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LESSONS LEARNED[1] IN RELATION TO CROWD MANAGEMENT AND EMERGENCY PLANNING FOR WORLD YOUTH DAY 2002 JULY 23-28

by
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2002 July 31

This report contains little but my personal first-hand observations and things told me by first-hand observers about circumstances which might be considered "lessons" in crowd management from Toronto's World Youth Day. There are real limits to what one person can see in the course of such an enormous festival.

The author had a sub-consulting role in matters related to crowd management and emergency planning, reporting to RCM Technologies, prime contractor for these issues. Starting about a month before World Youth Day, the author walked the sites and reviewed drawings and event plans working with RCMT through the end of WYD. The purpose of this report is identify areas where reality unfolded differently than planned… so that we can all learn from these instances.

Contents

Background

[1] Well, "lessons learned" inevitably means noticing shortcomings and deriving lessons from them. There is no suggestion here that *all* or even *any* of these shortcomings could have been identified under the best of pre-event circumstances even by the most prescient of emergency planners.

The festive weeklong gathering of Catholic youth from around the world, known as "World Youth Day," was comprised of several massive gatherings.

1. For the Pilgrims (the term used for the registrants), an initial day at Exhibition Place culminating in the Eucharist service under the Archbishop in the late afternoon and a second day of individual activities at Exhibition Place, perhaps 200,000 guests,

2. Also at Exhibition Place, a gathering of Pilgrims for the Pope's welcome ceremony, perhaps 250.000-300,000 guests,

3. On University Avenue, a broad public boulevard divided by a ceremonial and decorative objects and plantings, a series of dramatizations written by the Pope, *The Way of the Cross,* in 14 scenes presented on 12 stages along the three kilometer route, for Pilgrims and the public, perhaps 250,000 guests,

4. A day of assembly at the unused Downsview airbase (currently being made-over into a national urban park) culminating in the evening with the Pope's initiation of an over-night vigil for Pilgrims, roughly 300,000 by the end of the day, and

5. Sunday Papal Mass and conclusion of the visit, with the over-nighting Pilgrims joined by the public, estimated at 750,000-800,000 total attendance.

Ingress, egress, crowd movement, and security control

An ingress of hundreds of thousands of people can deteriorate into severe patron discomfort and, if untoward crowd movement occurs, serious mayhem and death. Following as it did the sad events of September 11, 2001, WYD was committed to effective security checking of all individuals admitted to events. Planning was based on an estimate of 30 seconds per person for a check of both grips (through examination) and bodies (through electronic metal-detection wanding). In other words, a pair of security staff (one for grips and one for bodies) working together[2] would maintain roughly a 30-33 second headway.

Security staff were stationed at gates designed as "chutes" and multiple paired-teams of parcel and wand checkers could be placed at each chute.

To accurately estimate throughput, you also need estimates of utilization or the percent of time checkers are actually checking a patron, rest break time, Poisson distribution on individuals who need exceptional amounts of time for checking, and related threats to efficiency.

The number of chutes and staff can be readily calculated, given a model of rate of arrival. For example, I estimated that the Downsview would need 1500 gates manned by pairs of checkers to

[2] There is no efficiency benefit from having a single pair of security staff (as compared to a single person doing both roles) since the statistics of multiple service-providers for two operations arrayed in series only kicks in with larger numbers of pairs.

manage a public arrival Sunday morning of 500,000 guests. It was assumed that the cohort would be traveling by transit and needed to be within the grounds before the Mass started.

The plan could have been readily mocked-up as a means of testing the speed of gating by experimental test ahead of time. Or, based on test results, revising the concept in various ways major and minor. This wasn't done despite the fact that there were substantial benefits possible to patron happiness, staff costs, life-safety, and security by testing and fine-tuning the procedures. After all, something on the order of 1.5- to 2-million security checks were about to be conducted.

In practice and as observed under many conditions at all secure entrances at Exhibition Place and Downsview, it was observed that the length of time for a check was largely a function of the extent of the back-up of arriving guests. The extent to which these queues were challenges to good order determined speed of checking; in other words, security took into account what fuss might arise from delays considered unwarranted by the crowd.

Reasonable checking did take place in roughly 30 seconds. But it was the exception to find security staff taking that much time. Ordinary checking took place typically in 8-15 seconds. Some checkers managed to wand a person in about 4 seconds; but needless to emphasize, this required ignoring all beeps. At some points in time, simple bag checking was used without wanding.

On the other hand, security staff when very tired were observed who took 20 seconds or so to do a cursory bag-check or wanding. This did not provide much security despite being slow.

On many occasions, the distribution of checking resources and the demand/arrival of patrons were poorly matched. Even within local environments, the match was sometimes poor as peripheral gates were ignored while central gates were over-patronized. For example, pedestrians were poorly distributed among the three or four TTC entrances at Exhibition Place. This was natural enough since the architecture featured the centre entrance over the others. However, patrons could have been encouraged to use lesser-queued gates though PA announcements.

Ingress at the Dufferin Gate of Exhibition Place was often badly congested. They may have arisen because the large entrance at the west-end Lakeshore Boulevard site was cancelled unbeknownst to some safety staff. Or, the initial estimate of the demand for service at that gate was too low to justify having an entrance in light of later changes of plans — again, unbeknownst to some safety planners. With forethought, the gate-perimeter could have been cast on a large semi-circle, rather than simply set as the *shortest* line across the Dufferin Gate bridge… as would be appropriate for a military defence line.

Dufferin Gate on Thursday.

Egress at Downsview began as a trickle on Sunday morning *before* the Papal Mass, less than 0.5% of the overnight Pilgrims left, it might be estimated, a flow of perhaps 5-10,000. Exit interviews indicated that the morning's rain and the threat of further rain were the main motivations. Those departing looked beaten by the weather. Had a substantial downpour occurred — as forecast — the fraction leaving would have been much higher and less orderly and perhaps would have swamped transit service.

When the Mass and valedictions were complete around 1 PM, some entertainment was provided to slow the mass egress. The actual circumstances of the egress were not observed. By 3 PM when observations resumed, about 90% of the crowd were out of the park and no major line-ups were present at subway stations or bus boarding areas. An exception was the Dufferin/Wilson intersection, a secondary boarding area, providing something more like ordinary rush hour service than special festival service.

Thus a highly successful egress of say, 600-700,000 guests took place in two hours. They were served by reserved pedestrian roads using a network of roads closed to private vehicle traffic, 200+ dedicated buses largely on reserved lanes, enhanced service on the bus street grid, and a largely reserved heavy-rail subway line with two nearby walk-in stations. The dedicated buses fed street routes and a second heavy-rail subway line. A very substantial number of police and transit staff managed the egress.

Personal medical emergencies

In planning, the greatest medical concern was for dehydration. In preparation, the organization brought a substantial amount of bottled water to the site. Due to the great heat and humidity on Saturday, and due to some delay in installing drinking water facilities[3], many Pilgrims — after their long trek to the Downsview site — were quite thirsty and hungry by noon.

As commented elsewhere, WYD management were altogether too shy in communicating basic useful information to guests. This included being taciturn about water and food information.

As mentioned, WYD had wisely purchased very large stores of bottled water which were stored at the easily identified medical tents, located around the site. WYD management asked the medical staff not to begin to distribute water until told to do so. Most of the medical tents did, however, begin to distribute water to all that asked. That was their decision in light of being on the scene and sensitive to the health of the audience.

Also out of synch with circumstances was WYD ethos for Pilgrims to be a money-less society, leaving the provision of the essentials of life up to management, as defrayed by their registration fees. Thus Pilgrims were programmed to have little money with which to purchase food and drink. Moreover, Pilgrims holding foreign currencies were doubly disadvantaged because no currency exchanges were at the Downsview site.

Lesson: as Napoleon observed, an army marches on its stomach; ensuring that drink and food are well provided for is important.

In preparatory walk-throughs of the Downsview site, the rough character of the ground — other than the paved sections, roughly 15% of the general audience area — raised concerns about injuries to feet and legs. Some number of lower-limb strains were treated, possibly 20 in two days. But this volume was less than anticipated by the planners, who were obviously a weak-ankled group of middle-aged folks.

The less-than-expected number of sprains may be due to some anticipatory grading done to some of the site by a paving contractor. My impression is that more sprains were found at the hospital nearest the Wilson entrance, the busiest. This confirms the theory that people learn the terrain (or stairs) on which they are walking in their first encounters with the surface and show accommodation to the surface after.

Often found were blisters on feet and toes due to Pilgrims walking long distances in minimal sandals. Medical staff had sufficient generic bandaging supplies to meet the need. But that is a lesson for future audience preparation.

[3] There seemed to be some incompatibility of plumbing fittings between the water tanker trucks and the fountains arrays that were installed at the site.

Lesson: if the care of sprains had required appreciable preparation, it would have been wise to "test" walking ability at the site, provided an ethical experiment could have been devised.

At the 1984 Papal visit, in a report which the safety planners could never find, the Ministry of Health found that many diabetic emergencies took place.

However, in 2002, few such instances occurred. Emergency treatment and self-medication practices had sufficiently advanced that this was not a prominent threat in 2002.

Some heart problems were treated. These were found among the public guests on Sunday who were older than the Pilgrims.

Lesson: learn from those who were present in the past (or try to get old reports if you can) but recognize the changes over time in medical practice.

Emergency planning

*** Fences

In a number of locations at Exhibition Place and Downsview the emergency planners specified "soft" fences which defined spaces but which in an emergency, would be no impediment to escape. That is, (1) they could be knocked over without much force and (2) when down, they would not present a tripping hazard.

In practice, virtually all places had temporary fences that failed to meet one or both of these criteria. Some were quite rigidly attached to the surface and some would not lie flat on the ground after being knocked over.

A particularly troublesome instance of unyielding barriers were the locked gates which flank the grand arch of Princes' Gate… despite the safety planners being quite clear to management that they had to be ready for crash-barrier service. The 5 meter wide arch, with no far-side impediments, could accommodate no more than about 250 pedestrians a minute resulting in an egress time for a mere tenth of the crowd (say, a tenth of 200,000 patrons) of 80 minutes — hardly a safe period of escape.

At Downsview, a permanent chain-link fence topped with strands of barbwire extended for the majority of the southern half of the west perimeter wall. A substantial part of this fence and a part near to escape routes radial to the altar was submerged nearly its full height in a trench — perhaps dug as a storm water conduit or for some benefit to operations as an air base. Further camouflaging this humanly impenetrable barrier were (1) tall grass, nearly as high as the fence and (2) the illusion of continuity arising from the fact that during the Mass, people were sitting on both sides of the fence, arrayed identically on both sides (the far side being a grassy knoll) and looking very much like a continuous slope with no reason to anticipate a trench or barbed

wire intervening. In other words, if an evacuation had been underway, thousands of people would have rushed for safety in that direction only to be trapped in the trench and against the fence. Alternatively, as the emergency plan specified, people might have made a run for a trench in the case of bad weather.

The fence in the trench, seen up close.

The fence in the trench, pedestrian's eye view.

Upon discovery by the safety sub-contractor, the hazard posed by the fence was brought to the attention of WYD management. Given the short amount of time and the shortness of resources to devote to this problem, management decided to tie bright ribbons to the barbwire, thereby making the fence slightly more conspicuous.

But this was never done.

Lessons: there is need for effective input from safety planners and there should be time, resources, and other opportunity for review and adjustment when oversights are committed.

*** Behavioural Models

To keep Pilgrims uniformly distributed at Downsview, a system of areas called “pens” were created and each pen had a volunteer leader. The pens were demarcated by temporary barriers at each corner and by ropes supported by painted steel stanchions. The volunteers were to be trained in the plans for emergencies of various sorts.

Stanchions confiscated by police from shelter builders.


Creative solutions to rain protection… not always pretty to look at.

In practice, the audience were little inclined to remain in their pens. Rather, given a day’s and night’s time and with no competing activities to busy themselves with, they migrated towards the

stage/altar… of course. When I went looking for the pen leaders, they were nearly all vanished, unidentifiable, or otherwise impossible to locate. Due to the threat of rain, all available supports, barriers and especially the steel stanchions, were seconded for the building of ad hoc tents. Therefore, by Sunday morning, there were no pens, no pen leaders, and no emergency plan.

Lessons: realistic expectations for the behaviour of crowds and volunteers are needed.

*** Command Structure and Communications

The risk and the reality of dehydration have been discussed previously. WYD management asked the medical staff not to begin to distribute water until told to do so. Most of the medical tents did, however, begin to distribute water to all who asked. That was their decision in light of being on the scene and sensitive to the health of the audience.

Planning for persons with special needs

A variety of disconnects between planning and reality occurred in relation to persons with impairments.

*** at Exhibition Place, some transport services were directed to drop their passengers outside Princes' Gate with the consquences that patrons then had enter at the rear of the waiting queue and in bright sunshine, to awkwardly and perhaps needlessly pass through security, and that the vehicles were routed through areas better left for pedestrians and emergency vehicles.

*** at the Way of the Cross, the two areas designated for special needs on the plans, vanished in practice. At the St. Patrick street drop-off, various tents and stages blocked the entrance path and no one at the space was aware of the plan; opposite the Royal Ontario Museum no arrangements were visible and security and police staff were unaware of the plan.

*** at Downsview, a substantial number of wheelchair users opted to mix with their peers as is conventional practice today, if not beloved by safety planners for obvious reasons; about half of the wheelchairs observed (total estimated at a few dozen) were more rugged than the usual indoor models and thus were marginally suitable for the terrain.

A large area was set aside for arrival and accommodation of persons with special needs. This was next to the main hospital. However, as persons with special needs like to point out, they don't think of themselves as "patients" but as just plain folks. The main hospital did have a few visits from special needs patrons for routine matters (not identified specifically, but believed to be related to ordinary care for urine bags, catheters, etc.) And the area set aside seemed to be much to big for the special needs of Pilgrims and especially in light of the congestion problem case study discussed below. Conditions during the Papal Mass at which many older persons with impairments were expected were not observed.

Some additional observations

A number of announcements, some of which were professionally crafted for WYD by an "Information Design" sub-consultant, went wanting and, in general, communication with the audience was inadequate at both Exhibition Place and Downsview Park. These included urging guests to maintain hydration by drinking lots of water, the need to be prepared for sun exposure (fewer than half the audience had hats, likewise for security staff), rain exposure and in promulgating a relaxed attitude towards getting soaked to the skin (despite forecasts, roughly two-thirds of the Pilgrims appeared to have raincoats), information about Pilgrim food distribution (which followed an unorthodox and perhaps insufficient schedule), as well as the many necessary loving announcements of the sort "we know you are out there and we are doing the best we can to care for you."

There was excess reliance on glossy and pre-programmed media. However one might view this in social terms, this is unsound practice from the safety point of view because is diminishes what psychologists call "the credibility of the source" not to mention leaving patrons without information which they were duly entitled to know.

Lesson: it is uncaring and perhaps dangerous to keep a large audience in suspense; it is reckless to fail to assertively provide necessary guidance in life-safety matters such as hydration.

A large number of toilets and washstands were provided but most were located within two or three main areas. This provided convenience to those who performed sanitary pumping at the cost of convenience to patrons.

A mixed-gender bank of moderately dirty toilets was timed as providing service headways of 2 minutes and 30 seconds per unit.

There were substantial variations in the quality of security checking of guests. As noted elsewhere, WYD management did not seem to have eyes-and-ears on the ground but instead, practiced crisis management, such as when the water plumbing problem was brought to the attention of management and in the disturbing case study, below.

Lesson: a good ability to sense local conditions especially as these may relate to safety is important.

Dr. Ben's case study

At Downsview, a road was created southwest of special needs area and running radially from the altar to the north amenities area. It was about 15 feet wide. To the south and west of the road was

a desirable pen, fairly full of settled Pilgrims, presumably assigned to that choice area. To the north and east was an area of about 2000 square meters intended for special needs patrons and essentially empty[4].

Around noon on Saturday, the road was on the verge of mayhem because pedestrians and emergency vehicles on this road were firmly locked in place by congestion. Decisive action was required immediately in the form of allowing the escape of pedestrians and ambulances into the special needs area and, incidentally, access to the many toilets there. The police stood by watching the dangerous situation unable to assess the risk, unprepared in ameliorative strategies, for whatever reason not informing their superiors of the dangerous situation, and/or unwilling (or not permitted) to assume responsibility for the situation. No member of the WYD security staff was around.

A sub-contractor to the safety planners, that's Dr. Ben, took personal charge and unhooked the barriers defining the road and relieved the pressure. After about 200 Pilgrims hesitantly but with obvious gratitude and relief entered the special needs area, the police and many volunteers easily re-established the road perimeter. The risk of harm was passed for the moment.

About 20 minutes later, a staff member with WYC security arrived and who, upon establishing that his superior had never heard of this sub-contractor or placed any trust in reference to the safety consultants, Mark Banga, or for sure, any fellow named Dr. Barkow who was claiming to a well-known authority on such matters, persecuted and abused the sub-contractor — who fortunately is a person of great aplomb and good humour who, when necessary, suffers fools gladly, even real big fools. The sub-contractor prevailed on the security person to remain on the scene and/or make changes to head-off any future danger. But the staff member was a jerk and wasn't inclined to take no advice from no doctor.

Lessons: all kinds of pretty obvious lessons here.

** plans and planning should have scrutinized with sufficient care to have identified the problem road (proximal causes were that the road was a main thoroughfare for Pilgrims who had little else but cruising to occupy themselves at that time and that ambulances and a variety of other service vehicles felt the road was especially right for their purposes, perhaps mistakenly),

** procedures and communication plans should have been in place to foster a good reaction to emergent circumstances such as this one,

** some amount of flexibility should have been built into arrangements/structures particularly if they have been identified as risky; while there was a large and empty space to the north and east of the road, it was not a simple matter to move the barriers out (even assuming anyone with established or "battlefield" authority was around the initiate the changes) because many electric cables were laid on the ground under the north/east line of barriers; later in the day, the barriers to the south/west could have been moved, slightly crowding the adjacent pens but that would

[4] As previously noted, no observations were conducted during the Paper Mass the following day when many more special needs guests were expected.

have taken more organization than simply moving into the then-empty special needs area (which had the electric cables as a further barrier),

** security and safety staff should have been working in a coordinated fashion and particularly, the presence of newly hired sub-contractors should not be a mystery to security managers.

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