GETTING THERE

AN ASSESSMENT OF LT's ENDEAVOUR TO IMPROVE BUS PASSENGER INFORMATION LITERATURE FOR CENTRAL LONDON, 1979–1985

'Fitness for purpose' is the catchphrase of those who combine effectiveness with economical design. It is frequently associated with well thought out engineering and architecture. But the ironmongery and hardware of public passenger transport is ultimately determined by passenger volume and revenues (including grant-aid), these being the criteria for the future well-being of the operator and around which the cost base must be structured. So fitness for purpose is nowhere more important than in publicising and selling the operator's product - bus and rail services - and in making these appear easy to use. Carefully designed and widely disseminated basic service information may be an unglamorous requirement, but is an essential element of marketing and other promotional strategies.

Latterly London Transport had not been wholly satisfied with the portrayal of its bus services in its central London maps and its systemwide 'London Buses' map. Being geographically based, the perceived problem for users was that it was difficult to follow the route of individual bus services, particularly in congested areas or where the route meandered. From LT's standpoint the bus maps were not selling bus travel as effectively as was believed possible. Other elements of bus travel information, such as wayside signing, were also considered to have potential for improvement.

Bus maps for central London are only part of a wider story. The all-London bus map has had a chequered career since 1982, and for a while was replaced by a separate central London map and a new range of suburban maps, leaflets and guides. The purpose of this particular article, however, is not to discuss the total range and application of bus travel information, but to focus on the basic theory of recent years. The central London tourist market was the 'test bed' for subsequent actions which have affected the whole of London: the issues faced in central London merit close examination.

So this article discusses London Transport's response to the problems which it believed to exist, the range and design of maps which have been produced as a consequence for central London, and the wider public reaction to this revised presentation of travel information together with some general observations of our own on the phenomenon. We have not covered in detail the other measures which were originally to have formed an integrated part of this information 'package', such as named bus stops, as in practice their implementation has been phased at a different rate, in response to different stimuli.

PART 1: CHILD'S PLAY

THEORY BY EXAMPLE - RAIL

There is no universally applicable manual for transport map design - circumstances depend widely upon the local geography and the variety of services to be portrayed. The London Underground, and rail services generally, lend themselves to a diagrammatic format. In order to plan a journey passengers need only locate the stations most accessible from their points of origin and destination, and presume a reasonable quality link between the two in terms of frequency and reliability. This can lead to round-about journeys - 'Finchley Central is ten long stations, from Golders Green, change at Camden Town', goes the song* - but passengers do travel this way, contentedly. Information on where to change routes can be provided crudely but with clarity - an inter-change symbol - because the discrete nature of the network limits the range of routeing options. The cross-city nature of most urban railways seldom requires passengers to change more than once or twice.

The London Underground has a complex pattern of interworking routes and services. On reflection, though, it will be seen that the Underground diagram is not a service diagram, (though recently some steps have been taken in this direction); passengers can be forgiven for believing that there might be a through rush hour train from Barking to Chesham if they wait long enough. The diagram is instead a crude but powerfully designed 'journey planner', colour coded by service group through key stations. There is an unstated requirement for passengers to travel to the next key junction and change there if in doubt or in the absence of a through train.

Travelling within this coarsened system, the passenger has no intrinsic interest in the track alignment between stations, because each station is itself a unique reference which can be clearly announced by station nameboards and by reference to on-train publicity. Signing within stations - concerning street exits, which platform to go to, or which train to take, etc - can be presented in an uncluttered fashion and in a coherent format. A valuable display at London Underground stations is the local street plan, which enables the passenger to locate destinations within a half mile distance. If supplementary signposted information is liberally available *en route*, even the less-than-perfect passenger on an urban railway can get by carrying little more than a basic, black and white diagram of the lines and stations. Automating the information-giving role of station staff is easier too on self-contained railway premises if this is desired, for example by extending the range of signs and real-time displays.

* 'Finchley Central' by The New Vaudeville Band, 1967.

Even with the regimented geography of the railway, though, most rail maps do try to show additional travel detail considered helpful to passengers. A study of various railway systems shows there are many ways in which such additional information can be portrayed.

THEORY BY EXAMPLE - BUS

Bus services by contrast operate in an adverse environment: on the streets amidst the clutter of other vehicles, other street furniture and with road and pavement layouts seldom designed specifically for buses and their passengers. In Britain bus stops, unlike railway stations, are seldom displayed on street maps - passengers must head hopefully towards roads which MIGHT be used by buses. Once in the immediate vicinity of a bus boarding point, it may not be clear even with a single pair of stops (one for each direction of travel), which stop to head for - the equivalent of finding the correct platform.

Identification of alighting 'stations' and interchanges, and the useful countdown process that many passengers on the Underground follow before alighting at the correct stop, is difficult on the buses without information to identify wayside locations clearly from the bus window. The bus passenger lacks uniquely identified stations and on-vehicle information, so may need to be interested in the geographical location of the bus at any point along the intended journey. And unlike the Underground passenger who can follow station 'way out' signing and check the local street map of the catchment within a half mile, the bus passenger alighting in an unfamiliar location lacks the on-site publicity to orientate himself in relation to the bus route just used and the catchment now accessible. The passenger frequently has to make recourse to bus staff and passers-by, because of the paucity of signing (not helped by the cluttered and haphazard layouts often found in the vicinity of bus stops).

What the bus passenger wants, irrespective of the practicalities, is information instantly available when needed and adequate in detail for the immediate requirement. At every stage of the journey, it would in theory be possible to offer specific alternatives to a detailed, geographical map of the bus route or bus network. Application of Underground standards would result in a diagrammatised, colour coded bus 'journey planner', and frequent signing along the route. Elements such as an on-bus route map plus announcements by the driver or conductor concerning the location of this stop and the next, for example, would provide the countdown facility mentioned earlier.

In the absence of a profusion of wayside signing, a geographically based bus map offers one medium for ALL information requirements, throughout any journey. Inclusion of railway information creates an all-purpose public transport map, important if passengers are to use a co-ordinated public transport system to best effect. The problems arise in portraying all this information in a concise, compact layout, in a form the user will understand, in devising an appropriate range of maps if more than one is needed to do the job, and in making the map(s) widely available.

It has been argued that presentational problems are generally inversely proportional to the scale of mapping. Issues include the size of the area; its population and road density (for example, urban or rural district) which are reflected in bus route density and complexity; variations in services at evenings and weekends; and how much supplementary information is considered necessary to be portrayed on the basic map. Cartographical styles vary, too. Whether to show road names and/or bus route numbers alongside or inside roads, or to group bus route numbers at bus 'interchanges', which specific methods to adopt for presenting background detail, how and whether to identify service variations, and so on, create major debate when cartographers with different attitudes meet to discuss these topics. 'See How They Run', a survey of a selection of passenger information literature produced by various transport operators, was published by the London Transport Passengers' Committee in 1984, and highlights a passenger's attitude to various mapping and display techniques.

However wide the initial choice of map design, there is little doubt that a map designed for one function might be used widely for other travel requirements. This is a perennial marketing problem: though passengers' travel needs can be divided into market sectors and publicity produced to match, it is rarely possible to control finely how such publicity is distributed or interpreted. Subsequent use may have little to do with the original purpose of the literature. Although many transport maps give a different impression, passengers do not step into a vacuum when they alight from a bus or train.

London Transport's Tourist Information Folder, for example, is produced primarily to give full travel information for bus and Underground services in the complex area that is central London. However the street map format has proved so successful that a specific plan (incorporating the tube lines geographically) of major central London streets, shopping centres and major places to visit, now occupies the bulk of available space, with bus route details relegated to inset status. For many visitors to London, LT's tourist map is all they need - and it sells additional public transport rides as a direct consequence of its wider appeal to the public. This reflects the indivisibility of land uses and the travel patterns created, which transport facilities exist to serve and to mould.

The role of any transport map, and its likely production costs and revenue benefits should, therefore, be judged also for its advantages to a wider range of users than just the captive, segmented public transport passenger, before the information to be portrayed and the detailed design are decided.

THE 'PENROSE' MAP DESIGN

The basis of the geographical London bus map stems from the 1890s when it comprised a crude street plan with the bus routes indicated by arbitrary numbers shown alongside the roads. The most recent style was introduced in 1969 and was designed by David Penrose. On this version, roads served by London Transport buses were denoted by thick red lines in which the road names were 'reversed out' in white. Bus route numbers were shown at convenient points alongside the road. The progress of the route number denoted the exact route taken by the bus. Generally route numbers were in black, but a useful refinement was the printing in red of bus service numbers (or parts of services) which did not operate all day every day. Users having been thus alerted, the exact service pattern could then be determined from the information given in the route list on the back of the map.

The Penrose design was available in two versions for central London: firstly, as a whole page presentation for tourists, the Tourist Information Folder, covering in 17" x 21½" the area from Camden Town to Stockwell (north-south) and from Aldgate to Olympia (east-west) - a scale of about 3.6" to 1 mile; and secondly as a central area inset map for the all-London bus map, 'London Buses'. By comparison with the tourist map artwork, this second version was substantially smaller in scale during the years under review, at about 1.5" to 1 mile, showed fewer tourist features and places of interest, and portrayed a larger geographical area incorporating much of inner London. It covered in 11¾" x 11¾" the area from Highgate to Brixton (north-south) and from Mile End to Olympia (east-west).

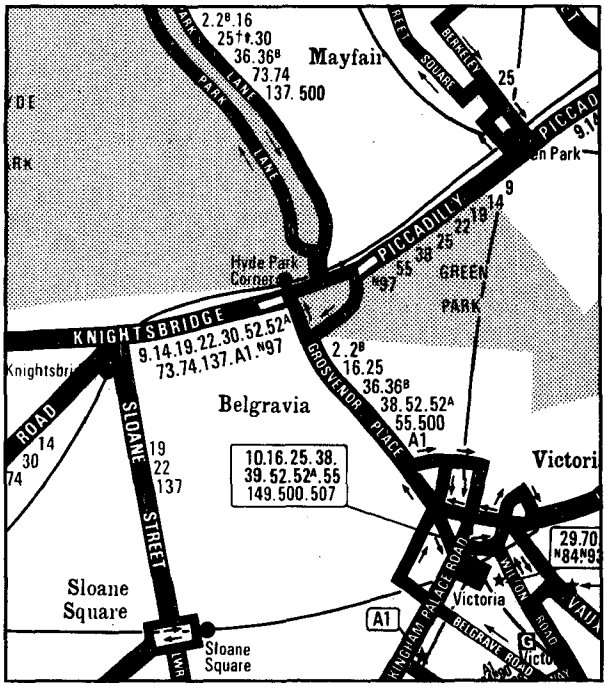


Figure 1. *The same portion of London is shown for comparison of each of the different styles of map illustrated; these have been redrawn in monochrome for reproduction here. On this Penrose-style Central Area map, from LT's* London Buses, *only London Transport routes have been included.*

The Penrose maps accentuated some problems already evident on earlier designs where the roads were not shown as thickly. The density of bus roads and bus route numbers tends to be greater in suburban centres and in central London. The cartographer needed great skill and ingenuity to display all the route numbers clearly against the roads to which they referred. Occasionally the result was less than ideal; in the central area bus map, it was necessary in eight instances to list the routes away from the road and key them in with a letter code. This was unsatisfactory but provided one solution to the problem of, for example, showing twenty-three bus routes in the length of Oxford Street between Selfridges and Bond Street.

Penrose's design showed all Underground and British Rail passenger lines and accurately noted the location of stations. This created a unified public transport map for London, and, when used properly, it enabled rail travellers using the bus for part of their journey to forecast the relationship of the bus route they wanted to the position of the station, so providing a basic interchange guide as well. The bus zones (latterly) and a number of places of interest were also shown on the map - again, in sufficient detail to make the relative position of both to the bus routes quite clear. On the bus it was possible to trace one's progress by observing the sights, and by referring street names, junctions, railway stations and bridges against the bus map, to assess where one was.

STIMULI FOR CHANGE

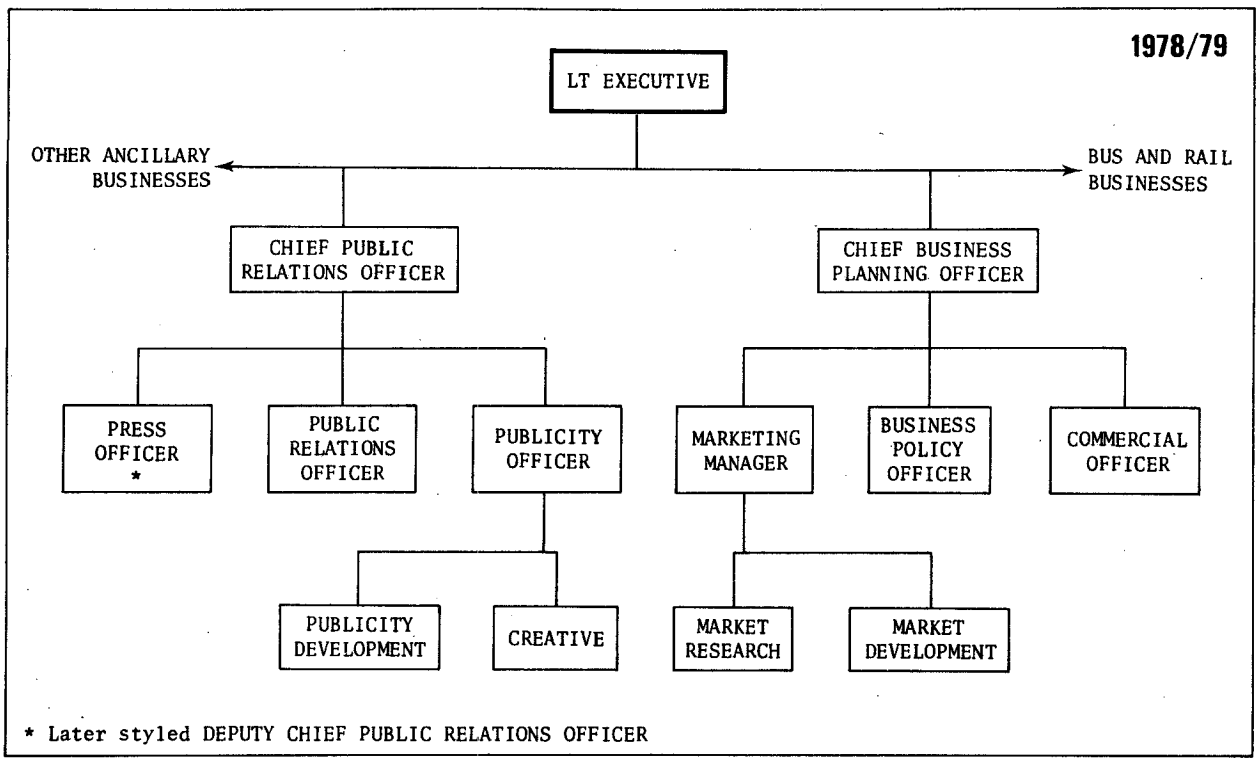
Traditionally the top management layer at London Transport has been divided into representatives of rail and bus management, and finance and staffing (including corporate administration). Other membership of the Board/Executive has reflected external and internal political priorities of the time, for example engineering. Corporate planning achieved Executive status in 1975 with the appointment of Dr David Quarmby. His appointment reflected the rapid expansion of operational research, and the recognition of the need to develop new forms of business yardsticks for what had become a non-profit making, subsidy-dependent organization. There was also a desire by both main political parties leading the Greater London Council during the 1970s to instil a new approach to professional transport management within the whole LT organization.

The criterion of passenger miles per £ was the most visible example of the search for a new LT soul and followed LT's corporate objective to maximise passenger miles within available funds (an approach encouraged and supported by the GLC). Once established as a workable tool for management, the test-against-yardstick approach was adopted rapidly in all areas, resulting in new departments such as Market Research, and leading to restructuring of established departments such as Press, Publicity and Public Relations.

The Publicity Office was combined with the Commercial Advertising Department in 1979 to give a more independent, business orientation to what had become largely an in-house section supplying graphics and information to the requirements of the 'client' operating departments. The Advertising & Publicity Officer now reported to Group Marketing, instead of Press & Public Relations. He had to assess his publicity work in terms of sales achieved per item, where possible, and improvements made where these could reasonably be expected to be 'aimworthy' (LT's terminology for worthwhile gains in passenger miles per £ spent), or profitable in themselves.

The success of the London Underground diagram is a byword - indeed it succeeds to the detriment of the relatively unpublicised British Rail services in the Underground territory. Until recently, though, little SYSTEMATIC attention had been directed to the maps of London's bus services even though the red buses carry twice as many passenger journeys as the Underground, while in terms of passenger mileage they are similar.

The London bus map and the Tourist Information Folder were not instantly candidates for assessment following the publicity re-shuffle - the latest basic design of all-London bus map, for example, had served LT well since 1969, through some 40 issues over 12



Figures 2A/B. *Organization of Departments relevant to this study before and after the changes of 1 July 1980.*

years, and many millions had been printed and distributed. But circumstances caused their value to London Transport - their ability to promote and sell bus travel effectively - to be severely questioned. This rapidly led to a searching internal review of the merits of the maps in anything like their present form, which, whilst containing a considerable amount of information, appeared by repute difficult to use.

The credit for initiating this questioning - which was, let it be made clear, not the first occasion London Transport and others have questioned the role and design of the maps, but happens to have emerged as the critical spark which ignited the present and continuing chain reaction - goes both to London Transport itself, and to someone outside LT, a Mr Ben Beveridge. His stimulus has proved to be akin to a passenger entering a Victoria Line train's front cab when all systems are 'go', and pressing the two start buttons, not knowing which way the train will go over a large array of points.

If London Transport had been given £5 every time someone has suggested a new design of bus map to them, fares would now be rather cheaper than they are. It is a matter of regret, within LT as well as without, that many superficially attractive suggestions for new graphics fall by the wayside. If they were robust, they would sell more travel - good for LT, good for the passengers.

Mr Beveridge's scheme, better designed than others before him, was to 'Undergroundize' a central London bus map, to achieve the same passenger appeal for the buses that the Underground diagram had achieved for the tubes. Bus routes would be colour coded, road intersections given the cartographical status of tube stations, and bus routeings identified by straight lines linking the 'stations' and colour coded to match the bus route numbers (see diagram). Mr Beveridge approached LT in early 1979 with his proposal.

Internally, London Transport had already decided by 1978 that there would be merits in publishing four

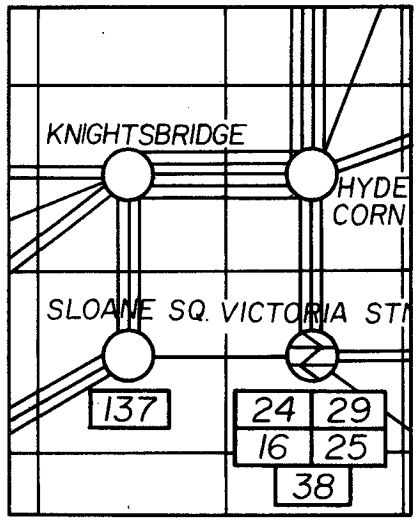
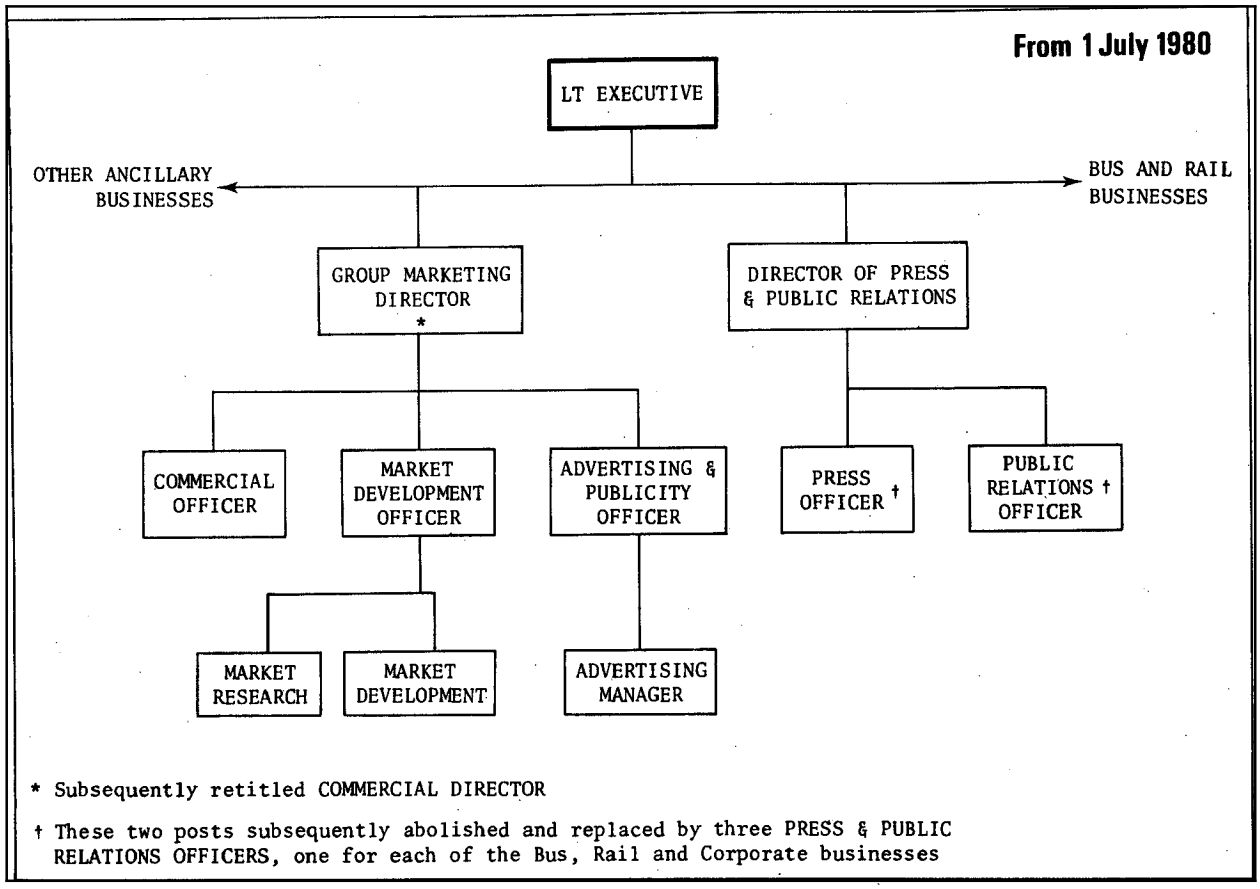


Figure 3. *Beveridge's diagram showed forty selected bus routes, using colour-coded lines; route numbers were only indicated at the extremities of each route, which were also indexed by grid references. Passengers would have been expected to work out which routes served which roads by tracing the colour-coded lines to the nearest map-edge or terminus.*



'area maps', as a means of publicising suburban buses on a more local basis and thereby, it was hoped, getting closer to the potential bus travel market. By the end of 1978, this had mutated into a project with potentially greater value still - 'area guides' using the then standard bus map format enlarged for the appropriate suburban district, but with supplementary, local information on the reverse side. This would tie in with the launching of the new London Bus Districts during 1979.

Though the short timescale to the launching of the Districts prevented radical redrawing of the Penrose design, Ben Beveridge's proposal was timed favourably, seeing the light of day at a stage when LT was willing to extend the scope of its bus maps, and was receptive to new ideas offering greater sales potential. He made contact with the Advertising & Publicity Office, then headed by Michael Levey, and received some comments and advice on ways to sharpen the presentation. A revised draft was then circulated to London Transport, in the hope that LT would be sufficiently interested to adopt the design or its principles. Mr Beveridge sought recompense on a royalty basis; Letts (the diary makers) were also interested, as it would help them rival the Nicholson London guide which includes central London day and night bus diagrams.

LT submitted his design to market research in summer 1979, with Opinion Research Centre (ORC) conducting interviews, to gauge attitudes to Penrose's 'conventional' design and Beveridge's diagram. By this stage, Basil Hooper, LT's Group Marketing Director, was closely interested in the results of the exercise. Liaison with ORC was undertaken by David Day, London Transport's Principal Market Research Assistant, and Michael Cleary from Market Development.

ORC surveyed a sample of infrequent users of central London buses, who demonstrated their preference for the Underground, based partly on the ease of finding one's way around with the Underground diagram. The existence of a bus map was not fully known; the Penrose design when revealed was found adequate for short journeys, but less so for those which were lengthy or required a change of vehicle. Beveridge's diagram - described by ORC as a 'bus route finder' - also worked (providing origin and destination were displayed) for short journeys, and appeared better than Penrose's design for long journeys. Infrequent users were then also more prepared to consider changing between buses, though the best combination was seldom found.

(A factor in all this is that a significant number who found the Penrose design awkward to use would have found any MAP difficult; also, it can hardly be denied that an acquaintance with London's geography is a great aid in using the Penrose maps, while the number of occasional visitors and newcomers to the metropolis increases the proportion of those who are unfamiliar with London.)

Favourable features of a bus route finder, according to ORC, were:

* colour coding of routes
* no clutter or ancillary details
* landmarks and stations gave passengers a sense of direction

The diagram, however, didn't help people 'find their feet' at journey's end. Suggestions for improvement were:

* clearer colour coding
* clear presentation of how routes diverge
* landmarks to be shown pictorially
* both maps were needed, the route finder to plan the journey, the geographical map to show where to board and alight, and for ancillary information. Bright ideas included putting a miniature route finder somewhere on the Penrose design.

ORC concluded that the route finder 'achieved a level of acceptance sufficient to merit further development'.

Coincidentally, in summer 1979 another individual, Mr Roger Putnam, pressed his views on map design with David Quarmby (by then, Managing Director, Buses) and Roy Smith (Development Director, Buses). He, too, turned a map of central London bus routes into a diagram, highlighting road intersections and simplifying bus service patterns into geographical blocks of trunk routes, later amended to 'blocking' by bus route numbers, for example 1-10, 11-20 etc. Mr Putnam too sought a royalty payment if his ideas were adopted. LT, unsurprisingly, was extremely reluctant to consider the principle of payment for revenue generated, and offered a flat rate fee to both Messrs Beveridge and Putnam, neither of whose designs were adopted in the event, but nevertheless reflecting credit for their individual efforts.

Both Beveridge and Putnam had approached their designs from a similar standpoint. Putting together their main hopes, they wanted:

* greater marketing opportunities for bus services (the main objective)
* a simplified 'route finder' diagram; this was NOT intended to do the jobs of a timetable or geographically-based map
* approximation of bus intersections to Underground stations
* grouping and colour coding of bus routes
* related publicity, for example in bus interiors, signing at bus stops, colour coding used on the buses themselves
* copyright use by other bus operators.

London Transport diagnosed faults in both the suggested designs, but following the ORC research was alive to the merits of improving on the existing bus map presentation. The pace of events now accelerated. Group Marketing assembled the results of the ORC research, and the merits of the external designs, in October 1979: as they wished to look at the matter untrammelled by established ideas, the Bus Department was not invited at this stage. Ideas such as splitting radial routes into central area and suburban feeders were considered, and subsequently discarded for the usual, sound reasons. But with hindsight this did illustrate one implicit problem (though it was not stated then) - that for improved marketing to succeed, the product itself has to be marketable. The

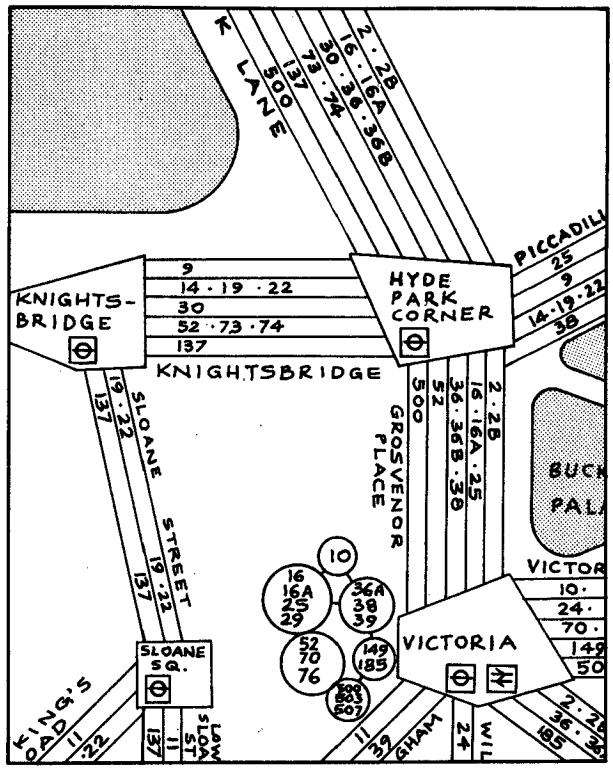


Figure 4. *In Putnam's map, blocks of route numbers were arbitrarily colour-coded. The design had provision for details of journey times and costs to be incorporated if desired.*

established pattern of bus services and their 'packaging' - route numbers, and signing and publicity - was not necessarily the easiest to market.

LT INTO THE FRAY

On the strength of this assessment, an advertising design agency, Royds London Ltd, was commissioned by Group Marketing in late 1979 to prepare a graphics approach to making buses more competitive in central London. A second, 'internal' team was also briefed by Basil Hooper, and was headed by Roger Graef, a part-time London Transport Executive member for three years from October 1976. Graef was born in New York in 1936; he acquired a Harvard degree in English and has spent most of his career directing plays and television, moving to London in 1962. As well as his short-term LTE appointment, he has served on a number of Department of Environment planning policy committees and as a lecturer at the Chelsea School of Art. He regards himself as a 'communicator', and his team at LT was to concern itself with the 'problems and complexities of communicating a bus service'.

Royds reported in May 1980. Their assessment contrasted the ease of comprehending and using the Underground, with the buses. The volume of information and graphics aids reassured the tube passenger: 'But if travelling by Underground might be described as a comprehensible two-dimensional experience, travelling by bus must be regarded as a three-dimensional dilemma'. Royds agreed that a

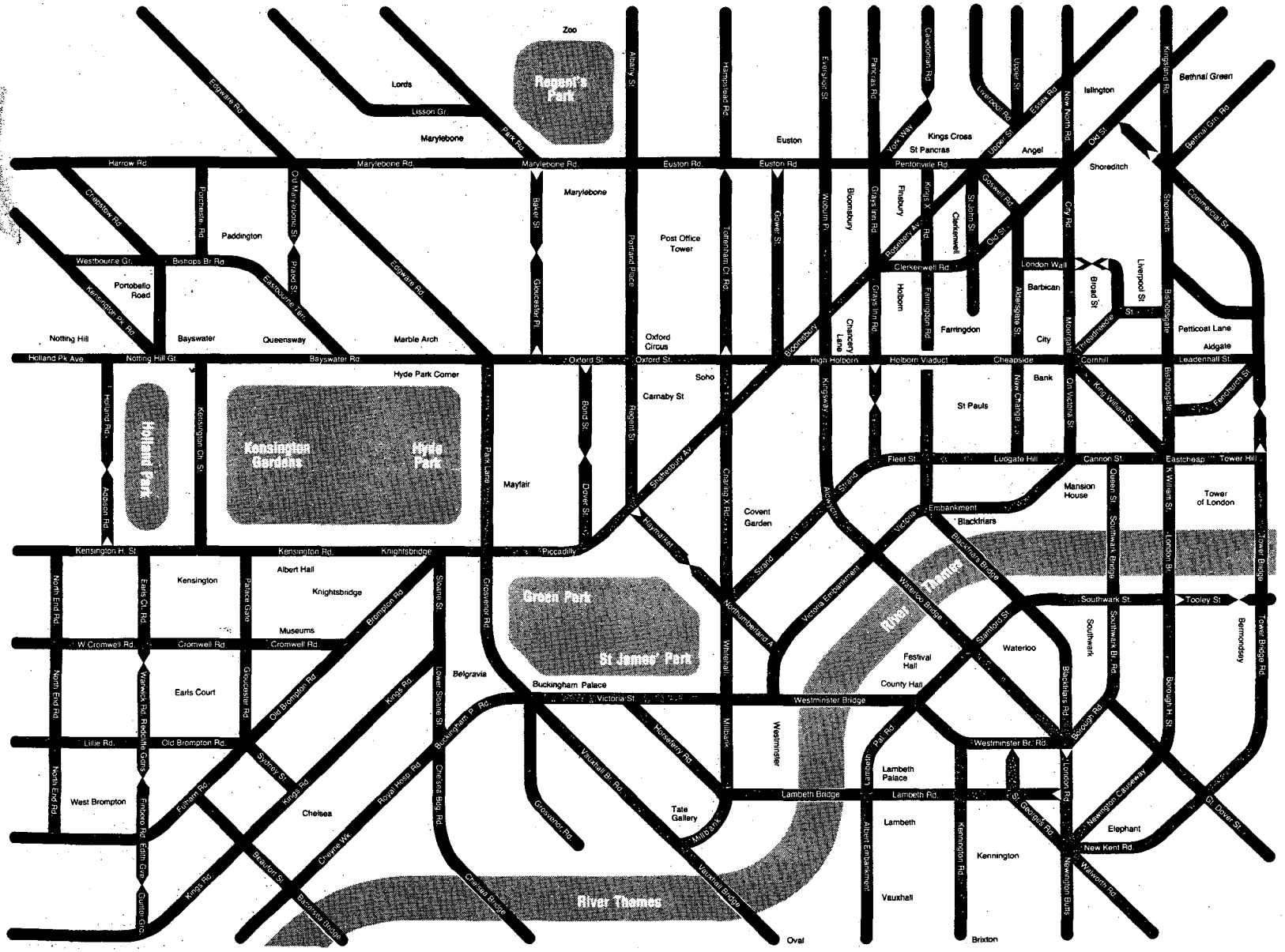
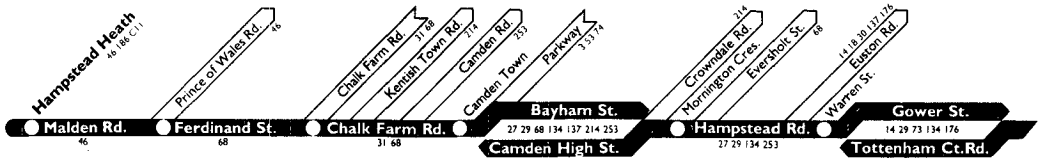


Figure 5. *Royds' diagram of central London bus routes*



stylised Central London Bus Map, echoing the tube diagram, was a lynch-pin, but emphasised it should not be thought of as an end in itself. 'Indeed were we to attempt to show all the bus routes, as the Underground so easily does its "lines", we could render even the most skeletally brief and stylised map bewildering'. Key objectives were to help the passenger know his exact location, which bus took him to his destination, whether or not a change of bus was necessary, and when he had reached his interchange or destination.

The Royds map would be located at individual stops, and highlight routes and destinations available from that stop. Selective information, about interchanges and major stops along the route, would also be displayed in a manner comparable to the individual line diagrams positioned opposite Underground platform entrances. A 'destinometer' guide for about 100 central London locations, showing the bus routes linking each (including bus/bus interchange where necessary), would be posted selectively in bus shelters. Route boards in buses, or an equivalent - interior roller-blind displays - would add to passengers' confidence. Stop names should be displayed boldly on bus stops and shelters, just like Underground station names on platforms.

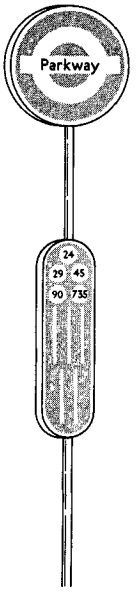
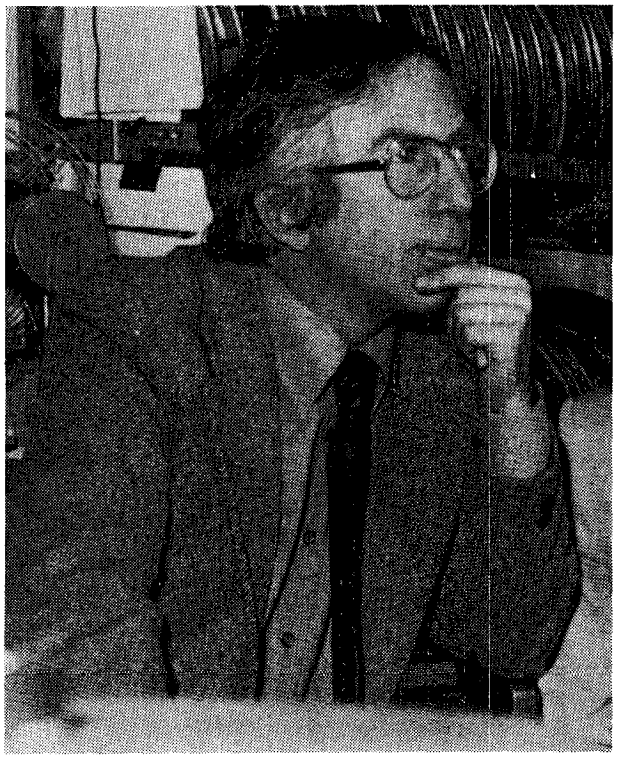
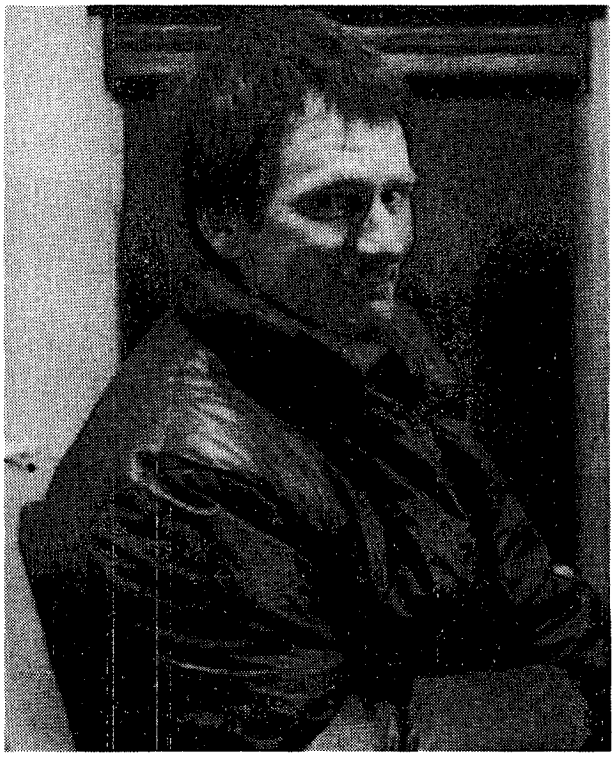


Figure 7. *An impression of route information, incorporating route line diagrams, to be displayed at bus stops. It is not clear from Royds' submission whether the mock-up represented a temporary (portable) stop or a new design for permanent stops, since no scale is shown.*

Roger Graef (photograph BBC Copyright)



Andrew Holmes (Photograph courtesy Andrew Holmes)



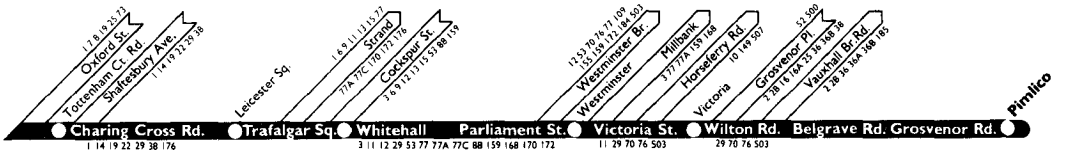


Figure 6. *Route information for display inside buses, by Royds.*

Royds saw these proposals as an information 'package' - 'a map of itself is not, and cannot be, enough. Various other reinforcing elements, all of which the Underground traveller takes for granted, are missing'. The Royds report therefore proved to be a significant advance in marketing philosophy, bringing the bus map within the proper framework of co-ordinated travel information.

LT appreciated the practical problems of the volume of display space potentially required at bus stops and shelters, and the provision of route diagrams at stops and on buses. But the overall approach was important, and deserved testing. Even if the whole package could not be made to work, some elements could be worthwhile in their own right - a rather unfortunate portent for watering-down what Royds had conceived as an essential whole if passengers' confidence in central London buses was to be sustained and increased.

'Group discussion interviews' and 'individual in-depth interviews' to assess public attitudes to the package and its elements (including samples of the Royds diagrammatic map) should be supplemented, it was proposed in June 1980, by a full scale pilot test managed by LT on one bus route, possibly route 24. But this second stage could require special funding and would depend on the results of the interviews.

The firms conducting the interviews (Gildon & Gildon, and Fieldcontrol) were to be briefed not only by LT's Market Research Office, but also by Royds as it was their design concept. But the interviews were to cover more ground than just the Royds scheme. It was at this stage that the two, previously parallel, conceptual exercises in helping bus travellers find their way more easily around central London, came together and were tested for their respective strengths and weaknesses. So Roger Graef from the LT 'internal' team was also to help brief the interviewing firms; June 1980 saw the amicable, first meeting between the two teams.

INITIAL DEVELOPMENT OF THE CENTRAL LONDON BUS MAP

Having observed the Royds approach, based on a system of signs and schematic maps for approximately 100 locations in central London, we must now describe what had been achieved by Graef's 'internal' team, which began to meet in October 1979. The other members of this informal group were a computer expert, a graphic designer, and an architect/artist. Various ideas emerged for communicating a bus network, such as a system of punched cards of destinations and route numbers, and a giant gazetteer grid (similar in concept to Royds' destinometer).

The most fruitful topic was a Central London Bus Map - which could not only represent routes but, illustrated by drawings of key buildings, would help passengers orientate themselves and follow the route on a bus. This attitude 'crystallized into a feeling that a sense of what London was really like topographically was essential to an understanding of the bus system, and therefore was crucially different from the Underground system'. It was asserted that even visitors to London soon became familiar with famous landmarks and their general orientation with each other. It was felt that the new design should take advantage of the fact that buses run above ground, past and through recognisable places.

Once a map had been decided upon, Roger Graef and the architect/artist, Andrew Holmes, became heavily involved in its development. Andrew Holmes was born in Worcestershire in 1947; he trained and practised as an architect. He may be known for producing the technical drawings for the 'Penguin Book of Kites', but he is more likely to be known as an artist, often using American subject matter. Some of his work is on display and he has undertaken a number of exhibitions. Graef had known Holmes since 1972 when the latter had given his final-year thesis at the Architectural Association: Graef had arranged to show Holmes's thirty-five foot long drawing of improvements for the North London Line at an ICA transport seminar. Graef considered Holmes to have potentially useful talents in putting across complex information.

The team made a conscious decision to reject the Underground diagrammatic principle for the bus map. Attempts have been made in the past to illustrate selected routes semi-diagrammatically - for example the old 'Hop on a Bus' leaflets (1958-60) which used coloured lines, and the Red Arrow diagrams (from 1966) which illustrate a self-contained network. But

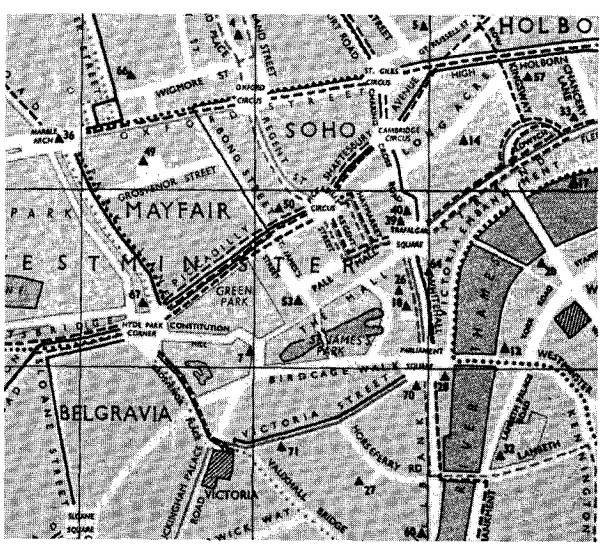


Figure 8. *An extract from the 1960* Hop on a Bus *diagram, reproduced same size as the original. Sixteen central London routes were symbolized and colour-coded, and a selection of places of interest was shown.*

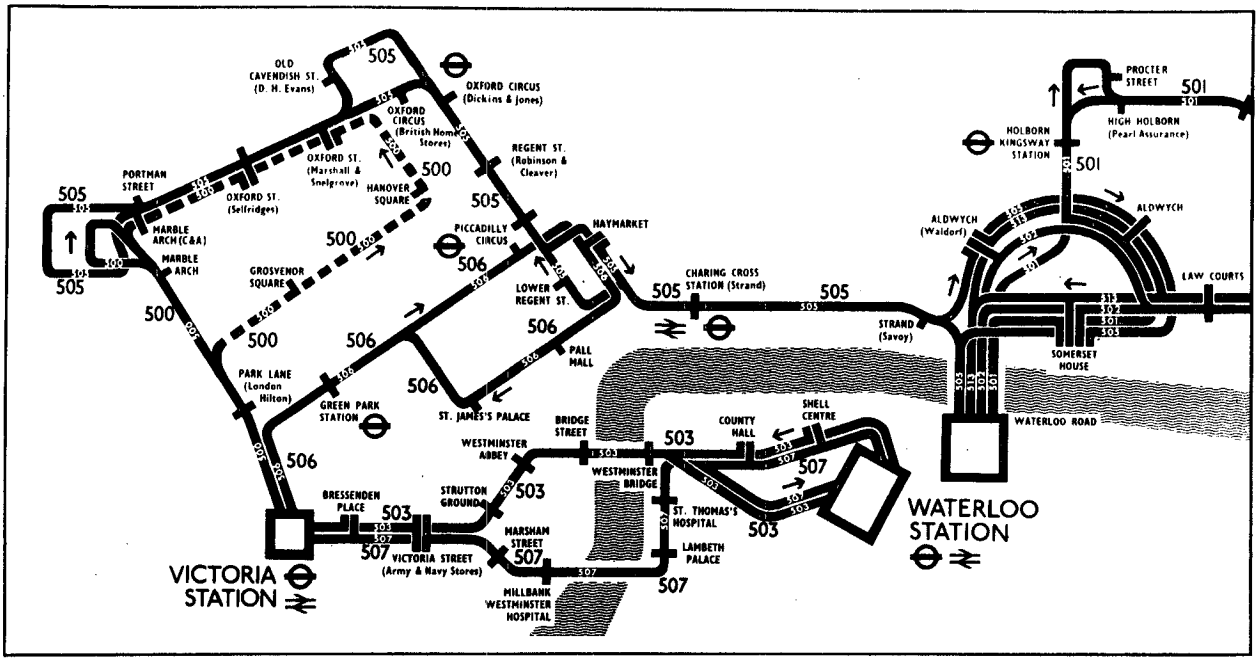


Figure 9. *The Red Arrow services were marketed as a discrete package, for some years having separate stops and folder maps. This is part of the February 1972 edition of the network diagram posted inside the buses. Originally colour-coded by route, they were later produced in red and black only.*

it is a frustrating task portraying 110 central London routes diagrammatically, especially with central London's geography. Attempts at producing a London diagram of such a complex nature have in the past been seen; the complexity is frightening although they work, in a fashion, if one persists (for example Beveridge and Putnam). Holmes was aware of these attempts and felt it wrong to try to 'regiment' a diverse bus network.

Yet the Underground's virtue of clarity was still sought. There were many attempts at sub-dividing and classifying the bus routes. After considerable work Holmes developed a system of grouping the central London routes into seven colours, each route being allocated to a colour group according to its general orientation. This coding would, it was believed, help passengers follow a bus route on the map, and provide the visual alternative to a diagram.

At this stage (late 1979/early 1980) no reference had been made to those responsible for the existing Penrose maps since the idea was being developed from first principles. Nor was any reference made to those who operated the services to see if they had anything useful to contribute at this formative stage. One can of course well understand why such new ideas should be kept under wraps until being more fully developed, but on the other hand Graef's team lacked anyone with wide transport experience and there can be no doubt that as a general principle the most fruitful time for meaningful input to a project is BEFORE any substantive decisions are taken.

It would seem that the embryo map was considered useful in planning direct journeys but did not make it particularly easy to plan journeys necessitating a route change - or so it appeared to Holmes and Graef having discussed matters with Basil Hooper. Of course no PASSENGER had actually been consulted and we are left to infer that so far all that had happened was the rediscovery of the Penrose-type design in a jazzed-up form, with buses grouped by colour and some building landmarks shown in outline. From this point onwards Graef and Holmes continued to develop the map between them.

What they regarded as the breakthrough occurred in March 1980. It is stated that Holmes was experimenting with a presentation problem at Hyde Park Corner which involved drawing a circle to represent the roundabout; he happened to insert the local bus route numbers inside the circle - when it suddenly occurred to him that this was a most promising way of tackling the problem of illustrating the opportunities for interchange.

From this point all further development was done on the basis that bus route numbers would be shown in circles at road junctions rather than alongside the road. It is interesting to note that a similar idea had been considered and rejected by LT on a number of occasions in the past. (David Penrose, for example, had proposed four options to London Transport in the late 1960s: 'conventional', with road names inset within the street plan and bus route numbers outside but adjoining; the reverse, with bus route numbers inlaid, and street names outside; bus route numbers enclosed within circles located at road junctions; or bus route numbers within circles located between junctions.)

Group Marketing accepted that the interchange circle idea, combined with bus route colour coding, showed promise and that there should be a trial map to assess user reaction. This was to be tested along with Royds' proposals. The trial seven-colour map would include, on its reverse side, seven smaller, individually coloured, maps to highlight the directional coding of routes, and an index to streets and places named.

MARKET ASSESSMENT OF THE NEW CONCEPTS

Assessment of prototype material, of the kind conducted in 1980, cannot be expected to give a precise response about the minutiae of designs - for example, whether interchange circles really do work better than conventional alongside-the-road bus route numbers. Professional judgement and common sense (not necessarily the same thing!) may lead to certain expectations, but real insight can only be found from experience in day-to-day use over useful periods of time. Responses will however indicate whether the basic concepts appear valid, whether on initial impressions the new publicity and marketing material is likely in large or small measure to bring more passengers to the bus network. So Royds' proposals for market research identified a number of issues to be tested, to judge the comprehension and usefulness of the two schemes for planning and making bus journeys in central London:

1. How do infrequent bus users - visitors to London and others - think about the geography of central London: what streets, place names, etc, are the best ones to use on a simplified map of central London.

2. How do infrequent bus users plan journeys in/into central London: how do they fit public transport into the trips they want to make and/or plan trips around facilities.

3. What preliminary reactions do the two schemes get: what first impression do they make on infrequent bus users.

4. How legible, easy to understand, and easy to use in practice are each of the elements in the two schemes.

5. How accurately and quickly does each scheme work, when used to plan some test-journeys.

6. What difficulties (if any) are experienced/ anticipated when using each scheme to plan journeys.

7. What difficulties (if any) are anticipated with each scheme when actually making journeys.

8. Do infrequent bus users ever worry about going in the right direction when they use an unfamiliar bus route, and how do they react to each scheme in this respect.

9. How do infrequent bus users keep track of where they are during a journey, and how do they react to each scheme in this respect.

10 What practical improvements to each scheme are suggested by infrequent bus users.

After some adjustment, which included comments from the Bus Department, involved in the proceedings now that the conceptual stage was drawing to a close, it was proposed to conduct varying types of interviews with Londoners, and English-speaking holiday visitors to London from beyond the home counties (including some from abroad). Standard interview techniques would be followed, such as presenting the Graef/Holmes scheme first to half of each group, followed by the Royds scheme, and reversing the presentation and order of discussion for the other half, and with separate assessment of men's and women's views. 180 responses from English-speaking foreign visitors on holiday in London would 'record claimed knowledge' of where 100 central London streets and landmarks were situated.

The research was given the go-ahead on 10 July 1980, when the Royds destinometer was also seen in full size for the first time - it appeared rather off-putting to some! A prevailing view among the Bus Department was that Royds and Graef/Holmes were attempting the impossible, expensively. Perhaps this negative presumption is a good post-hoc justification for Group Marketing's initial reluctance to approach the Bus Department. Interviews were carried out from 3 to 10 August, with Paul Gildon (from Gildon & Gildon) undertaking the main interviews, and MEW Research the knowledge of central London locations.

The results of the locational survey did not affect the main presentational issues. A preliminary snap-shot of the interview results was given to LT on 15 August by Paul Gildon, followed up in September by the full reports, prepared in collaboration with Royds. As the questioning had focussed on differences in attitudes to bus and Underground, the basic findings on getting around London will not surprise anyone who has read this far! The table below summarises the personal responses:

TRAVEL BY TUBE

* Quick
* Easy to find one's way around the system
* Ease of carrying and interpreting the tube diagram
* Dependable information and services
* Something to use for 'serious' journeys
* A machine

TRAVEL BY BUS

* A chancy business in planning, and for journey time
* Difficult to get the right bus in the right direction
* Difficult in the provision of information
* Something to use for 'pleasure' journeys where getting there is half the fun, time of arrival is less important, even the destination is not fixed
* Never far from a bus stop
* A human service, some avoided the buses because using them depended on passengers' ability and asking people, others used it because of this human factor.

There was a strong preference for more human involvement on the buses, such as bus crews calling out the major stops and putting people off at their right stop. The uncertainty and chance in using buses was bearable in three circumstances: hopping on a bus seen to be going in the right direction; regular committed journeys such as daily commuting; and pottering about on pleasure journeys. Speed and certainty were more important in choosing the means of travel than comfort and cost. The main scope for improving usage of the buses was felt to be in giving people the confidence and ability to use the buses for more non-routine journeys than they do at present, rather than automatically opting for the tube - or the car.

So attitudes to the bus travel material were generally very favourable - not surprising with the

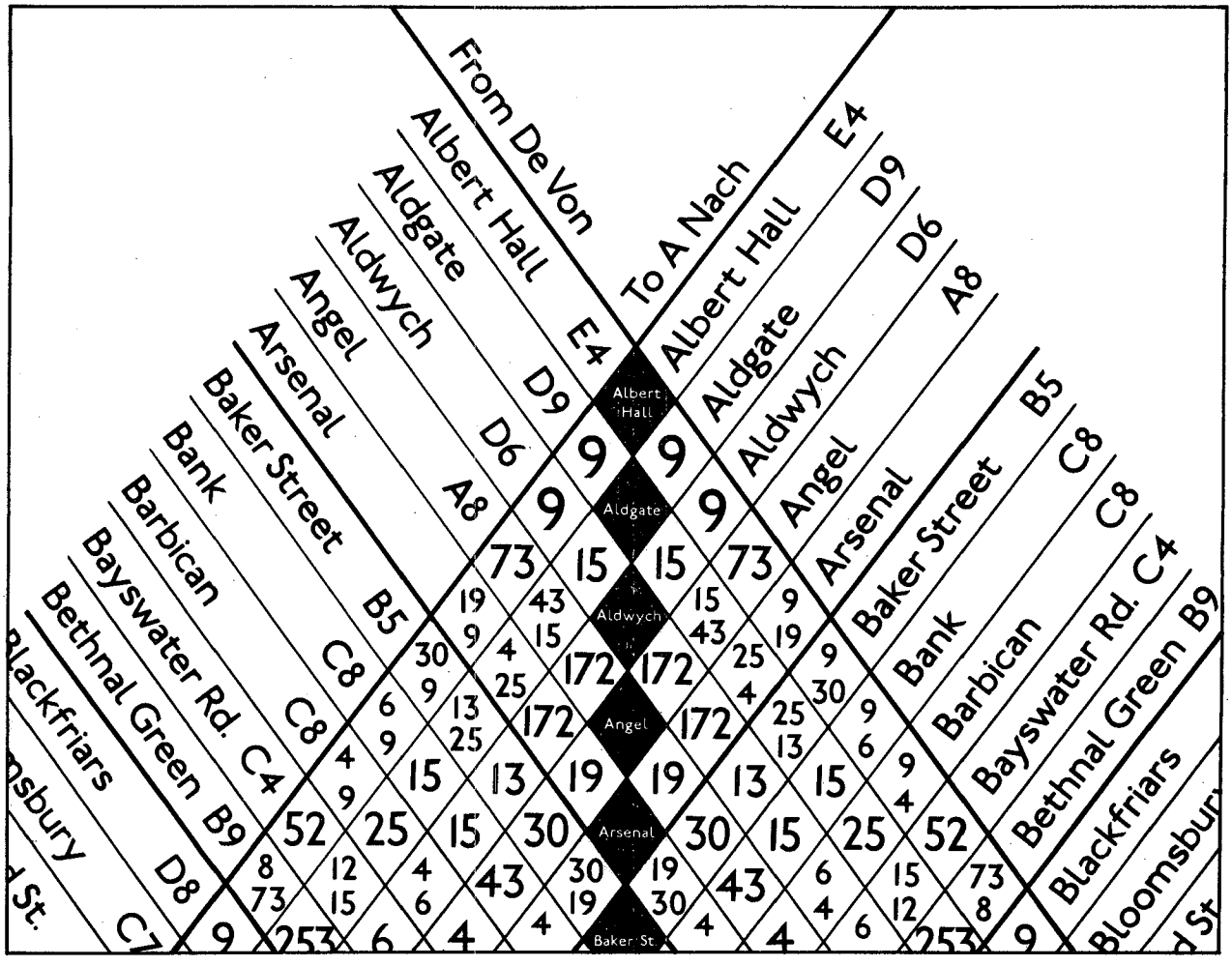


Figure 10. *A portion of the 'Destinometer', for display in bus stop shelters. The traffic objectives are given grid references. Only one route option is offered, although in some cases an alternative is available, for example route 1 between Baker Street and Aldwych. Where a journey involves two buses, the upper route number indicates the first bus to be caught; no reference is made as to where to change.*

present bus service seen as extremely deficient in information compared with the tube. Any relevant information was wanted, provided it did not overload the passengers. Not many had the Penrose central London guide, those that did seemed incapable of using it - it demanded too much of patience, eyesight and aptitude! The Royds material was regarded very positively, excepting the destinometer, which was considered frightening and unusable in practice. Only one style of destinometer might be acceptable - a machine of some kind, perhaps similar to the illuminated route-finder of the Paris Metro.

The Graef/Holmes map was more successful than the destinometer, giving a choice of routeing, helping the passenger to decide where to change buses, and indicating journey length. Both schemes suffered because some people were unable to follow maps and complicated diagrams. The value of the colour-coding was queried - what seemed 'obviously' a good idea, to begin with, had failings such as a large variety of potential destinations within each colour group. It 'promised too much'. The small map showing the route patterns for each colour unnecessarily complicated the main map and confused people. Simplicity was desired for any mapping - but the ideal level of detail was a contentious matter - some wanted a bus equivalent of the tube diagram, others wanted the street geography, for example to check their direction of travel when on the bus.

Paul Gildon concluded that the Royds proposals for named and labelled bus stops, and linear route maps at bus stops and in buses, and the Graef/Holmes central London map, should be developed further. He suggested that alternative levels of detail on the Graef/Holmes map needed more thought, with a fairly large scale 'product test' before any final design was approved: features such as non-bus roads, and the landmark drawings, might cause too much clutter.

RÉSUMÉ

It is worth pausing for a moment to recap, before coming to the later processes leading to the introduction of the new Central London Bus Map. London

Transport was not satisfied that the main means of portraying and marketing its network of bus services - the Penrose style of maps - was either the best overall means for the job, or served any one bus travel market to best effect. Some of this concern had been stimulated by outside parties, who had indicated that new styles of graphics might be one means of improving bus patronage. LT had to go back to square one, to define the markets most responsive to additional bus travel promotion. Within the context of central London, this was considered to be the infrequent bus user currently uncertain of which bus routes went where.

Professional consultants and others felt that the problem was not just one of mapping the services - LT needed to present a comprehensive bus travel package to tempt and retain these users. In fact, to attempt to give them a similar degree of confidence in journey planning and point-to-point ease of comprehension as was provided (in sharp contrast) on the London Underground. Positive ideas included naming of bus stops and linear route diagrams at stops and in buses, and various new styles of point-to-point mapping.

The 'traditional' map of bus routes serving central London was also re-invented in a somewhat different format, by a design team whose main exponents were Roger Graef and Andrew Holmes. Qualitative research suggested that more information, of all sorts, would encourage and aid potential passengers, but it had to be put across simply. 'Underground -style' travel aids were welcomed strongly, but effective mapping of the central London bus system - for both journey planning and point-to-point use - remained unresolved. The Graef/Holmes map showed some promise, but needed further refinement and testing.

The final strand which has to be gathered in at this point is the interest of the London Transport Passengers' Committee in mapping and general presentation of information. A meeting of its General Purposes Sub-Committee (GPSC) on 15 February 1980 considered the topic of London Transport maps, largely sparked off by the continued absence of the diagrammatic *London's Railways* pocket edition. The discusion however extended beyond railway maps, to review the availability and coverage of various local timetables, maps and road/rail area booklets. Local bus maps produced by Newham and Havering Councils, and LT's own maps for Forest and Watling bus districts, were considered briefly; the Committee reiterated its view that the clarity of bus service publicity needed improving.

Coincidentally, Mr Putnam made representations to the Committee shortly after this meeting, about his own diagrammatic map of central London routes. When this was considered at the March 1980 main LTPC meeting, together with the GPSC's review, members were informed by London Transport that Mr Putnam was only one of several people who had suggested a new style of map, but that in LT's judgement his approach was not the right answer; and that LT itself was now looking at ways of improving the presentation of bus information, especially for visitors to central London, and work was continuing.

The Committee agreed it was important to test a variety of presentational styles; John Cartledge, Deputy Chairman of the GPSC (and later to become the author of 'See How They Run', already cited), volunteered to produce his own attempt at a local map. His offer of helpful interest found most response from those LT departments closest to the ground - Buses, and Advertising & Publicity. They recognised that despite this being 'yet another scheme', the two current official candidates being groomed by Group Marketing might themselves founder, on matters of detail if nothing else. So a fresh approach was still useful.

John Cartledge presented his draft map at a meeting on 12 August 1980; LT representatives from Market Development and from Bus Development attended. Cartledge was not aware of the existence of any alternative designs other than that by Putnam, and LT did not take LTPC into its confidence on this matter, beyond the general statement made in March 1980.

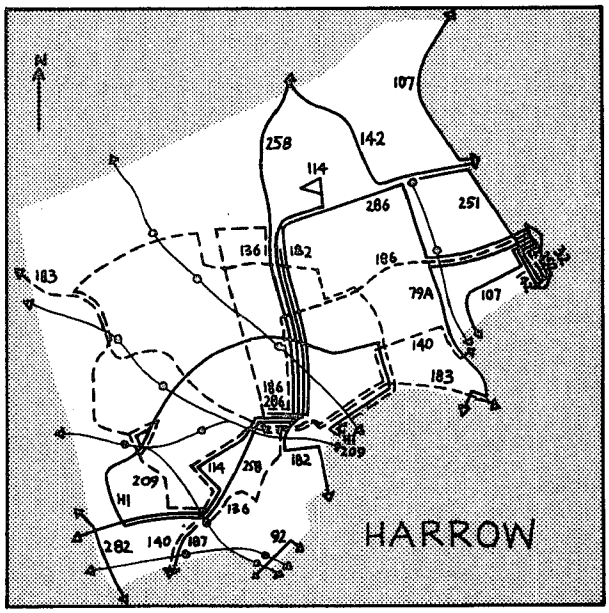


Figure 11. *John Cartledge's map, redrawn half-size from a visualization in six colours supplied by him to the LPTRG.*

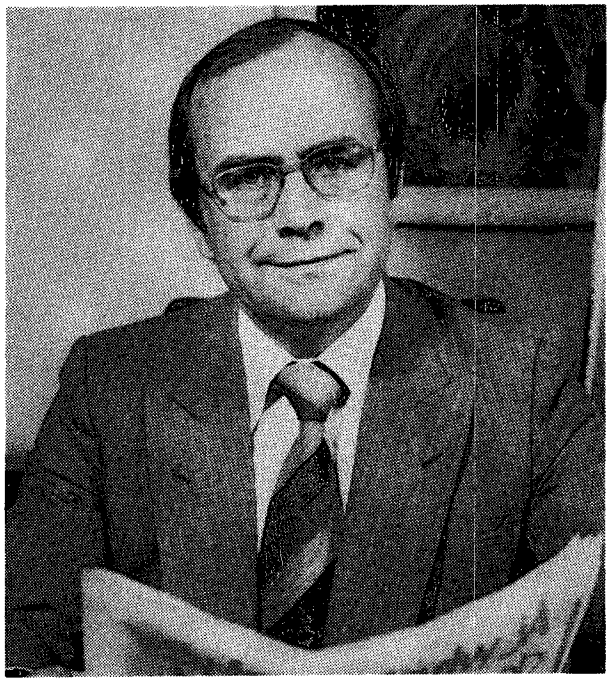
The Cartledge map covered the Watling District, and mixed nine different colours and broken and solid lines, to identify each bus service separately (on the model of the equivalent publications in New York and Paris). No two routes using the same colour crossed each other. Received reaction was very favourable from the Bus Department, even with the 'unpolished' draft version. Advertising & Publicity felt that any further development of the Cartledge map should await a structured programme to deal with bus maps as a whole - this would materialise when decisions were taken following the market research on the Royds and Graef/Holmes proposals.

DECISIONS AND DETAILS

Armed with this wealth of information, and its own professional instincts, London Transport had to decide what principles and details to adopt. The principles were determined at a meeting on 11 September 1980, following an internal assessment of Paul Gildon's preliminary results. The destinometer was discarded, as was Royds' diagrammatic street map originally intended for bus stop panels. The other Royds' schemes were to be adopted - with route

diagrams in buses (possibly colour coded to match the bus map colours), directional route diagrams at bus stops, named stops (with plates affixed to bus shelters) - and the Graef/Holmes map to be developed further. The Cartledge design should be attempted for Abbey and Tower Districts.

A Bus Map Design Committee was established, chaired by Basil Hooper - its first task on 24 September 1980 was the full presentation of the survey results by Paul Gildon. Development of the favoured Royds and Graef/Holmes elements was to be the responsibilty of a Working Party led by Nick Lewis, the freshly-appointed Advertising & Publicity Officer, who had replaced Michael Levey. Queries to be resolved for the Graef/Holmes material included the colour coding of routes, the pictorial representation of landmarks, the small maps explaining the colour coding, inclusion of non-bus roads, and the instructions for using the map. The principles of the Cartledge design might, it was considered, now provide a possible basis for local maps of the six suburban bus operating districts. Before final designs were approved there would need to be a fairly large-scale product test.



Nick Lewis, LT's Advertising & Publicity Manager since late summer 1980. He had previously been brand marketing manager for Beecham Products (1966-68) and Chesebrough-Ponds (1968-70) before being appointed an account director for the advertising agency Davidson Pearce (1970-80). (Photograph courtesy LRT)

Various meetings during October 1980 winnowed a variety of detailed design matters concerning the Central London Bus Map and associated publicity, such as the need to redraw some areas of the map to provide sufficient separation between interchange circles. An improved bus map was still regarded as just one element in a total package of bus travel information, with 'integrated information' to be provided at named bus stops and in buses. Between these meetings, Andrew Holmes himself dealt with all the graphics problems in his own studio, employing freelance technicians where necessary. He regarded it as a virtue to be handling the entire project himself. For example, the map would 'appear as a visual and logical whole'; endless hours would be saved in not having to delegate and 're-explain complex factors'. This was, to say the least, an unusual approach.

Details were discussed and dealt with by the Working Party as follows:

Interchanges:

The use of a circle enclosing the bus route numbers, evolved from the Hyde Park Corner roundabout, was not the only way of depicting interchanges. Squares and rectangles (more space-efficient if containing text or numbers), roundels, larger symbols incorporating place names as well as route numbers, variants for interchanges with long names, and ways of showing bus/rail interchange, were all discussed. The 'simplest' design was preferred: a circle with route numbers, though Andrew Holmes had wanted to keep the option of squares or rectangles. Inclusion of night buses appeared to overload the interchange circles, especially in the Trafalgar Square/Strand/Fleet Street/Bank area. It was decided to delete the night services, and to show these separately on the reverse of the main diagram.

Colour coding, and days of operation:

This caused the greatest discussion - whether to colour code by route number (similar to Mr Putnam's scheme), by direction of route (for example NE-SW), by days and hours of operation of each route (for example Daily, Monday-Saturday, Monday-Friday, Other), or by 'tourist' and 'Londoner' categories. Other ways of identifying operating periods were considered, for example heavy type/light type, 'flagging' the number, or background colours printed behind the route number. Andrew Holmes considered that colour coding for route directions was not proving satisfactory, but that its use for days of operation was 'more hopeful'. This approach was generally favoured by the Working Party.

Folding of the map:

'Staggered' folding was considered, for easier referencing and to highlight certain areas. The idea was discarded because of the impracticability of non-conventional folding with large numbers of maps (which could require hand folding).

Bus road indication:

It was suggested that a yellow colour should be used for bus roads; this was adopted, though Andrew Holmes for a time favoured pink.

Other information:

Andrew Holmes devised a scheme for locating major bus stops and the direction of travel. The consensus was that this complicated the map for little reward. He also suggested changes to the 'Where To Board Your Bus' panel at principal stops, to highlight route numbers; however it was recognised that passengers unfamiliar with the locality looked first for the destination, before selecting their route number.

The Working Party agreed that the top priority map for the Graef/Holmes treatment was the central London Tourist Information Folder, which comprised a bus map of central London and additional tourist information. The map was chosen partly because of the work already directed to this area of London, but principally because of the potential revenue benefits and the harsh nature of the testing ground (factors which had also entered into the original decision to draft a new map style based on central London). A map which succeeded there SHOULD succeed also in the suburban districts, it was considered. This was the first positive indication that this new map style might not be confined to the central London tourist market but could be used more widely around London.

By now, official attention was focussed entirely on the Graef/Holmes design, with no references to the Cartledge map. Any new district maps for the suburbs might, it was considered, be worth extending in coverage to show not just the local bus operating area, which had little relevance for travel patterns, but also to overlap with central London - the destination of many suburban bus journeys. This was the origin of the later so-called 'quartile' maps, which were to portray London's suburban bus routes on four sheets (NE, NW, SE, SW).

The work to date was reviewed at a Bus Map Design Committee meeting on 4 November 1980. Three versions of an enlarged section of the West End were presented by Andrew Holmes. The first used seven colours to show days and times of operation of each route (red - daily; blue - Mondays-Saturdays; black - Mondays -Fridays; green - weekend service; yellow - not evenings; orange - peaks only; green - early journeys only). The second presentation used one background colour to advise that the route did not run all day and every day. The third used a simplified four -colour directional coding.

Received comments from the operators were that any attempt to show 'irregular' services, with a high degree of accuracy as to the times of availability, was likely to founder on the intricacy of the time-tables. For this reason alone, complex colour coding by days and times of operation was not thought worth-while. Any use of coloured route numbers to help users plan their journeys was best left to directional information. Mixing directional colours with an 'irregular service' colour (traditionally, red on the Penrose design) was impractical; there were other ways of showing non-daily services. The desire for simplicity caused the meeting to consider limiting the numbers of bus routes shown, selecting those most likely to appeal to tourists (on the precedent of the earlier **'Hop on a Bus'** leaflet), but this approach was not favoured - nor was it consistent with any extension of the Graef/Holmes design to the suburbs.

Andrew Holmes was asked to draw up a new, draft Central London Bus Map suitable for the Tourist Information Folder, to include all-day routes, to exclude night routes, and with no directional codes (but colours allowed) and with one background colour to indicate a non-daily service. The timing and contents of the product test would be decided in due course.

TOWARDS INTRODUCTION

The Working Party resumed its sifting of details. To begin with, four test maps were thought appropriate: two maps to highlight non-daily routes, to be identified either by colour-coded route numbers, or by route numbers 'flagged' with an extra symbol; and two maps to highlight directional coding, using coloured lines between interchange circles, or linked by a coloured road (Andrew Holmes favoured combining the latter two). A change of mind - not the first, nor the last - meant the idea of four test maps was discarded, to be replaced by one test map, of a more developed design. This would exclude coloured lines between the circles, and exclude any indication of non-daily services, as it was stated that any method appeared to complicate the map unacceptably. Consumer testing was now planned for early spring 1981.

However the testing does not seem to have materialised. The only element of external selection was a presentation of a mock-up to John Cartledge of the Passengers' Commmittee, on 9 March, attended by Nick Lewis, John Cartledge and Dick Cordey from the LT Planning Liaison Office (who provided the internal link between the various ramifications of the LT organization and the Passengers' Committee.) Comparison was made with Penrose's existing tourist map. John Cartledge thought the new central London map was a great improvement on the current design, and met many of the requirements that the Passengers' Committee had considered important at a discussion the previous September - geographical layout, street map format, and at least partial colour coding to differentiate routes. In due course, the LTPC officially 'welcomed' the introduction of the new Graef/Holmes Central London Bus Map.

At this 9 March meeting, LT said it had already 'tested a wide response to the new design' and were 'sufficiently confident to want to put it into production as soon as possible'. LT was to monitor the results of the new design and amend it where improvements were identified. Although the LTPC might not have made matters clear at the time, in no circumstances had they regarded the new map as an alternative to the Penrose design. No explicit indication was given that it was LT's intention to abandon the all-London Penrose bus map (which also happened to include a 'traditional' map of buses in central London) in favour of the interchange circle design. Indeed the Committee had received the impression from LT statements that the Central London Bus Map was an ADDITION to the range and they had judged it accordingly. LT however interpreted the 'welcome' as an acceptance in principle for use of interchange circles throughout London.

The LTPC expressed strong concern subsequently when London Transport announced the introduction of suburban interchange circle maps and the intended abolition of the all-London bus map. In view of Holmes's early desire for the uniform use of interchange circles across London, it would appear that there was an unfortunate breakdown in communication.

The contradiction between the earlier decisions to test the interchange circle design further before production, and London Transport's statement to the Passengers' Committee, can be explained by the view of LT's Market Research assessment. There were already indications of the GENERAL merits of the new design, at least compared to the Royd's destinometer; this was sufficient in Market Research's view to warrant its early introduction. Fine tuning of the design had already been followed through to some extent by the Working Party.

Any worthwhile pre-production testing and further refinements would be a lengthy process - giving people the opportunity to use the map over a period of time before gaining their views on its efficacy,

possibly followed by a further period of redesign. Alternatively a quick test would give little opportunity to do more than repeat the validation of the overall design concept that had been carried out by Paul Gildon in 1980 - verifying the new approach, which involved a 'package' of 'Underground-style' travel aids, or showing it to be so grossly misconceived that it should be abandoned at once. Nor can internal factors within LT be ignored, such as the pressure to see some substantive result for the year (and more) of creative ideas and research.

The detailed proofs of the Central London Bus Map were available in June 1981; coloured directional lines were once again provided between interchange circles. On the main map side, some six colour separations were produced from flat artwork ready for the printer, Cook, Hammond & Kell. Holmes also designed the cover which, in addition to the title 'Central London Bus Map' depicted a middle section of a Routemaster bus side. Whilst the front cover was not particularly inspiring on its own, Holmes explained that when the interchange circle concept was extended to outer London areas the other maps would have different parts of the Routemaster on the cover so that when the maps were placed next to each other in the right order a whole bus would be seen. It is intriguing to note that long before the problems of the outer London maps were thrashed out that the details of the cover designs were sewn up! Just for the record it is worth noting that when the proof map was printed during May 1981 copyright appears to have been vested in Andrew Holmes and Roger Graef. By the time the production map was printed, LT had acquired or claimed the copyright.

The Bus Department immediately registered concern about the way in which non-daily routes were treated - there was no clear indication on the map that 50 or so routes out of 110 did not run all day and every day, and users had to refer to a separate list. Not only that, but this list was headed 'Irregular Routes', which had discouraging connotations - there are those who think all LT buses run irregularly! Minor problems with wording of some of the text were discussed - a process with a history as old as map publication itself, but another major concern was the remarkably high proportion of mapping and typographical errors, for a publication which had supposedly been checked in substantial detail. Not all were corrected by the time the design work was deemed ready for production.

Work on the other elements of the 'integrated information' for central London's buses had received far less attention by summer 1981. There were still 'long term' aims to name bus stops, and to introduce route diagrams on buses, but, according to the discussion with John Cartledge in March, progress would depend on finance being available and 'the solving of some practical problems'. However, independently of any integrated approach, some bus shelters had already been given names, often by their sponsors working in conjunction with the suppliers, giving rise to a situation in which these did not always concur with names of bus fare stages or named circles on the new bus map. Bus stop timetable panels were now being introduced with a linear route diagram at the head of the timetable information, with effect from April 1981. But these 'integrated' elements were not being introduced in phase with the new bus map, nor were they being applied with the 'Underground station' scale of prominence looked for in the Royds concept. And just as they were not being extensively tested along an entire bus route (such as route 24) before introduction - which had been hoped for by Market Development - so the recommended product test for the Central London Bus Map had failed to materialise. The test was the production edition itself.

* * *

INTO SERVICE

The new Central London Bus Map supplemented the ranks of LT travel information literature during the second half of 1981: the Penrose-style Tourist Information Folder, and the central area enlargement of the 'London Buses' map, were both updated and distributed that year.

The new map as produced was printed and trimmed to A2 size paper (about 23½ inches by 16½ inches). The far left hand side was given over to helpful information with the instructions for using the map at the top, a list of 'Irregular Routes' below and an 'Index to Intersections and Places' at the bottom. The map area measured about 18 inches by 14¼ inches, although bus routes leaving the central area extended a little beyond the map border towards the edge of the paper in order to list the routes concerned together with traffic objectives beyond the limits of the map. The area covered was represented at an approximate scale of 3 inches to 1 mile, although the need to accommodate the interchange circles resulted in localised distortions.

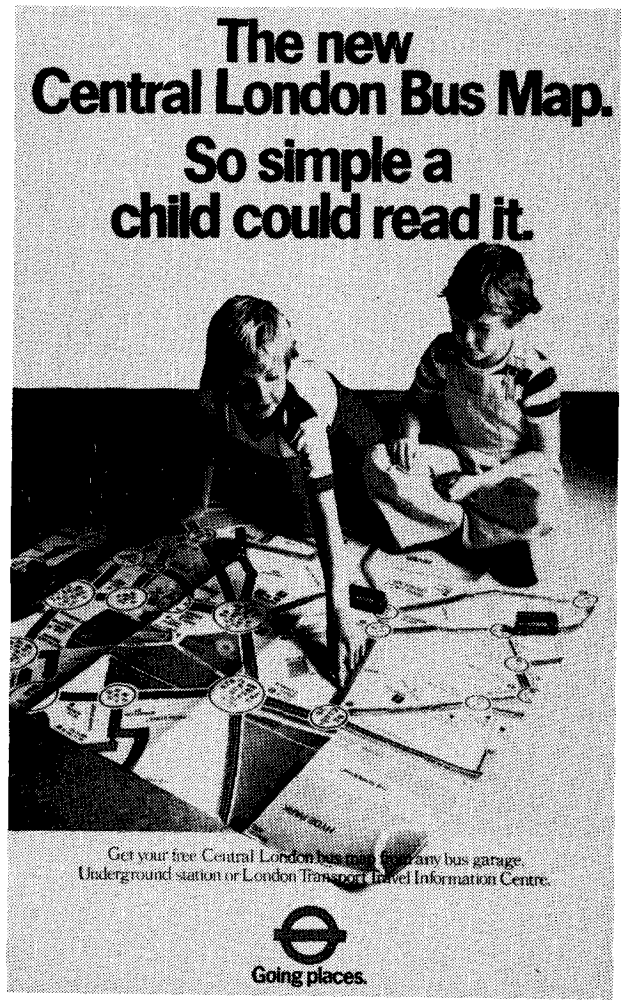
The base colour of the map was pale grey and a number of features were shown in white, 'reversed out' of the pale grey base. Bus roads were shown in

yellow with non-bus roads in white; bus roads were shown somewhat wider than non-bus roads (in some ways this method of presentation was not dissimilar to that used on the recent tourist maps using a Penrose design - but there the resemblance ended). Road names were generally printed within the width of the roads and were lettered in black. Area names and names of principal features (such as parks) were in fairly large black letters. Intersection circles were named, the name being printed in blue lettering but outside the circle.

Underground and British Rail lines were not shown but the stations themselves were - by a red LT or black BR symbol. Places of interest were generally indicated by a small, standard-size black square with an appropriate name beside it. Reversed out of this grey background was a system of grid squares, each square of which could be identified by a letter and number. This feature was used in conjunction with the adjacent 'Index to Intersections and Places' which listed these features in the appropriate blue or black colour and quoted the grid square in which the feature was to be found.

The reverse side of the Central London Bus Map featured a list of bus routes in the central London area and the places they served. There was also a new idea, a 'Map of Routes Going from Central London' which showed the onward routeings of the central London bus services to their suburban termini (shown in their directional colours). There was no map of night buses, in spite of the earlier intention to display these on the reverse. In fact this category of information was completely absent.

The map was given an intensive launch on 10 August 1981. It received in consequence more than a little press attention together with reviews in several magazines concerned with design. About 120,000 pocket maps were available on 10 August 1981 at various locations, including 66 bus garages and 66 central area Underground stations, with the eight Travel Information Centres distributing copies the following day. A further 80,000 maps were available a few days later at remaining stations. An extensive poster campaign used the slogan 'So simple a child could read it', incorporating two children finding their way around on what appeared to be a huge version of the new map. There was other LT publicity too, together with newspaper advertisements and television and radio advertisements. Not unnaturally there was a sudden rush for the new map as compared with the concurrent Penrose design which had received no publicity. By the beginning of September about two thirds of the initial print run of 500,000 pocket maps had been distributed to outlets.



PART 2: STUDIED REACTIONS

THE PRODUCTION DESIGN ASSESSED

Once the Central London Bus Map had been launched LT eagerly awaited reaction, by now being firmly convinced that the map was a world beater - a view no doubt encouraged by the map being submitted as a British entry for the 1982 International Cartographic Association Conference and Symposium (held that year in Warsaw). At home, the map received a mixed reception. Some members of the public clearly liked it and said so. Some did not like it and likewise said so. Most said nothing. When prompted (partly by market research teams) it would appear that on balance more people preferred it than otherwise. What, of course, they preferred it to, and whether or not they had actually tried to use it to get around on their own we do not know. Nor do we know if and how they were influenced by the 'Child's Play' publicity campaign. Rather more staff did not like the new map than liked it, and the majority of staff who actually had to assist the public did not like it at all, although having been trained to use the Penrose design then anything new would probably be resented. None of the instances of dislike actually caused problems because the Penrose 'all-system' map was still available, albeit getting a little out of date in parts; in any case the term 'dislike' does not mean that the disliked map was unusable.

Views were expressed by senior LT bus managers and some other officers, about the perceived inadequacies of the new design, which in their judgement created a join-up-the-circles puzzle every time anyone had to refer to the map to check on the street location of a bus route. The inaccuracies still not eradicated from the production edition of the map did nothing to improve their assessment. At this stage, though, most detailed criticisms related to items which could be put right on subsequent editions. General difficulties were in tracing bus routes around complex road layouts, and in finding out which routes were 'irregular' (still regarded outside the Advertising & Publicity Office as an extremely unfortunate description to apply to London bus routes).

Market evaluation of the new map would in any case have gone ahead, since it was 'on test'. However a greater sense of urgency was felt in Group Marketing, Market Research, and Advertising & Publicity, for two reasons: firstly, planning for 1982's maps was already in hand, for which feedback was important; secondly, it would be very useful to have up-to-date evidence to deflect any unreasonable criticism from internal sources.

The terms of reference of the study were therefore put together rather rapidly, and commissioned from international pollsters Louis Harris, who include the better-known UK organization Opinion Research Centre*. Their task was to manage structured discussions among four different groups of regular London bus users, and to interview tourists, and to report urgently with a 'qualitative evaluation' of users' attitudes to the new map. The check list included the map's strengths and weaknesses, the ease of using it, presentation of ancillary information, and ways of improving the map.

Discussions were undertaken on 7-8 October 1981 with regular London bus users (totalling 37 people resident in the area covered by the new map), and interviews with tourists on 16 October 1981. Those involved in the discussion groups had been given a week to familiarise themselves with the new map. An initial presentation of the results of the discussions was made to London Transport on 15 October 1981, and a full report was completed by the end of that month.

The four discussion groups were divided into:

Female:	under 35 years old:	ABC1 socio-economic group
Male:	under 35 years	C2D
Female:	over 35 years	C2D
Male:	over 35 years	C2D.

The four groups were made up of individuals chosen at bus stops - neither the method nor the criteria of 'choice' being specified, except that they needed to be regular bus users and have used a familiar London map (eg. bus map/A-Z/Underground map) some time in the past six months. We are left to assume that somebody considered that the 37 people were somehow representative of the millions of passengers who use central London's buses, and perhaps of POTENTIAL bus passengers too. We must assume that they were grouped in the way they were in order that intelligence levels were fairly equally matched - so that the discussion groups were easier to manage.

It is not clear, though, why other social groupings were excluded, nor why passengers waiting at bus stops were the most apposite candidates. Teenagers and OAPs were not included, yet are heavily dependent on bus travel. A full selection of all under-35 socio-economic groups (including Female C2D and Male ABC1), could have been important since it is the younger age groups of any social class who may be most willing to change their travel habits and use buses more.

RESEARCH FINDINGS

The check list for the discussions featured various topics. *Attitudes to travel generally* around central London....

frequency of visiting the central area,
the normal mode of travel within central London and the reasons for this choice,
the reasons for use and non-use of bus services, and advantages and disadvantages compared to the Underground

....revealed nothing not already known from previous researches. At least it suggested that these groups were not 'abnormal' or perhaps that general travel attitudes had not changed. Most of the 37, it transpired, normally stuck to routes they knew well and if they needed to go somewhere else would use one of these routes and then ask on a bus or at a stop for directions they needed next, or ask friends in advance.

Attitudes towards the Central London Bus Map's principal features....

likes and dislikes,
had any journeys been made using it, and comments arising from these,
ease of identification of routes,
colour coding and lines,
comprehension of instruction panel,

* Opinion Research Centre had conducted LT's 1979 bus map research, comparing Beveridge's and Penrose's designs. The UK group has latterly been renamed 'Harris Research Centre', and is based in Richmond, Surrey.

usefulness of names chosen for intersections,
value of the map index

....were variable. The design was apparently 'well received' but the female C2D group, 35-55 years, found difficulty with the new map even after practice. Although all 37 people had been given bus maps they hadn't used them fully - because they were too difficult for them or because they didn't trust either themselves or the map. When looking at the maps, the instructions for use were generally ignored - most worked out how to use the map by tracing a route they already knew.

The ability to identify routes for specific trips proved favourable, with the circle-to-circle system fairly self-explanatory. This may have contributed to the result that the directional colour coding for route numbers was largely ignored - being described as 'a little too sophisticated for the average respondent'. Indeed the use of so many colours was regarded as a confusion, most of the respondents not having any idea why the numbers appeared in four colours*, although it was agreed that the use of more than one colour was helpful as an eliminating factor, cutting down the range of numbers to be checked. The coloured lines linking the circles were used only rarely. There was no suggestion that the names for the circles were wrong, but the market research report noted that respondents were familiar only with those parts of routes they already knew - a wider test might have been useful. The map index was regarded as a helpful feature, but there were some regrets about the lack of suburban locations. Use of two colours for the index was thought to be a waste of effort - people did not perceive any difference between 'intersections' and 'places'.

Strong comments were received about *ancillary information*. The groups were especially concerned about the 'irregular' routes - a very off-putting phrase. Some had an interesting way of interpreting the term and claimed they would tend to avoid using them because they 'could not depend on them'. A clear view was expressed that a special colour code could be used for the irregular routes 'which would immediately identify them'. One feature identified was that many of the members of the groups planned journeys on the new map but did not check the 'irregular route' list. These individuals might have been in trouble had they actually tried catching a bus, confirming that some more obvious indication was required on the map itself to warn of conditional services: every route needed to be checked to see whether it was 'irregular' or not. Green Line routes could be left off, it was felt, but the groups thought night buses were important and needed to be included as basic information (even if not much use was made of them - there was no evidence of their use by group members themselves).

The new Central London Bus Map had *other strengths and weaknesses*....

legibility,
ease of understanding,
usefulness of non-bus route information,
use as a street map,
usefulness of the reverse side of the map.

All except the female 35-55 C2D group thought the new map offered greater clarity and more obvious interchange points, but then this is not very surprising with intersections specially highlighted. 'Their judgement was simply based upon the ease or difficulty of following numbers along routes and determining where to change and on to which bus' - nothing here about its usefulness when actually in the street attempting to relate the plan to reality. The new map was regarded as no worse than the Penrose design, for street-map information, but the point was not exhaustively researched, being no more than an 'armchair' opinion. The 'Map of Routes Going from Central London' was viewed with little enthusiasm, being described as 'not crucial'; something more relevant was considered to have been the central London fare zones (though these had not existed when the map was first designed) and the various bus destinations.

A number of *potential improvements* to the new map were suggested. One interesting problem 'frequently mentioned' was that of finding the exact location of the bus stop at the intersections, the circle-to-circle system giving few clues about where to look. Some respondents assumed that all the buses listed in an interchange circle would stop at the same bus stop. A minority appeared to be aware of 'Where To Board Your Bus' panels and suggested (in view of the implied need for them) that some reference to their existence ought to be made on the map. The panels were thought to be 'highly desirable'.

Several topics were regarded as areas of lesser importance, in the official preparation before the discussions. The attitudes to travel generally around central London have already been mentioned - these had not been expected to produce new evidence. Two other low priority aspects were: whether the new map should be seen as an alternative or a supplement to the Penrose design, and whether the new design would encourage an increase in bus use in central London. (It is surprising these were seen as low-key issues - these were surely the prime issues to be faced in deciding whether or not to proceed further with the Graef/Holmes design as a high priority item, bearing in mind the original reasons advanced to justify the expense and effort of developing a new format.)

The groups offered no comment on whether they saw the new map as a supplement or an alternative. The Louis Harris report concluded that there was little suggestion that the new map would increase bus patronage (at least among the type of people participating in the discussion groups) - it would just aid their journey planning. The groups too had been unusual in that they had been presented with the map, and had not been forced to seek it through more conventional outlets. To have any influence at all on travel habits, according to Louis Harris, the map would have to be freely available, and potential passengers would need to be exposed to the map frequently at bus stops.

CLARITY OF CONCLUSIONS?

The market research evaluation raises questions which require consideration before too many conclusions are drawn from the apparent results. Time after time the 'clarity' of the new design has been referred to subsequently by London Transport, but no evidence was offered in the Louis Harris research to support this assertion, in a form which took into account the different format, and the different volume of information on old and new maps. It is not disputed that it can be easier to follow route numbers around using the Graef/Holmes system, but from the evidence of the discussion groups there were

* no-one made use of the compass sign (printed alongside the main map) which explained the directional colour-coding.

manifestly problems caused by a lack of clarity; for example the confusing colours, absence of reference on the map itself to 'irregular' routes, and the assumptions made about stop location at interchange circles.

It is interesting to see that one of these groups (female C2D over 35, as it happens) was reported to have 'found the new map confusing': a quarter of the respondents, and representing LT's largest single bus passenger market. Half of these couldn't make anything of the new map whilst the other half had felt that with application and persistence they could probably get to grips with it (but the same might be said of the Penrose design). Reading between the lines, the impression is gained that no matter what this group had been provided with, there would have been difficulty. Of the remaining respondents, none had found the new map without faults and many were critical of certain aspects to a greater or lesser degree.

The Louis Harris research did not present an overall assessment of the degree of support for the new map. The most one can infer from the report is that spontaneous support was noted from 11 people out of 37, while 'most respondents became more enthusiastic as their familiarity increased'. There is no qualification of the degree of enthusiasm, though. The extent of substantive criticisms is not defined numerically, as a proportion of the respondents, except that the quarter-sample noted above was distinctly unenthusiastic. Allowing for human likes and dislikes, in LPT's view it is unlikely (even with generous allowance made) that more than half the respondents could be described as 'uncritically enthusiastic' towards the new map, a percentage which allows no strong statistical or qualitative conclusions to be drawn*.

The same can be said for the tourist interviews, which were brief and inconclusive, and not regarded as very helpful by anyone within LT. It would appear that nine tourists, mainly North American, were interviewed at the Cunard International Hotel. The results were arguably representative of guests (moreover North American guests) at the Hotel but were not necessarily typical of the hundreds of thousands of tourists from all over the world who flock to London every year.

This does NOT mean that the evaluation exercise was a waste of time nor that the market research people were incompetent. Any feedback is useful and valuable comments were made with regard to some particular features on the new map. However the scale of the evaluation was quite small, possibly because there was no money available within the appropriate budget for just another in a succession of market research exercises, and possibly because the strategy for 1982's maps had already been determined. It has to be realized that in this type of exercise one gets what one pays for.

The problem appears to be that the limitations of such an evaluation were not realized fully, and there has been a tendency to conclude far too much from the apparent results, some conclusions appearing not to be totally supported by the evidence. In so far as the research was intended to aid LT's subsequent map policy, the crucial issues were treated with low priority, and unrevealing answers were obtained; so far as map details were concerned, useful information was gleaned, some of which was subsequently ignored; while another outlet for the research was an exercise within LT in defending points of view.

Having reviewed some of the initial reactions to the Central London Bus Map, it is now time to look at the map itself more closely.

USING THE CENTRAL LONDON BUS MAP - IN THEORY

The fundamental difference between the Penrose and Graef/Holmes designs is that on the latter the bus route numbers are grouped together within circles superimposed on the road intersections; route numbers are NOT shown alongside the roads served. This is the converse of the Penrose format, where route numbers are located at intermediate points alongside roads, but not at intersections unless they terminate there.

To find which bus serves a particular road on the Graef/Holmes design, it is necessary first to locate the road, then to look at the adjacent intersection circles and note which routes are in both circles. To plan a longer journey requires searching circles near origin and destination to see which routes are congruent, or, if there is no direct bus, which intermediate circles (potential interchange points) offer routes from both origin and destination. Again this is the converse of the Penrose design, where at junctions one had to scan each outlet to see along which road the required route went next.

The Graef/Holmes design is in theory relatively inefficient for planning short journeys, if the passenger's origin and destination are not actually at the major road junctions, because of the extra effort required to work out which routes serve which roads. However for planning longer journeys the highlighting given to route numbers on the Graef/Holmes design means it is certainly little more difficult to use - if anything it may be easier and helpful when more than one route serve the same origin and destination or intermediate interchange, but go via different roads. If instead of journey planning one wishes to trace the course of a bus route, having established a route number there is in theory little to choose between the two designs; the Penrose format does, though, positively link the route numbers to particular roads.

Some of the theoretical shortcomings of the Graef/Holmes design were minimised by use of the four-colour directional grouping: each major compass axis was ascribed a colour code and each route shown on the map was allocated to one of these colours according to its general orientation. For example route 15 (basically east-west) became blue, route 2 (south east-north west) became black, 30 (north east-south west) became green whilst route 3 (north-south) became red. These four colours sufficed for all routes although the allocation of some of the colours was somewhat arbitrary. Within the intersection circles the bus route numbers were shown in their 'directional colour'; route numbers of the same colour were each grouped together and were listed in numerical order within each colour group. The order of appearance within the circles was blue-red-green-black; for example the circle at GT PORTLAND STREET listed 18 (blue), 3 and 137 (red), 27 and 30 (green) and 53 and 176 (black). Whilst this is complicated to explain the result is that, having once found the

* In any case, expressions of support or satisfaction are meaningless by themselves, without a comparable test using an equivalent Penrose design, both designs being judged against common objectives set for the publicity material. No such parallel research exercise was organized as a 'control'.

colour of the route in which one is interested, it becomes very much easier to scan the adjacent circles as the range of numbers to be checked is usefully reduced. (In this example, and those that follow, intersection circle names are denoted by UPPER CASE lettering, and road names and other features in Upper & Lower Case within quotation marks.)

Holmes's early semi-diagrammatic scheme was adopted following the grouping of bus routes into four house colours and this contributed to helping users follow routes around. Between adjacent intersection circles coloured lines were superimposed over the roadways to show which 'directional service' connected the junctions. This was a good idea, at least in principle. Since intersection circles generally appeared at the confluence of at least three, and more often four, roads the odds were that for a small number of routes no more than one or two would be in the same colour; having established the colour of the route in which one was interested one could then be guided by the coloured link lines when looking for the next circle. For example the PALACE ROAD intersection (an error for Fulham Road) shows 45 (red), 14 (green), 49 (black). To follow the 45 one looks for the red line and finds that it goes along the Fulham Road; this suggests that there is no need to check the CHELSEA TOWN HALL circle but that one should instead check DRAYTON GARDENS. At DRAYTON GARDENS one finds the 45 (red) and 14 (green). Only the green line continues along the Fulham Road (so no need to check EDITH GROVE) and the red line has turned south, requiring one to check BEAUFORT STREET and on to BATTERSEA BRIDGE.

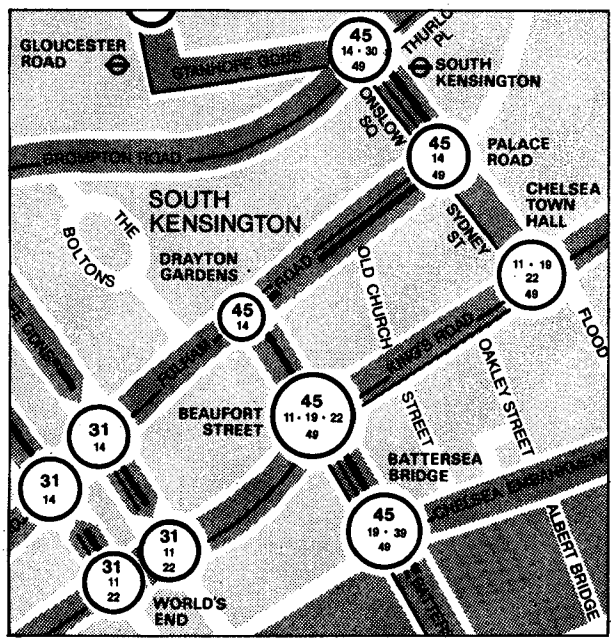


Figure 12. *Route 45 can be followed with ease between* SOUTH KENSINGTON *and* BATTERSEA BRIDGE. *(In this extract, red in the original is shown emphasised.)*

The method is simpler to use than it is to explain. As one would expect with only four directional colours there are instances where the colour code is no help: at KNIGHTSBRIDGE, for example, there are six green routes and all four roads contain green lines; at BANK, there are seven blue routes and all seven roads contain blue lines. Other examples are very simple - the 137 from SELFRIDGES all the way to BATTERSEA PARK is the only red route and can be traced along its course in an instant.

The other new idea was the 'Map of Routes Going from Central London', on the reverse of the main map. This shows a 'grid' representing central London with the central London bus services radiating outwards, in their directional colours, to their suburban termini. There is no clue as to what happens to the route inside the central grid, one has to turn over to the main map to glean this. The grid lettering system aids the process of associating the main and outer area maps, while on the main map routes leaving the area are carried off the map edge and their destination labelled. There are, however, problems in relating the two maps since in a number of instances places on the main map are shown for no obvious reason as being outside the grid on the outer map. This gives rise to some irritating perplexities, the worst example probably being at Camberwell where the outer area map suggests that it is not served by routes 12, 171, and the 36 group and the main map shows that it is actually served by them all. Nor, in many cases, is it clear beyond reasonable doubt which routes buses take on the outer area map since route numbers are only shown at the central area boundary and at the outer route terminus. Does route 3 go via Streatham or Tulse Hill? Just how does the 243 get to Wood Green? (see Figure 13).

USING THE MAP IN PRACTICE - USERS' PROBLEMS

Having explained the virtues of the circle-to-circle method of following bus routes around on a map, it should now be said that there are problems if one wishes to translate this into something buses do on the road, and to enable passengers and potential passengers to use the Graef/Holmes map to the fullest advantage. The LT market research had identified some potential deficiencies with the new map, and others were pointed out by members of the public who communicated with London Transport.

It may seem arbitrary to divide these problems into cartographic shortcomings and general design failings - especially since in this case Andrew Holmes had dealt personally with the graphics problems in his own studio, to produce a 'visual and logical whole'. Nevertheless, in deciding how to resolve the various problems, it is important to be clear whether they can be remedied within the principles of the design, by revised cartography, or whether it is the design principles themselves which may require attention. It has to be borne in mind, too, that LT's initial reaction to received doubts would be to endeavour to make the new design work - after all, various features were still on test - and to be disinclined to discard the substantial investment of time, money and reputations in the new maps.

Illustrations of the CLBM have been faithfully redrawn for monochrome reproduction with other presentational adjustments made where necessary. Although these highlight specific points, the reader may find it helpful to have a copy of the printed map to hand. LPT has a limited supply available and a copy can be requested by sending a stamped, addressed envelope to the address on the inside front cover.

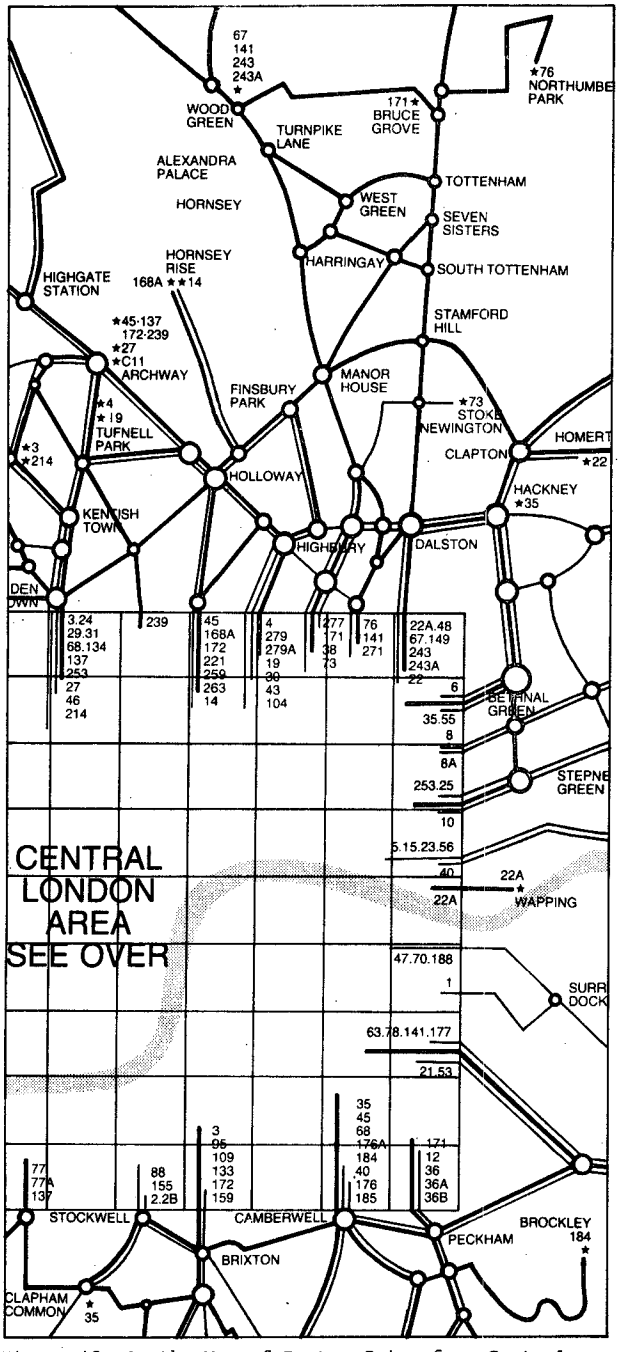


Figure 13. *On the* Map of Routes Going from Central London *it is not clear how route 243 (red) gets to Wood Green; ALL red lines have been emphasised in this extract.*

Many of the problems can be ascribed to the lack of clear definition of method and priorities when developing the production version of the Graef/Holmes map - for example the absence of a detailed brief from the designer or Working Party which would have required approval by the Bus Map Design Committee. The numerous changes of mind during the development phase have already been identified. A firm decision was never taken to clarify whether the primary objective was to portray the central London bus (or bus and rail) network at least as comprehensively as in the Penrose maps, and improve presentation in that context, or instead to give higher priority to various presentational features, at the expense of other information if necessary.

What seems to have emerged is a consensus to adopt a certain style of presentation for testing, and to fit as many details as possible around it, but again without any prior definition of essential information - or of marginal information which might be deleted. A further, hasty decision was made not to proceed with testing but to launch this design as a production edition. Yet one further issue not considered was whether to present information at least as accurately as the Penrose maps.

The discussion that follows is therefore coloured by the lack of a clear yardstick emanating from London Transport, which would have enabled the Graef/Holmes map to be judged against LT's own expectations. It has been possible only to assess the substance of the Graef/Holmes map against the equivalent design and cartographic techniques of the Penrose maps, a method which has its shortcomings. For one thing, it is possibly rather futile to compare two radically different designs and then claim that, overall, one is BETTER than the other. A wider -ranging discussion would be to contrast both map styles against objectives for bus travel information. For example, both designs might be equally effective - or ineffective - but in different ways. The Penrose maps, too, are an 'all-systems' presentation, so that comparison of the two complete documents is hardly fair.

Within the limitations of contrasting two different designs, the only pertinent procedure is to avoid making an overall comparison, and instead to study the individual features presented on each design, asking 'how robust is each map feature, in contributing relevant information for journey planning and point-to-point travel?'. That is the central theme of the discussion below.

DESIGN PRINCIPLES - INTERCHANGE CIRCLES

The key element of the Graef/Holmes design was the intersection circles, also described as interchange circles. The main criticism has to be that in showing a circle at an intersection, the junction itself is entirely obliterated. This might not matter much at, for example, BROMPTON ORATORY, but at places such as ELEPHANT & CASTLE, KENNINGTON PARK, ALDWYCH and TOTTENHAM COURT ROAD, to name but a few instances, the result was exceedingly confusing. The large number of bus routes within central London meant, too, that at busy junctions - generally the more complex ones - the size of the intersection circle had to be notably larger to accommodate all the bus route numbers. This blotted out nearby landmarks. Someone walking along to ST GEORGE'S CIRCUS, VICTORIA or KING'S CROSS would have no idea where to start looking for his stop, and anyone who knows Liverpool Street and its stations can only gaze with helpless incredulity at the way it is portrayed on the Central London Bus Map.

In numerous instances local geography had to be distorted severely to fit in the interchange circles. The penalty for any improvement in route display was therefore increased difficulty in locating the exact route taken on the ground, an important factor given

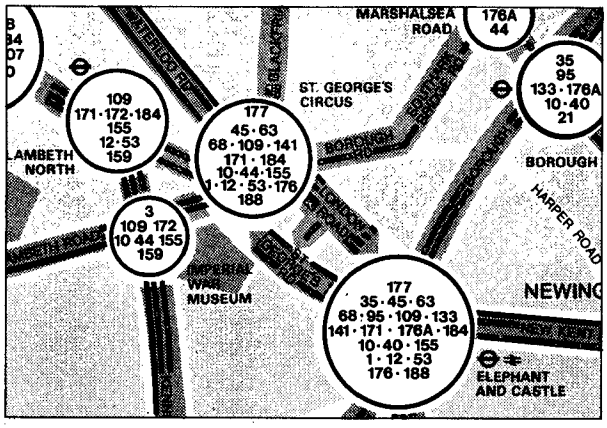


Figure 14. *Someone wishing to travel from* ST GEORGE'S CIRCUS *would have no idea of where to find the bus stops. The circle obliterates a roundabout with unusual traffic flows, and a one-way system. In addition, the map fails to indicate which of the three 'green' routes (10, 40 and 155) uses the spur road between* 'London Road' *and* 'St George's Rd'.

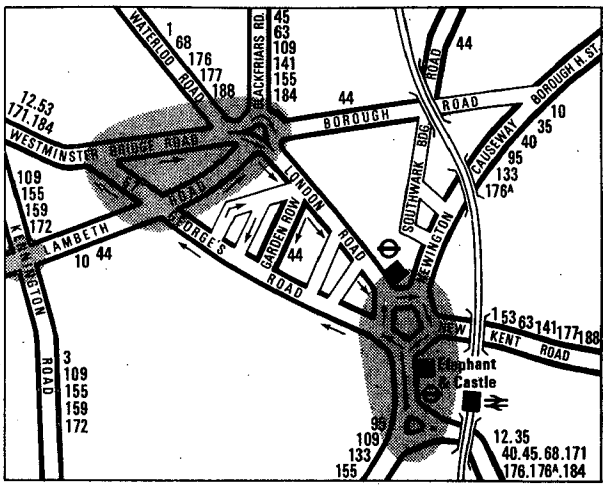


Figure 15. *Geographical representation of the same area. The detail lost under the intersection circles is toned.*

that at this stage the map was aimed especially at a market which might well be expected not to be over-familiar with London's general geography.

London Transport dismissed this increased difficulty in use by arguing that at the larger points of intersection there tended to be 'Where To Board Your Bus' panels including maps of the actual junction layout and the position of the stops, which were all lettered for ease of identification. These panels are all very well for people who know they exist and can use them and it cannot be denied that they do make up for some of the deficiencies of the map. Nevertheless the majority of junctions do not have these panels and in any case they do not help anyone already on the bus who could, with the Penrose maps, identify a junction by the road layout to see where to get off. There is, incidentally, no reference on the map as to which intersections actually do have the 'Where To Board Your Bus' panels. In fact, there were at the time only about 100 such schemes for the whole LT area.

The existence of the junction circles made it impossible to show the majority of railway stations in anything remotely resembling their correct geographical location, with results which are at least confusing and at worst downright inaccurate. Anyone emerging from Westminster station will be unable to understand why he is apparently in Bridge Street and not Whitehall or the Victoria Embankment. What happens at Edgware Road is quite unfathomable. South Kensington is difficult to come to terms with and the choice of site at Bank leaves room for improvement, to name but a few instances.

The interchange circle concept has other drawbacks too. Apart from obliterating simple junction layouts the method fares even worse at complex junctions. Someone wanting to go to Broad Street station from Charing Cross station might well wait 15 minutes or so for a number 9 or 11 bus, yet let several number 6s go past because he doesn't realize that the BROAD ST intersection on the map is actually the same place as LIVERPOOL STREET. In this instance matters are further confused because buses terminating at either intersection ALL display 'Liverpool Street Station', and the 'Where To Board Your Bus' panel won't help as Broad Street is not mentioned. On the other hand the map would discourage a change of buses at BROAD ST/ LIVERPOOL STREET from (say) route 22A to 11, but an equally awkward change between (say) westbound routes **15 and 18 at EDGWARE ROAD appears misleadingly easy.** In other words there are inconsistencies in the way information is put over - scarcely the integrated approach sought by Royds, and lacking the detailed consistency and reassurance offered 'on the ground' at tube stations.

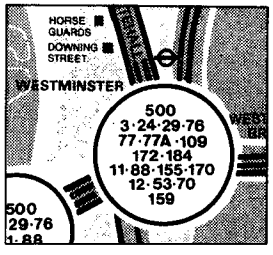


Figure 16. *Westminster Underground station could be construed as being in Whitehall or Victoria Embankment.*

DESIGN PRINCIPLES - ONE-WAY STREETS

One consequence of the principle of locating bus route numbers only appearing within intersection circles, is the problem of defining their direction of travel along one-way systems. Places such as ALDGATE and CAMDEN TOWN are most off-putting to the

map user, other examples are simply misleading or wrong. It would appear, for example, that one can wait at the TOTTENHAM COURT ROAD intersection for a southbound 19 or 22; how wrong one would be. Some one-way systems can be resolved if one works hard at it, as the 171 working between GRAYS INN ROAD and FLEET STREET serves to illustrate. There are rather more mysterious workings. How, for example, do routes 68, 77A, 172 and 239 get from Holborn to Southampton Row? The problem here is a massive oversimplification of a traffic network to the extent where what is shown is actually wrong.

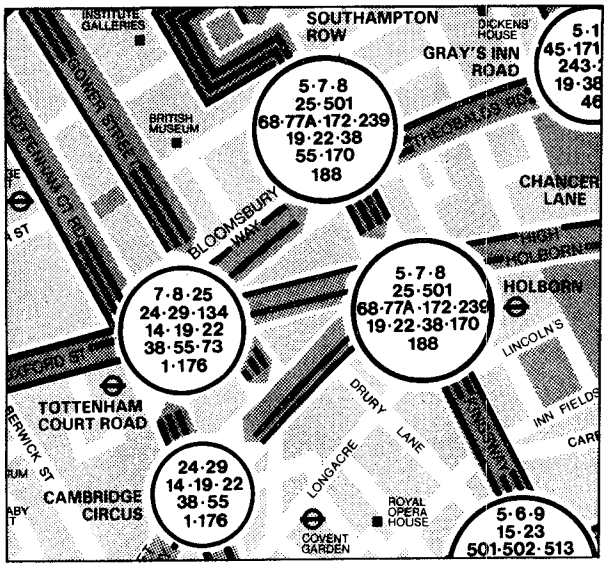


Figure 17. *Route 22 runs between* CAMBRIDGE CIRCUS *and* 'High Holborn' *and the 19 and 38 between* CAMBRIDGE CIRCUS *and* GRAYS INN ROAD. *The northbound routeings can be established with some care but southbound routeings are ambiguous. A more glaring problem concerns routes 68, 77A, 172 and 239 which operate along Kingsway and Southampton Row; because of the way in which bus roads have been shown north of the* HOLBORN *intersection it is impossible to see how these routes operate in the northbound direction. In a similar vein, how do southbound journeys on route 55 get from the* SOUTHAMPTON ROW *intersection to that at* TOTTENHAM COURT ROAD?

DESIGN PRINCIPLES - SUPPLEMENTARY INFORMATION

The Graef/Holmes design requires intersection circles. These create a derivative cartographic issue - how to include the rest of the map information within the space remaining, and with clarity, after large areas have been given over to the circles. Railway stations were shown on the Graef/Holmes design (apart from Chancery Lane and Baker Street which had been forgotten, although, intriguingly, they had been on the proof), but it had been decided not to show British Rail or Underground alignments on the new map, to avoid 'unnecessary clutter'. The difficulty of locating the stations has been noted already.

The absence of railway alignments is not necessarily a major loss on the central London map, because of the generally close-knit network. However some passengers will not be amused to find that their railway journey from Edgware Road to Marble Arch, or from Farringdon to Chancery Lane, would have been better managed by bus or walking. In this case the new map represents a degradation of information.

Bus route terminals have been shown inconsistently. In many cases routes terminate 'within' an interchange circle, but the fact that the route does not proceed further is not made clear. Where routes terminate other than at interchange circles one might expect them to be marked by the 'Terminus of Route' symbol - some are; some are not indicated at all. To quote route 31 as an example it appears from the map (see figure 12) that southbound buses along Edith Grove (not named) turn right into King's Road and right again towards Earls Court along Gunter Grove (also not named). This, of course, is nonsense but there is no hint that buses actually turn left into King's Road and run most of the way towards Beaufort Street to terminate in Limerston Street. Nor, at the other end of the route, is there anything to hint at a 31 terminus in Bayham Street. To give just one more example, it would have been helpful to show the final destination of route 1, next to the LT/BR symbols at Marylebone, since it is far from obvious that this route actually uses the short section of one-way road leading up to the station.

The consequence of this abbreviated presentation is to create uncertainty among some passengers; to inconvenience others by encouraging them to make an unnecessary change of bus or to board or alight distant from the terminus and walk further to their destination; and to undersell the travel links offered by the bus routes. Useful information has been lost, and marketing opportunities denied. While the loss of information is arguably a cartographic issue, it is certainly the case that the designer closest to the new map found the details difficult to incorporate within his own format.

CARTOGRAPHY - IRREGULAR AND COMPLEX ROUTES

The purely cartographic failings are legion, and reflect in part the indeterminate approach adopted by the Bus Map Design Committee and its Working Party. Map portraiture too, is a specialist subject.

The first problem begins beguilingly simply - that users must forget any conventions of colour they have become used to on the Penrose maps. Thus green does NOT mean a country bus service or a private operator, and red does NOT mean a 'conditional' service. No mapping information whatsoever is given of conditional workings - that is, routes not operating all day, every day.

There are two possible results of this revised practice. Either passengers will have to consult the forbidding-looking, two column list of 'Irregular Routes' printed on the reverse of the map EVERY time they look up a bus route, purely to satisfy themselves that the route runs when they plan to travel. This could be described, kindly, as an unhelpful imposition; it certainly expects a great deal from passengers - even intelligent ones!

In the alternative situation, the passenger will be blissfully unaware of any potential problem with the general availability of simple end-to-end bus routes, and simply turn up at the stop for the bus - he could be in for a long wait for a 502 on a Saturday or a 46 on a weekday evening, for example. At best he will not thank London Transport if he consults a timetable on arriving at the bus stop - his travel plans will have collapsed.

The presumption - 'when-in-doubt-look-at-a-list' - is not a real solution to the cartographic problem. LT's own market research shows that passengers do not behave as they might in an ideal world: unreasonably or not, some will assume that the map contains all the relevant information.

The occasional practice of varying bus routeings on evenings or weekends exacerbates the problem for passengers trying to interpret services on the Graef/Holmes map. Each route and route pattern is given equal prominence with the directional colours. Passengers relying on the map alone can be led to make unreasonable assumptions about service availability. For example, we find both the (daytime) Berkeley Square and (evening) Park Lane routeings shown for the 25 bus, without distinction. And is there a 25 from GREEN PARK to MARBLE ARCH, perhaps?

A worse example is that both weekday and Sunday 159 routeings across the river are shown with equal prominence, making it impossible to determine with certainty how the route gets from Kennington to Trafalgar Square (assuming both routeings are noticed at all). After some attempts to get to grips with it, buses logically appear to go: KENNINGTON, IMPERIAL WAR MUSEUM, LAMBETH NORTH? ST THOMAS' HOSPITAL? LAMBETH BRIDGE (via Lambeth Palace Road), MILLBANK, WESTMINSTER, TRAFALGAR SQUARE. This is the only routeing that appears to take account of all the circle entries - unless one realizes that two different routes are shown. Can tourists and ordinary Londoners really cope with this? For all its complexity, ambiguities such as this would not occur when bus route numbers were shown alongside the road and where 'Irregular Routes' were denoted in a different colour.

Inherently complex bus routeings are not a common feature in central London. Nevertheless it is worth observing, for this discussion, the problem that can arise using the circle-to-circle method of route planning. 'U'-shaped routes give a false impression of the ease of travelling from one circle to a nearby one - route 226 in north-west London and route 235 in north-east London are textbook examples. Extensive one-way loops are the closest equivalent within the central area, such as route 502. The routeing problem is not necessarily an irredeemable failing of the circle-to-circle method - the offending routes can be displayed alongside the road in the 'traditional' style - but then further problems arise: are these the only routes along that road? Wouldn't it be better to show all the routes alongside that road to make the service pattern explicit; yet doesn't this clutter the map with route numbers running riot both inside the circles and along the roads?

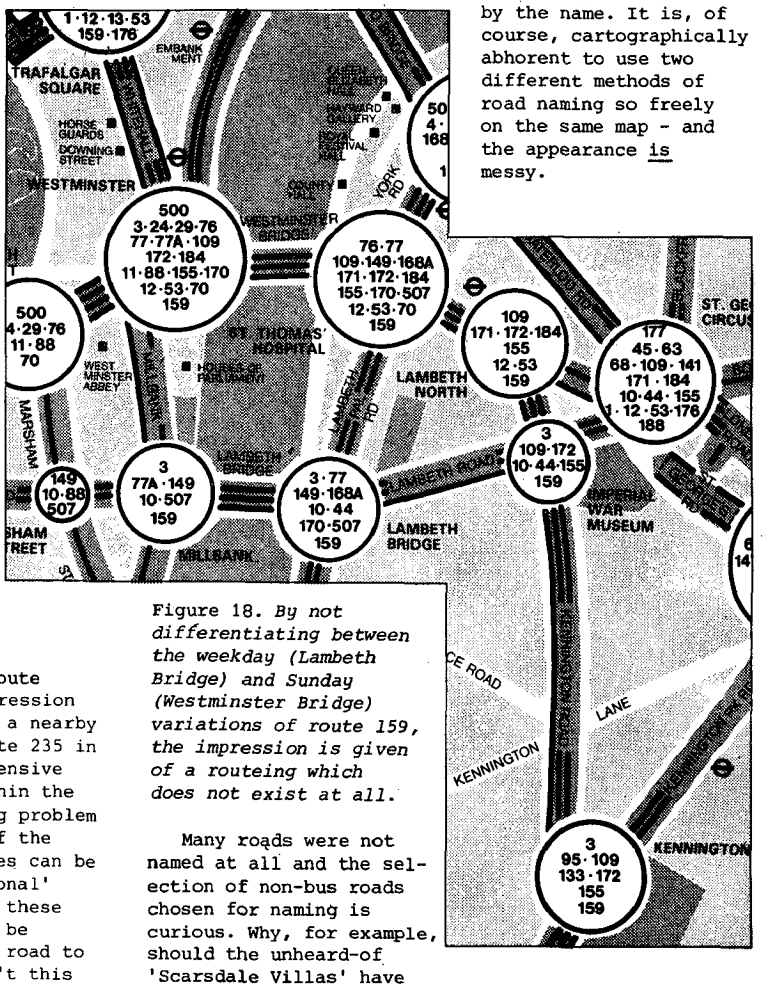


Figure 18. *By not differentiating between the weekday (Lambeth Bridge) and Sunday (Westminster Bridge) variations of route 159, the impression is given of a routeing which does not exist at all.*

CARTOGRAPHY - ROAD NAMING

Cartographically, the standard to which the map was drawn is inconsistent. Taking road naming as but one example we found numerous cases where names were arbitrarily abridged: for example, 'Druid St' but 'Tooley Street'. In some instances the road was not long enough for the name to be shown in a single line and it was shown in two (or even three) lines. In itself, the haphazard presentation mattered little; however there was no apparent correlation between the use of abbreviations and the need to maximise the display of the coloured directional bus route lines.

In some cases road names were not shown within the road width at all, mainly because it would have been difficult to have fitted it in - for example 'Old Marylebone Road'. It is unfortunate that this seems to have been the primary criterion because there were numerous other instances where the name would have been happier next to, rather than within, the road to which it referred, in order to avoid disrupting the directional colour lines - 'Eastbourne Ter' and 'Shaftesbury Ave' being examples. In another example, 'St George's Rd', the directional lines have been completely obliterated by the name. It is, of course, cartographically abhorent to use two different methods of road naming so freely on the same map - and the appearance is messy.

Many roads were not named at all and the selection of non-bus roads chosen for naming is curious. Why, for example, should the unheard-of 'Scarsdale Villas' have warranted a name when the potentially useful Cardington Street (near Euston station) did not? About half the non-bus roads were named, the choice appearing to be completely arbitrary. Some of the bus roads were also not named - for example, Chapel Street, or Ludgate Hill (though not every road was named on the Penrose maps either). Most of the roads leading from the edge of the map were unnamed, highlighting again the lack of clear definition of method and priorities.

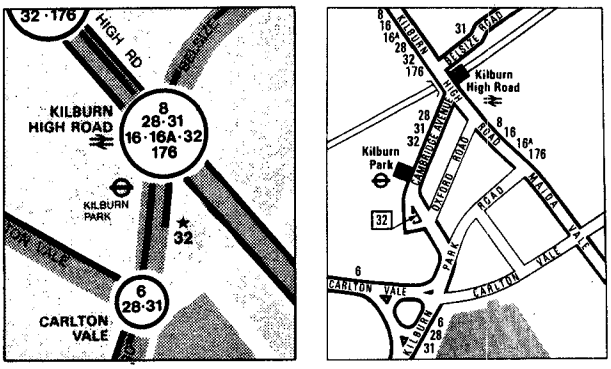
A more common problem is that a number of roads are not named clearly: frequently this is because the map user is forced to assume that a name on one side

of a junction circle also applies on the other. Many of these examples actually leave the user to guess which of two names the road adopts - there are many ambiguously 'named' roads. Is it Westbourne Grove or Bishop's Bridge Road which leads off Queensway? Is it Piccadilly or Shaftesbury Avenue which leads off Dover Street? None of the roads at the LAMBETH NORTH intersection are named at all. A few are wrongly named: part of 'Stanhope Gdns' should be Harrington Road, for example, and Old Brompton Road lacks the 'Old'.

The sloppiness of the road naming serves to introduce an element of doubt in the mind of the map user. It makes it difficult to orientate properly when heading for the required bus stop, and to rely on finding the right street when alighting from the bus; and makes it a far from simple exercise to follow progress when on the right bus. Nor does the stylized nature of the street plan aid matters here. The positioning of some of the 'places of interest' provides another pitfall for the unwary traveller.

CARTOGRAPHY - STATION LOCATION AND NAMING

Even if the existence of the circles makes it impossible to show railway station locations accurately there is little excuse for the imprecision of many of them. Why does St James's Park station appear to be on the opposite side of Petty France to the Passport Office? Why is Kilburn High Road station on the wrong side of the High Road? Why does Victoria station seem to be next to the bus garage in Gillingham Street - or is the road shown not Gillingham Street, and the garage in the wrong place? This careless representation of stations is most confusing to passengers, particularly those arriving at a station by train and wishing to continue their journey by bus. One of the main virtues of the Penrose and the earlier B G Lewis maps was that one could usually relate the station exit to the general direction of bus routeings.



Figures 20 and 21. *Whatever its virtues as a journey planner, the problems encountered when trying to use the CLBM on the road are highlighted in Figure 20. On routes 28 and 31, in addition to the absence of indication of various changes in direction, the location of landmarks such as the 32 stand, Kilburn Park station and Kilburn High Road station tend to mislead rather than guide. The correct geographical location of these features is shown on the right.*

Another feature was the ambiguous method of naming the railway stations. It had been decided that where a station was near to a junction circle of the same name the station would not be separately named; this convention did work in many instances, for example

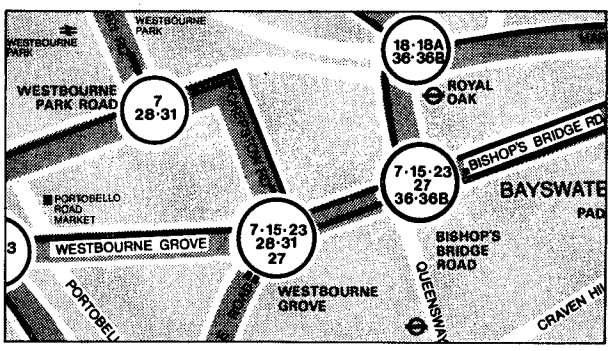


Figure 19. *Is it* 'Westbourne Grove' *or* 'Bishop's Bridge Rd' *which leads off Queensway?*

LADBROKE GROVE or NOTTING HILL GATE. It does mean that from the user's point of view some stations were named in blue and some in black. Problems started to arise where the convention was adhered to with disregard for common sense; who, for example, would think Kennington station was named at all? (see figure 18). Confusion really abounds in congested areas. Lambeth North station could equally well be St Thomas's Hospital; Mansion House could equally well be Blackfriars; Marylebone could be Baker Street; Great Portland Street could be Warren Street, and so on. On a map issued by a responsible organization such obvious sources of ambiguity should not be apparent.

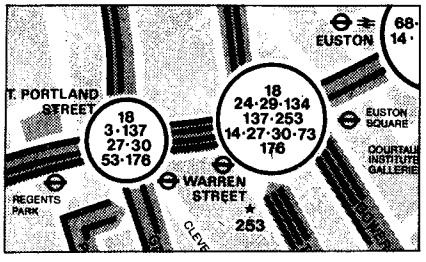
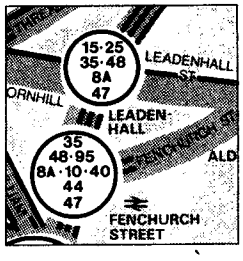


Figure 22. *Which Underground station is Warren Street?*

Some of the station naming problems are merely an extension of a more general malaise in that the names of many of the junction circles are badly sited. Most of the names can be correctly identified by careful, persistent and intelligent searching by the user, but why should passengers have to fight for information? It is not, of course, an easy problem to cram these names in as well as having the junction circles, but by way of example at first glance the following questions spring to mind. Which circle is called SELFRIDGES? Which is LUDGATE CIRCUS? Or LEADENHALL?

Figure 23. *Which circle is* LEADENHALL?



Production problems have not helped here, either. Three blue circle names are almost unreadable over a heavily-screened (blue) River Thames; interestingly the screen on the proof map was lighter, consequently the names do stand out there.

CARTOGRAPHY - ONE-WAY STREETS

Central London of course has many one-way schemes. The yellow colour strip which defines the bus roads on the Central London Bus Map is modified for one-way traffic systems, with the strip ending in an arrow-point where the road concerned joins another road or a circle, to show the direction of traffic. Yellow is not a bold colour, so the presentation is weakened. At night, too, the yellow vanishes under sodium light and so does any indication of one-way traffic! Even with a bold colour, the paucity of arrows can provide insufficient warning of one-way traffic flows.

CARTOGRAPHY - OTHER SERVICE INFORMATION

It is worth noting that the new Central London Bus Map did not show any Green Line or night services, though it included Airbus routes. The intention had been to show night buses separately on the reverse of the main map - however this was not done. Green Line and Airbus routes have no direct relevance for travel around central London; the requirement is principally to show where these services can be caught, in much the same way as main line railway termini imply the existence of trains to other parts of the country. Victoria Coach Station was shown on the Graef/Holmes map, while the various Airbus stops were indicated - and indeed an extra circle was provided at the Penta Hotel (now the Forum Hotel), to show the Airbus stops when these were not at an intersection. The route between the Airbus stops is not always obvious as they are far apart, but in this instance it is of little consequence since they only offer a service to and from Heathrow Airport.

TAKING ACCOUNT OF CRITICISMS

Even before the Central London Bus Map had been evaluated, the decision had been made to incorporate the new design in the 1982 edition of LT's Tourist Information Folder (entitled 'Welcome to London'). Decisions on presentational changes were taken in parallel, in December 1981, at a meeting chaired by Nick Lewis. This was to review the new bus map and its new use in the Tourist Information Folder (TIF).

Within the limitations of the research exercise, the post-introduction Louis Harris report had revealed a number of detailed failings with the first production map, principally that:

* colour coding of bus roads was not helpful
* the use of four colours to differentiate bus route numbers was too complicated - though it was helpful to have more than one colour
* 'irregular routes', it was now accepted unanimously, needed rewording
* use of two colours for the index appeared unnecessary
* the 'Map of Routes Going from Central London' had not been successful as a travel aid: there could be other uses for the space it occupied, such as fare zones and night buses
* if the new design supplanted the former TIF, then the index would need to be geared towards tourist attractions.

The Bus Department regarded a one-colour index, inclusion of some additional tourist objectives such as Petticoat Lane and Portobello Road, and an indication of the location of the 'Where To Board Your Bus' schemes, as potentially helpful changes. Unsurprisingly, they also favoured two-colour differentiation between route numbers - one colour for 'all day every day', and the other for 'irregular' (that is, conditional) services. Including night bus routes on the main map would cause too much clutter, in their opinion, though this did not rule out a self-contained map of night services, perhaps on the reverse of the main map.

For reasons which are unclear at this historical distance - and despite pleas from the operators and the evidence from market research - it was agreed that four colours were to be retained to differentiate route numbers, with no indication of conditional workings shown directly on the map. Coloured lines linking the intersection circles were to be dropped, however, and the text relating to conditional services would be drastically revised. Other changes were agreed:

* the index to use one colour, and list more tourist objectives
* the 'Map of Routes Going from Central London' to be deleted, as not relevant for the TIF
* a reference to the separate availability of a night bus timetable booklet, rather than incorporating a map of these services
* 'Where To Board Your Bus' schemes to be indicated if possible
* the Underground diagram used in the TIF to be printed in colour
* various instructions to be amended: a north point to be inserted on the map; the direction 'compass' information revised; and a new description of how to use the circle-to-circle format.

It will be appreciated that these changes left several major issues unresolved to the satisfaction of various LT departments. Mapping of conditional routes was still an area of disagreement. The need for clear information on the possible terminal points served by buses was also expressed cogently by Buses and Public Relations; passengers would be inconvenienced and lose confidence, they commented, because the area covered by the new bus map did not dovetail with the destination displayed on the bus - a point raised in passing by one of the interviews with tourists in the Louis Harris research. The absence of the 'Map of Routes Going from Central London' would reinforce the need for this kind of information. No action was taken on this suggestion.

Nor could some of the agreed changes be introduced smoothly. The simplification and rewording of the 'irregular' routes panel meant the new text presented incomplete details about the conditional status of some bus routes, despite the strong view outside the Publicity Office that once a route was shown, any exception to the basic service should be advised to intending passengers. A suitable way of mapping the location of 'Where To Board Your Bus' schemes also eluded Advertising & Publicity.

SUBSEQUENT USES OF THE CENTRAL LONDON BUS MAP DESIGN 1982-85

London Transport has subsequently developed four categories of central London bus maps, which have used the principles of the 1981 CLBM design. Though there may now seem to be a prolixity of central London bus maps, the artwork sometimes fulfils a secondary role as part of different marketing

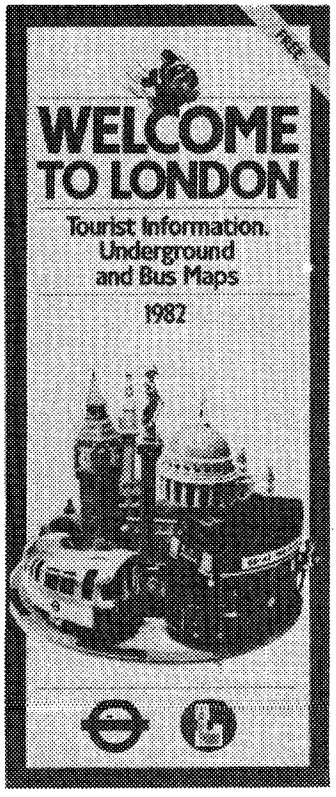
'packages':

* the 'Tourist Information Folder' series (TIF), replacing the former Penrose design from 1982 onwards
* the 'London Connection' series, which show on the main side of the map a unified diagram of London's railways, LT and BR, and on the reverse have a small panel showing at reduced scale a cropped section of the central London bus map, also from 1982
* the 'Central' London Bus Map, one of a set of five area maps issued from 1983, covering London's bus routes
* the central area inset map of the 'Londonwide' Bus Map, also issued from 1983.

It would be otiose to list the complete set of modifications to the CLBM artwork during 1982-85. Each edition of each map has generally incorporated subtle changes, with an identifiable evolution as artwork variations have been attempted and either rejected or retained in later versions, depending on practical success and internal debates within LT. Of course this is normal for any map, but is particularly important to identify during the early production editions of any substantially new design, when the scale of change may be drastic.

To illustrate the way in which early modifications emerged on the Graef/Holmes central London design, we now focus in detail on the 1982 and 1983 editions of the Tourist Information Folder, and the 1982 'London Connection' map.

1982 TOURIST INFORMATION FOLDER - 'WELCOME TO LONDON'



Once the initial decision had been taken to use the Graef/Holmes design for the TIF - a decision which was consistent with intentions expressed during the map's development stages - a proposal was made at the end of 1981 to retain the Penrose tourist design but to remove all the bus numbers and keep it purely as a street map showing tourist attractions. The Graef/Holmes map, based on the Central London Bus Map but covering a slightly smaller area, would have been printed on the back of the folder with the remaining information panels revised and simplified. Some work along these lines was done.

Within a month or so this strategy was changed and the decision was made to transpose the Penrose and Graef/Holmes designs so that the latter constituted the main map. The Penrose design - or rather a part of it - appeared in miniature form on the reverse side, where its better capability as a street map showing tourist facilities could not be exploited fully. As it happened a second Penrose-style map was provided on the reverse, at a much larger scale than the other, purely to show West End theatre and cinema locations. This was an afterthought owing to space being available. Both these maps continued the former convention of showing the bus roads in red, even though there were no route numbers.

The Graef/Holmes design itself was modified as described above. Although the artwork closely resembled the Central London Bus Map extensive adjustments had been made to the 'black' overlay. For example, apart from corrections, numerous road names had been re-set so that most names now appeared within the width of the road (made possible by the removal of the 'route' lines). The colour of the bus roads was changed from yellow to red (thus matching the Penrose maps overleaf) and the roads fitted the junction circles better which made matters a little neater and helped to emphasise the one-way systems. Among the corrections were the inclusion of Baker Street and Chancery Lane stations, the removal of Waterloo (East) station and some adjustments to the places of interest.

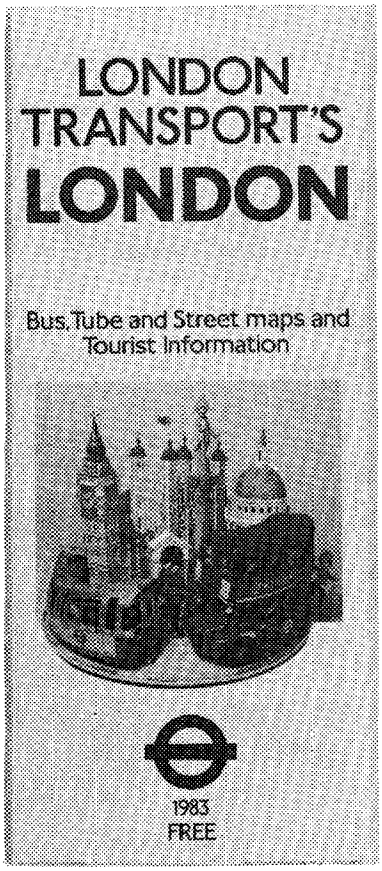
The size of the Graef/Holmes map was reduced, compared with its predecessor, so that the grid fitted about 14 x 11 inches (a scale of approximately 2.4 inches to 1 mile). The size of the index was also reduced and the type became rather small; it also appeared in a single colour (black). The table of conditional bus services (now called 'When Buses Run') had been limited to an approximately 2 inches square note adjacent to the map, and the additional more comprehensive table which had appeared on the Central London Bus Map (measuring 11½ x 6½ inches) was not incorporated. The smaller table was necessarily only a very general guide. As agreed at the December 1981 meeting, the map of services from central London was discontinued, and the Underground diagram appeared in colour.

The English version of the 'Welcome to London' map underwent several printings - from the point of view of the Graef/Holmes design they were all extremely similar. The most striking feature was that on all the later printings the road colour was changed back from red to yellow. Apart from any other disadvantages this change might have caused, particularly to legibility, it meant that on the face of the folder the bus roads were yellow, but were red on the reverse. A feature to note on all the maps is that they took account of the major bus changes that were due in April; since these were postponed several times, until September 1982, it meant that for most

of its life this particular version of the tourist map was somewhat inaccurate (although the Publicity Office could hardly have foreseen this eventuality).

* * *

THE 'WATKINS' TOURIST FOLDER - 'LONDON TRANSPORT'S LONDON', 1983



The second tourist information folder to incorporate the Graef/Holmes map was called 'London Transport's London', and appeared early in 1983. Unlike its predecessor, the Graef/Holmes design now fulfilled the subsidiary role on a new design by Geoffrey W Watkins, another architect, who worked from Blackheath.

Watkins had drawn and published his own map based on the Ordnance Survey which he was selling both himself and through a distributor. The characteristic features of his map were based on the premise that people were generally familiar with the Underground diagram, its symbolism and the way it worked. When faced with a street map, however, he considered that the 'average' passenger had difficulty in relating the Underground diagram to it, and vice versa. The solution as he saw it was to superimpose the colours and conventions of the Underground diagram on to a street plan, the Underground lines necessarily in a stylised form.

Watkins had approached LT to see if it would consider marketing his map, which was not selling as well as he had hoped. The result was not quite what he expected: LT did not particularly want to market the map as it stood but saw merit in the map's concept and negotiated a deal enabling them to produce a map on similar lines with Watkins acting as consultant. The London Transport version of the street plan was based on the former Penrose tourist artwork. The base colour could best be described as khaki with the road layout reversed out - bus roads in white and non-bus roads appearing in a light yellow. There was no other bus route information. Tourist attractions were shown in a manner similar to the earlier Penrose tourist designs and the scale of the whole map was reduced to allow advertisement matter to appear on the right-hand and lower edges. The colour-coded Underground lines showed up prominently against the khaki tone.

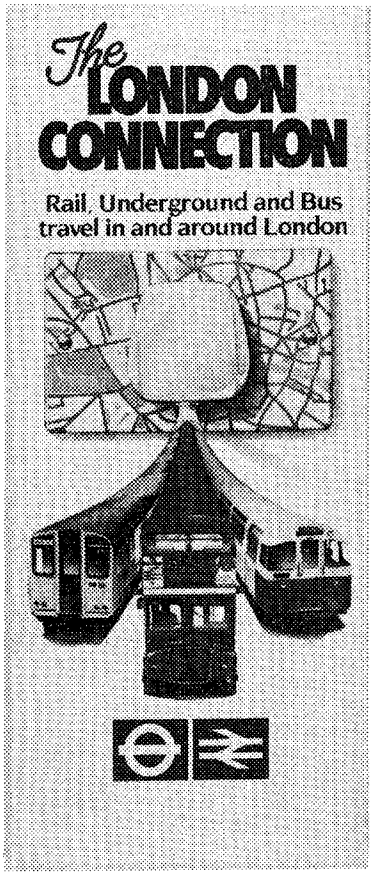
The reverse side of the folder contains all the usual information one has come to expect on tourist folders, but an area a little larger than four panels is given over to the Graef/Holmes central London bus map. The full expanse of the original artwork has been used, and this necessitated a further scale reduction, to about 2 inches to 1 mile; the map area measures 12¼ x 9½ inches. This is the first version of the whole-area central London map where the bus roads are not shown leading out of the grid area with labelled destinations; as a result it is not possible to determine in many cases which road a particular bus uses if it is near the edge of the map.

The artwork itself is the same as its predecessors, although a few points have been tidied up - for example the 'north point' symbol has been 'improved' - but the opportunity has still not been taken to provide some crude form of scale (although there is one on the main map overleaf). Some road names have been re-set, particularly those which had the name spread over three lines. Some circle names have been re-set, too, and at long last Kennington station is sensibly named.

Together with one or two other very minor adjustments the map is very slightly happier as a result. No special treatment has been given to the main line termini, in contrast to the contemporary map on the 'London Connection' leaflet, but the former LT/BR symbols at these locations have not necessarily appeared in the places they occupied on the 1982 'Welcome to London' map - as a result of this process the BR symbol at Blackfriars has been omitted. No reference at all is made to conditional bus services, and there is no hint whatever on the leaflet that some services do not operate all the time. Since grid squares and an index are provided on the main map none are provided on the Graef/Holmes map.

Undoubtedly the 'London Transport's London' folder as a document represents by far the best use so far of the Graef/Holmes map design. The main reason for expressing this opinion is that the bus map has been relegated to a secondary role; in this its virtues are displayed at their best and a considerable number of its shortcomings are rendered less of a problem because of the existence of a more conventional map overleaf. It is now possible to use the Watkins-style main map to determine actual location of features, streets and railways, thence to use the Graef/Holmes map on the back for planning travel by bus (making reference back to the main map if necessary to aid following the route).

THE 'LONDON CONNECTION' MAP, 1982



Meanwhile, the next new format for the Graef/Holmes design had already been developed, this being the 'London Connection' brochure published towards the end of 1982. The principal feature was the combined LT/BR railway line diagram, but a version of the central area bus map was devised to occupy three of the twelve panels on the reverse.

The Graef/Holmes map, at 10⅞ x 7 inches, is somewhat smaller than the version on the 1982 tourist folder, partly because the geographical coverage was heavily reduced but also due to a scale reduction to about 2.2 inches to 1 mile. The map appears to use, in an updated form, the tourist map's artwork. Regrettably Tower Hill station was omitted altogether and the station symbol was obliterated at St Paul's (although the name remains it appears to refer to the Cathedral) - so, no London Connections here!

Two revised features of the map are immediately obvious. Firstly the British Rail termini are denoted by white lettering reversed out of prominent blue boxes, and this has necessitated some minor adjustments to other features and the removal of a few street names. Secondly, those bus route numbers colour-coded green have been altered to appear in maroon, thus avoiding any possible confusion with Green Line services.

Since this version of the central London map covers a smaller geographical area than the tourist map, but uses the same artwork, there are several instances where the new border cuts across roads and would have cropped off part of a road or feature name. In most cases where this would have happened the road name was entirely removed but there are some untidy examples where the word 'Road' was left though the rest of the name has vanished. Two junction circles were cropped, and the solution adopted to overcome the problem of only having part of the group of numbers visible was to remove all the numbers but to leave the rest of the actual circle on site. This too is untidy - it would have been neater if the circles had been removed altogether.

The 'London Connection' leaflet is undoubtedly valuable in showing LT and BR suburban services and central London buses all on one document, but inevitably space for a more extensive bus map is at a premium. Consequently the instructions for using the 'London Connection' bus map were somewhat shortened, compared with the earlier central London and tourist maps. Further space was saved by omitting the index and the associated grid lines.

One should be grateful for the three panels provided for the bus map. Nevertheless many of our earlier criticisms still apply. The fact that two Underground stations were left off, and that the list of conditional bus routes was omitted altogether (now leaving the non-regular passenger in complete ignorance of both major and minor service variations), hints at continuing shortcomings with the bus map's cartographic processes.

AND SO TO 1985

The evolution of the Central London Bus Map has continued to this day. At the time of writing (February 1985) neither Graef nor Holmes are now employed by London (Regional) Transport nor have any other association with current design changes. Holmes's involvement ceased in 1984, while Graef had been closely associated only with the conceptual phases, which ended with the prototype map's production in 1981.

The two most recent versons of the CLBM have been: the second 1984 'Londonwide' Bus Map, incorporating a central London bus map on its reverse which has been derived from the 1983 'London' TIF artwork; and the newly-issued 'Capitalcard' leaflet, which is the latest in the series of 'London Connection' maps and includes a cropped central London bus map.

Recent adjustments to the Graef/Holmes design, during the past two years, have included:

* a better attempt at portraying bus termini
* redrawing of complex road layouts
* occasional inclusion of route numbers alongside roads, where individual buses have complex routeings
* special indication of Airbus stopping points.

These changes have not been without drawbacks. Presentation of bus route termini remains haphazard and inconsistent. Because of the spatial constraints imposed by circles superimposed on road junctions, attempts at redrawing some road layouts can lead to a catching-one's-tail exercise where other information suffers (for example, Southampton Row/Holborn is now clearer if attempting to follow buses 68, 77A, 172 and 188, but is now ambiguous for routes 19, 38 and

55). And we have already observed that the addition of solitary bus numbers alongside roads (for clarity of routeing) can misleadingly suggest that only one route serves the road, to the exclusion of others.

It will be apparent from the foregoing descriptions that a design originally created for a specific purpose, and as part of a 'package' of ideas, has been radically altered in terms of application, and substantially modified to suit various new roles. Railway alignments were omitted from all editions of the CLBM from 1981 to 1984, and were only included when the basic artwork was totally redrawn in early 1985. The abandonment of directional lines within roads has left as a legacy an apparently arbitrary and unexplained system of displaying bus route numbers in four colours. The application of the central London design to documents other than a dedicated 'central London bus map' has made it difficult to show where bus routes head for once they leave the edge of the map, and in consequence makes it difficult to use the map near the edges. Similarly in a number of applications there is no indication whatever of conditional routeings - a matter felt by some to be of great importance when the original map appeared. Problems remain with interpretation of precise bus routeings, sometimes now affecting different routes in the same area.

COMPARISONS AND CONCLUSIONS

In drawing together the many strands of our description and discussion about the Graef/Holmes Central London Bus Map, from early ideas to day-to-day use, it is important to recall that the impetus for new designs arose from a belief that it would be beneficial to present the bus system in a clearer style. The Underground system's apparent virtue of clarity of information was sought also for the buses.

A stylised map of central London bus routes, it was considered, might aid prior planning of journeys and encourage additional bus business. This view was augmented by outside consultants who indicated that a 'journey planner' and an associated travel information 'package' were vital elements in making the bus system more comprehensible, and in gaining the confidence of the passenger.

There can be little doubt that the developed Graef/Holmes circle-to-circle system, as a system, has some virtues. We have acknowledged the previous Penrose design to have its faults, notably owing to congestion of information; its own virtues were its accuracy and ease of use in intelligent hands.

Considering the new Central London Bus Map on its own merits, we have NOT said that the public did not accept it and found it of no use. We HAVE said that there were some within LT who considered the map to have been well received; we have queried the reliance they may have placed on the market research, and the extent to which the map design was developed without clear guidelines. We have noted the possible effects of a major publicity campaign on the alleged acceptance of the new map. We have observed that the associated travel information - route diagrams in buses and at bus stops, and bus stop naming - failed to materialise in the co-ordinated manner originally sought.

Whilst the Graef/Holmes design may well have simplified the system of following a string of numbers around a piece of paper, trying to plan real journeys when using the map was not entirely without problems. And, while the new map could point potential passengers in the right general direction, when passengers were actually standing in the street seeking to establish their whereabouts - or even find their bus - it was apt to let them down. There are also areas of confusion which have been caused by oversights in the artwork preparation, and by cartographic shortcomings.

We have illustrated successive adaptations of the new design: to act firstly as a Tourist Information Folder (the 'Welcome to London' map). We then saw how the map adopted an auxiliary role on the following TIF ('London Transport's London'), and the 'London Connection'. Every version of the map has had some problem with it. Also, some errors existing on the very first version have been carried through to the very latest without being picked up at the various proof stages - the persistent mis-spelling of the name Baker Street (as 'Baker Steet') for example.

In the map's format as a Tourist Information Folder, it is apparent that the Graef/Holmes design and the tourist 'street plan' map have been exchanged so that the Graef/Holmes design is not put in the position of seeming to offer something far beyond its capability. We believe it is happier in this latter role, though it could have been better if some of the remaining areas of confusion could have been rethought. (The artwork was never satisfactorily debugged during its life and is now being replaced by new artwork which illustrates a different set of idiosyncrasies. The new design does not involve Andrew Holmes.) Our discussion of the 'London Connection' presentation, though, indicates continuing deficiencies when the map is used in a supporting role as the only source of bus and street information.

It is not clear whether the new Graef/Holmes design has actually sold extra bus travel (after allowing for the effects of additional publicity, and fares and ticketing changes), or if the man-waiting-for-the-central-London-omnibus is really better off overall with the Graef/Holmes or Penrose designs. One needs to be extremely careful indeed in making comparisons between different map designs. As soon as one starts to argue their respective merits, one must consider what one is studying. We would even question how far it is safe to extrapolate some of our own detailed comparisons.

The central issue is whether the objectives set for bus travel information and marketing are best met by a detailed bus map, by a detailed map plus a separate 'journey planner', or by a map which attempts these two tasks within the same design.

London Transport had formerly relied on a detailed bus map, the Penrose design. It has not, even in the present round of experimentation, formally tested the merits of a separate 'journey planner'. Instead it initially adopted the Graef/Holmes design to combine the two functions. It will be appreciated that it is an heroic task to make a detailed map also serve the function of a 'journey planner' without simultaneously sacrificing some details and risking the benefits of the journey planner.

The Graef/Holmes formula, of combining the two functions, survived unaltered for only one full tourist season, 1982. Though the format of the Graef/Holmes map continued in 1983 and 1984, its role in providing tourist information became closer to that of a journey planner, allied to the Watkins street plan. The Tourist Information Folders for 1983, 1984 and 1984/5 ('London Transport's London') have required two maps - a 2" to 1 mile Graef/Holmes bus map and a 3" to 1 mile street map - to do the same

work performed in 1982 by the one Graef/Holmes Central London Bus Map, and prior to that by the one Penrose tourist map.

The internal 'efficiency' of any design is a function of the layout and volume of information, and the scale at which the maps are published, measured as the users' reaction to those three factors, in terms of 'usefulness' and 'clarity' for both journey planning and point-to-point travel. The Penrose tourist map had presented more information on a map scale of 3.6" to 1 mile (nominally covering over 28 square miles), than the Graef/Holmes map which covered the same area at approximate scales ranging from 3" to 1 mile (1981) to 2.4" to 1 mile (1982), to 2" to 1 mile (1983-4).

There has been no direct evidence to show whether the two-map format or a combined design is the more effective, though 1983's radical revision in presentation may be indicative. Nor, within any format for central London, has it been reliably determined whether the Graef/Holmes style is more effective than Penrose's, or indeed if cartographic elements developed by Graef/Holmes such as colour coding of bus routes, could be successfully transferred to the Penrose design, or vice versa. At the present level of knowledge, it cannot be stated that the Graef/Holmes formula (contrasted against other designs and formats) has been good 'value for money', in terms of the amount of travel generated divided by the cost of the map.

The central issue has still not been tested robustly by London Transport or its successor. 'Fitness for purpose' has not been achieved, because fitness has not been defined.

The subsidiary issue is whether, at the chosen scale of presentation, the Graef/Holmes design can be successfully imposed in SUBSTITUTION for other maps.

In our own judgement the full potential of a central London bus map combining detailed mapping with a facility for journey planning, has not yet been achieved. We consider that the Graef/Holmes presentation did not take adequate account of the particular characteristics of the London bus network: its design and cartographic processes have shortcomings, market research has been incomplete, and critical comments have not been followed through adequately by London Transport.

Nevertheless, at the irreducible minimum some passengers will have found the Graef/Holmes map a helpful adjunct to other, street-based, maps for travel in central London.

In conclusion, it is worth noting Andrew Holmes's comments about the evolutionary time-scale of public transport maps, made prior to the 1981 launch of the Central London Bus Map: *The design of the Underground Map and its integration with the system took some twelve years and has evolved in the intervening period. In most respects the bus system is more complicated, so the new map and its implications are likely to take some time to be fully absorbed. So the map should be seen as the first step in communicating the advantages of the bus system and thus opening the option of making a journey by bus.* 1985 is unlikely to see a final resolution of bus map design for the succeeding generation of central London passengers.

* * *

A response to a final draft version of the article 'Getting There' has been received by LPT from Dr David Bartram, of the Ergonomics Research Group of the University of Hull. His professional work includes analysis of the problems of producing comprehensible information displays, and his commentary (which we hope to publish in a future issue) will provide a fresh viewpoint on the information needs of bus users.

LETTER TO THE EDITOR

Dear Madam,

I am a newly joined subscriber to LPT, and have recently read in one go, both a selection of the older issues of the Magazine (issues 5, 6 and 7) as well as the two most recent (issues 11 and 12). I am thus in a position to comment from a fresh perspective, on what I find.

I like the 'new' style of presentation - it is a great improvement on the previously barely readable typescript. It is a great pity that the issues are so infrequent and at such unpredictable time spacings. Perhaps more frequent and thinner? Even a regular 'twice a year' would encourage a dialogue with your readers, and present more topical material, as well as your readers finding it easier to remember references back to the previous issue.

In issues 5, 6 and 7 some of the articles were very long. I personally would prefer a greater variety of 'mid-length' articles of no more than two or three sides perhaps. This seems to have been achieved in issues 11 and 12, partly through the smaller typeface. Perhaps I just found it difficult to cope with a very long article which was faint and difficult to read.

Where is the article on the 'LT Bus Routemap' which was previewed in the last paragraph of issue 11 (page 543) but which I couldn't find in issue 12?

Would it be possible to print the contents EITHER on the front page of the front cover, OR on the back of the back cover? This would make it easier to scan the journal for a particular article, later, without having to open each one up.

Would it be possible to provide proper cumulative index pages: either for all issues to date, or for Volume 2?

It would also have been most helpful, on the sheet giving the contents of back issues which was sent to me on becoming a subscriber, if the length of the article could have been indicated in some way. This would have enabled me to judge in advance whether the articles that I was particularly interested in, were only a short paragraph or several pages long.

I think your reviews are hard hitting and to the point.

I feel sorry that I have launched into print like this with my subscription scarcely dry. Don't worry - you probably won't hear from me for 100 years now.

signed

BOB WAIXEL
Cambridge
14 November 1984