train targets, with far more bus attacks occurring during non-peak hours. However, similar to weekday train attacks, almost all fatalities in weekday bus attacks occur in the peak traffic hours. In contrast to train attacks, attacks on bus targets in the afternoon rush hour are more lethal than those in the morning rush hour.

As for the original research questions – when do most attacks on transportation facilities occur and when do most casualties occur – there is no simple answer for all countries, all target categories and all attacker types. However, it is clear that the most lethal attacks have occurred during peak hours. Adversaries determined to kill in quantity are most likely to plan attacks during peak travel hours, with the morning rush hour trains and stations viewed as particularly lucrative targets ●

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**Total fatalities from attacks during peak hours are almost 2.5 times greater than attacks during non-peak hours**



Picture credit: Getty