

Carnival Public Safety Report Executive Summary

Key findings from the 2001 Notting Hill Carnival Public Safety project

prepared by Intelligent Space Partnership for the GLA Carnival Review Group

www.intelligentspace.com

About this report

Intelligent Space led a team of consultants in an assessment of crowd safety and route design at the Notting Hill Carnival. The project involved both state of the art computer modelling of the crowd and best practice risk assessment. This provided the GLA Carnival Review Group with guidance on improving crowd safety and an evaluation of the merits or risks of alternative routes that were proposed by various Stakeholders.

Intelligent Space won the prestigious 2002 AGI Award for Innovation for their advanced computer modelling of crowds at the Carnival. Ken Livingstone, Mayor of London, said "I am delighted that Intelligent Space have been given this award for innovation. Their research has been absolutely vital to the review of Notting Hill Carnival."

This document contains the Executive Summary from the final report. Also available for download from our [website](#) is the report section on **design guidance for alternate route design**.

Further information

The following additional publications about ISP's work on the Notting Hill Carnival are available from our [website](#) (click titles to download):

- [GLA Carnival Review Group final report](#)
- [CASA Working Paper 56: The Discrete Dynamics of Small-Scale Spatial Events](#)
- [Safety in Numbers? Modelling Crowds and Designing Control for the Notting Hill Carnival](#)

For more publications from Intelligent Space Partnership, see www.intelligentspace.com

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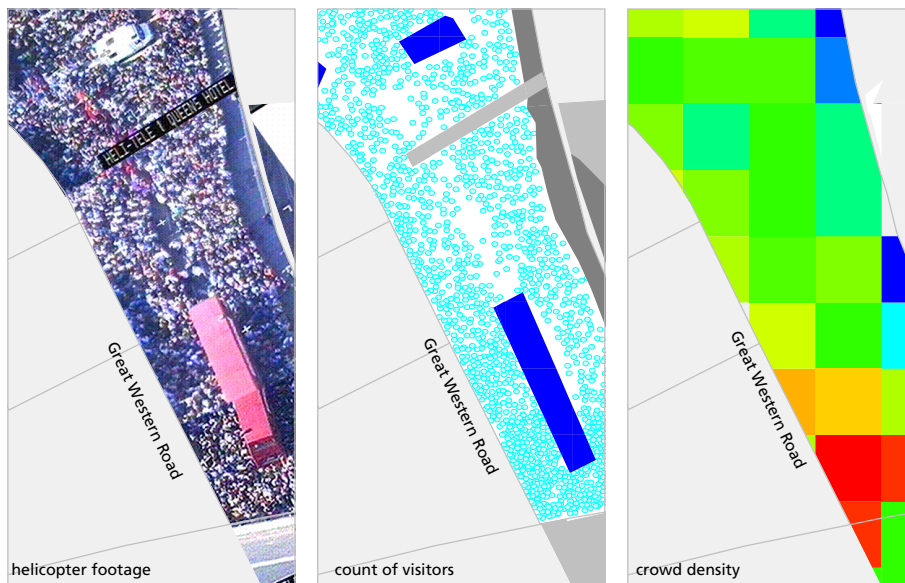
INTELLIGENT SPACE PARTNERSHIP

CARNIVAL PUBLIC SAFETY PROJECT
ASSESSMENT OF ROUTE DESIGN FOR THE NOTTING HILL CARNIVAL

EXTRACT FROM FINAL REPORT

Executive Summary

FULL REPORT PUBLISHED JANUARY 2002



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1 EXECUTIVE SUMMARY

1.1 Executive Summary

1.1.1 Introduction

- 1 This report presents the findings of the Notting Hill Carnival Public Safety Project by Intelligent Space Partnership on behalf of the Greater London Authority Carnival Review Group. Following the interim report of the Review Group, this project was given the following brief:
 - to undertake a detailed liaison process with the Stakeholders of Carnival, utilising their experience and informing their decision making
 - to provide an analysis of crowd behaviour at Carnival 2001, identifying the factors involved in crowd buildup and the major associated risks;
 - to develop a set of design guidance recommendations for crowd safety that can be used to inform the choice of the future Carnival route
 - to assess a shortlist of alternative routes identified by the Stakeholders in terms of their compliance with design guidance, and to use crowd modelling and risk assessment to evaluate the potential effects of these routes on crowd safety.
 - to make recommendations about the problems and merits of each route.
- 2 The remit of the project was limited to public safety issues and did not encompass any review of non-safety issues (e.g. funding, logistics, convenience etc.). A detailed liaison plan was implemented that included over 20 diverse 'Stakeholder' agencies involved in Carnival. The Stakeholders provided both data and experience at key stages of the project. They used the design guidance and analysis to inform their decision making process in their selection of a shortlist of routes.

1.1.2 Analysis of Carnival 2001

- 3 In August 2001, the project team undertook the first detailed observation survey of crowding at Carnival in the history of the event. This established a number of key facts:
 - Approximately 710,000 visitors came to Carnival 2001 in total.
 - As far as can be determined from information on past years, Carnival increased in size steadily throughout the 1990s, although attendance numbers fell in both 2000 and 2001. The historical trend of growth is an important long term safety consideration, given the uncontrolled nature of the event in terms of visitor numbers.
 - In terms of occupancy (i.e. the total number of visitors in the Carnival area at any one time), the peak time was on the Monday of the event

- between 4pm and 6pm, when approximately a quarter of a million people were inside the area.
- The arrival flows into Carnival peaked between 3pm and 4pm. Departure flows peaked between 8pm and 9pm on the Monday, but total movement remained high between these times.
 - For the whole period of 3pm to 9pm, additional pressure on crowding was put on the route by high level of pedestrian movement entering and exiting the area. All of these visitors must use or cross the processional route.
 - Arrival and departure flows were very unevenly distributed, with just four of the 38 roads into the Carnival area accounting for more than half the total flows in. This pattern leads to increased pressure on certain areas of the route.
 - For the distribution of the crowd on the route, there is a marked distinction between the North and the South of Carnival, with a heavier concentration of use in the streets to the South.
- 4 These main characteristics of crowding at Carnival have a number of important safety implications:
- The uneven distribution of the arrival and departure flows is a safety concern in that it can put additional pressure on areas where these flows meet the procession route. Analysis shows that this is influenced by the layout of streets in the Notting Hill area (urban barriers and the visibility of the processional route from arrival streets) and public transport facilities (tube stations and their level of use).
 - Peaks in density present safety concerns for some parts of the route. Analysis shows that this is influenced by the available space for spectators, the visibility of different parts of the route and the accessibility of public transport for arrival and departure flows.
 - Floats reduce available space for spectators and there is a safety issue relating to the location of some of entry and exit points for floats in densely packed sections of the route.
 - The fact that the route encloses the entertainment area means that all emergency vehicles and all visitors to the entertainment area are forced to cross the route, which also impacts on the available space for spectators.
 - The location of the judging point is believed to contribute to the uneven distribution of crowds, especially as it influences the distribution and congestion of floats in areas close to and upstream of the judging point.
 - The width of streets is particularly important in the issue of available space for spectators and thus to crowding. Where the procession goes through a narrow street or street section, less space is available for spectators and a pinch point is formed.
 - Crowding in the entertainment area is predominantly influenced by the locations of static sound systems and the available data points to a strong attraction influence of the static sound systems on the overall pattern of use.

1.1.3 Design Guidance

- 5 Using the evidence from the analysis of Carnival 2001, the Crowd Safety Risk Assessment Methodology developed for the Health and Safety Executive (HSE) has been applied to Carnival to show how patterns of crowd build up and behaviour translates into risks for safety. A number of the risks identified related to the route, and these have provided the basis for design guidance.
- 6 The following table summarises the key points of the design guidance that was developed in light of the observation study of Carnival 2001 and the risk assessment. In each case, the relevant risk for each recommendation of the design guidance is noted.

TABLE 1 DESIGN GUIDANCE FOR CARNIVAL

DG	RISK	DESIGN GUIDANCE
DG1 ^a	Crowd density heightened on route by cross-flows for ingress and egress	Remove circular enclosure by route to end compulsory crossing of route for all visitors.
DG2	as above	Avoid significant pinch points on the route
DG3	Uneven distribution of crowd and concentration of ingress on a small number of streets	Locate route to encourage more evenly spread access, using public transport and attraction locations
DG4	Emergency vehicles have trouble accessing interior of route and create crowd congestion when crossing the route	Minimise need for vehicles to cross route using alternative ingress routes
DG5	Ingress and egress flows are concentrated between large urban barriers (e.g. canals, railway)	Choose areas with permeable street grid both for egress and to allow for contingency diversion
DG6	Turns in route are conflict points for vehicles and pedestrians and crowd concentrates at junctions	Minimise turns on route
DG7	Judging point increases concentration of South Western half of the route	Move judging point to quieter street or to a larger area
DG8	Vehicles on surrounding streets may pose a danger to crowds	Fit Traffic Exclusion Zone around any new route
DG9	Floats accessing route disrupt crowd and reduce available space	Put entry and exit points for floats away from most crowded areas
DG10	Risk of crushing under vehicles on route.	Implement safety cordons around all vehicles and avoid significant pinch points in route.
DG11	Risk of injury to carnivalists boarding vehicles from the side.	Introduce safe ingress points on vehicles away from wheel path.
DG12	Static sound systems block pedestrian flows	Locate sound systems off key pedestrian movement routes. Locate sound systems so that peak zones do not overlap with other sound systems. Manage flows around big sound systems with stewarding. Introduce separation between dancers and pedestrian traffic in the vicinity of big sound systems.

a. For the sake of clarity, the guidance points have been renumbered since they were first presented to Stakeholders.

1.1.4 Assessment Of the Alternative Routes

- 7 Following the presentation of design guidance to Stakeholders at the October 2001 Conference on the future of Carnival, the Stakeholders decided on a shortlist of 6 alternative routes for evaluation.

Compliance with Design Guidance

- 8 There are differences in the compliance of each shortlisted route with the Design Guidelines. The Horseshoe and Merging Horseshoe are least compliant, whilst all the other routes which are more compliant and Chair is most compliant with the criteria that were identified. These differences are discussed in detail in the report but summarised in Table 2 below¹:

TABLE 2 SUMMARY OF THE ALTERNATIVE ROUTES' COMPLIANCE WITH DESIGN GUIDANCE

DESIGN GUIDANCE	HORSE-SHOE	MERGING HORSE-SHOE	WEST-EAST ELL	EAST-WEST ELL	REVERSE PARK	CHAIR
DG1: Remove enclosure by route	No	No	Yes	Yes	Yes	Yes
DG2: Avoid pinch points	No	No	No	No	No	Yes
DG3: Spread out ingress and Egress to encourage better crowd distribution	No	Yes	Yes	Yes	Yes	Yes
DG4: Minimise need for vehicles to cross route	No	No	Yes	Yes	Yes	Yes
DG5: Choose permeable streets for ingress & egress routes	No	Ambiguous	Yes	Yes	Yes	Yes
DG6: Minimise turns	No	No	Yes	Yes	Yes	Yes
DG7: Move judging point to quieter street or more space	No	Yes	No if 5-ways Yes if Bishops Bridge	No	Ambiguous	Yes
DG9: Put float entry and exit points away from crowded areas on route	No	No	Ambiguous	Ambiguous	Ambiguous	Ambiguous

1. Guidance that did not relate to route choice has been omitted from this table but can be found in Table 1 on page 12

Modelling of the Alternative Routes

- 9 The alternative routes differ significantly in the extent to which arrival and departure flows from the entertainment area would be forced to cross the route. The Merging Horseshoe and Horseshoe would have negligible effect on opening up the entertainment area. The "Ell" routes and the Reverse Park would open up the area to about 22% of flows and the Chair route would provide the least enclosure, with 44 to 46% of arrival flows having direct access to the entertainment area.
- 10 In terms of sheer overall capacity, modelling suggests that the length of the route is an important issue as a reduction in route length reduces the overall amount of space for spectators and the general effect will be an increase in crowd density. The Horseshoe and the East West Ell both show worse levels of average and maximum crowding than the existing route and this result is strongly influenced by the short length of both routes. The Reverse Park and the West East Ell show lower average and maximum crowding than the current route. The lowest route crowding indices are for the Merging Horseshoe and the Chair routes. For the Merging Horseshoe, the analysis is strongly affected by the extreme length of the route, as it is so much longer than the others and this implies much greater capacity on all modelling scenarios. For the Chair, the result relates to the much greater width of the route.
- 11 Modelling has identified a number of pinch points that pose serious issues for crowding. For the Merging Horseshoe, both Ell routes and the Reverse Park route, a new narrow section at the Eastern end of Westbourne Grove¹ would be a major concern. For the Horseshoe route, a new pinch point at the top of Great Western Road would be a major concern. Only the Chair route has no significant pinch points.
- 12 Agent based modelling has been used to illustrate the more general implications of the configuration of the route for capacity in future years. The routes differ in the extent to which crowd attractions are focused or dispersed. The least capacity for coping with increased numbers would be likely to result from the Horseshoe route, owing to its high concentration of attractions in a small area. The greatest capacity would be likely to result from the Chair route, owing to

1. between the Five Ways junction and Queensway

the spreading out of the route attraction away from the concentration of Static Sound Systems.

Risk Assessment of the Alternative Routes

- 13 In terms of public safety risks, the crowd safety risk assessment has shown that there would be problems associated with all of the proposed routes. For the selection of a safer route for the future of carnival, the key considerations are how serious the problems are (i.e. the risk levels), how many of them there are for each route and whether these problems can be resolved.
- 14 The Horseshoe and the Merging Horseshoe routes have the largest number of high-level risks. Most of them are believed to be difficult to resolve. Amongst those that could be resolvable, some would only have limited effects (i.e., only reducing the risk slightly). In comparison, both the W-E Ell and the E-W Ell routes have less high level risks. These two routes have similar numbers of high level risk, although the hazards with which the risks are associated differ slightly. The routes that have the least high-level risks are the Reverse Park and the Chair routes. Both routes have the same number of top level risks (i.e. Level A and Level A/B risks).

1.1.5 Recommendations

- 15 The purpose of our recommendations is to help inform the planning process by advising on which of the six proposed routes shows most potential for further planning. As can be expected from a complex event such as Carnival, the study has identified some benefits as well as pitfalls in all of the proposed routes. But none of them provide an 'easy fix' for enhanced crowd safety. What is important is to look at all aspects of our assessment and to weigh up and compare the pros and cons for each route. On this basis, the proposed routes are listed below in order of preference from the perspective of crowd safety:
 1. Chair
 2. Reverse Park
 3. W-E Ell (considered as the option of judging on Bishops Bridge Road)
 4. E-W Ell (if the judging point is moved and the length is reconsidered)

- 16 The routes “Merging Horseshoe” and “Horseshoe” are not recommended for further planning.
- 17 A number of additional recommendations are made for action by the Stakeholders:
 - to review the design of the “Entertainment Area”
 - to ensure continuous safety inputs during the detailed planning and implementation stage
 - to review and revise the risk assessment
 - to monitor future crowding patterns
 - to continue the development of the models
 - to obtain additional information about the visitors
 - to share experiences with stakeholders from similar urban world events