

THE ARUP JOURNAL

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Games of the XXVth Olympiad



The Olympic Bid

THE ARUP JOURNAL

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Swakeleys House

An article on this project will appear in the next issue of *The Arup Journal*.



The way ahead

Ronald Hobbs

This originated as a talk at an internal Arup R&D meeting on 12 November, 1985.

I am talking about the future of consulting engineers and architects in the building industry, and when I say 'we' in the following chat I mean the industry, not the 'Royal we' of the Ove Arup Partnership.

Questions are being asked about what we build, how we build, and the management of the whole process.

The record of our industry since the end of the last War has not been good. We have built the wrong things; high rise flats for the wrong people; cheap office blocks which are outdated before they are 20 years old; energy inefficient buildings of all types.

We have not built well: dramatic problems like Ronan Point and high alumina cement; less dramatic but perhaps more important problems of condensation, leaks of water and air; we have built in fairfaced reinforced concrete – not a finish to weather well generally.

We have not managed our projects well; they are late, overspent, and take longer to build than those of our competitors.

This is what the Prince and the public see and, whilst we have had pockets of success it is, I am afraid, only a somewhat exaggerated picture of our industry.

The most probable reason for all this is that building is not taken seriously; the industry does not, with the obvious exception of those present, attract good enough people. Clients do not take it seriously – 'office boys' are appointed as project managers in public authority jobs as well as private industry – the buck should stop with the project manager. We on our side have not been able to protect the client from himself; admittedly, that is a difficult job.

Instant solutions

But the solutions that are being sought lie along other lines; after all, even if you can entice the bright 15-year-olds into our industry, it will be another 15 years before the effect is noticeable, and we must have 'instant solutions'.

And that, in one way or another, is what the present changes in relationships and in methods aim to do.

How does this affect us in our relationships with our clients, our fellow professionals, contractors, sub-contractors and suppliers?

The base line or traditional scene is a client with a design contract with one or more professionals, a construction contract with a contractor and with the lead consultant – architect or engineer – administering the contract on behalf of the client but enjoying an independent status.

Now, the snags with this begin by the client not organizing himself so that one senior member of his staff or organization can, with authority, act as project manager. The result is a number of confusing dialogues with chairman, managing director, works director, etc., with the architect naturally selecting from these dialogues the words which suit best what he wants to do. So now the client blames the design team and appoints a 'project manager' from a new and parasitic profession instead of putting his own house in order. At best the project manager is tolerable; at worst, a complete disaster, magnifying the worst sins of the client and design team alike. In building, the architect has made this possible, even necessary, by his failure to grasp the design team leader-



Ronald Hobbs is co-Chairman of Ove Arup Partnership

ship, to recognize the skills of management, and to graft these on to his designers. The client in his turn is often 'protected' by the project manager from the design team advice that he usually needs.

I have said 'design team' several times, and to create a real team is where management by the architect should come in.

We have not built well, and now the client is saying – perhaps with some justification, but with I think, little hope – that the detail design must be done by the contractor 'who knows how to build'. But we have all contributed to de-skilling the contractor: we have told him how to build in our specifications: we should have expected more expertise: he should have offered more.

Quantity surveyors and contracts have probably not helped. The traditional QS role of standing slightly aside and then saying it costs too much only leads to the architect fighting – and most can fight well; they have had a 'mafia' training – to keep his expensive idiot child alive.

If you want more on this subject read the British Property Federation (BPF) manual for their system of building. Its analysis is good – nine out of ten: its synthesis is, I think, naive – say three out of ten – but we should read it.

That's something about our clients. What of contractors? I believe that building is difficult. Even if we solve the technical problems the logistics are still with us. The solution to this problem must, to my mind, lie along some team approach of client, design team and contractor. The traditional 'we and they' combative situation cannot be the right way. The BPF brushes the design team aside after the scheme design and the client, or his representative, deals directly with the contractor who is responsible for everything.

We obviously have a vested interest in keeping the design team around; two basic reasons: I don't believe design only is inherently satisfying to most people, and I do believe that the design of the details is crucial to a successful project – architecture is more than skin deep.

We have approached this problem through management contracting or construction management where client, design team and contractor work very closely together with a high degree of trust between the parties. In general in Arup Associates this has worked; Ove Arup & Partners, members of a more fragmented design team, are not so happy – we may be back to architects and management.

Then there are the people who, in any sort of contract today, do all the work – the sub-contractors, trades contractors or works contractors. In most contracts today they have some sort of direct contract, warranty or the like with the client, and some involvement in the design process from shop draw-

ings to performance specifications. It can readily be seen that unless the client/contractor/design team relationship really works, this is a fruitful field for disputes.

And lastly, what about us?

Our sacred cows of no competition, of unlimited liability and no overt advertising have all disappeared within the last five years.

Admittedly the ACE is fighting a rearguard action on advertising, but is being attacked by the Office of Fair Trading on the grounds that no advertising does not give our clients a fair choice!

Of these, I suspect fee competition is likely to be the most serious. Limited liability in some form or another was, I think, bound to come in this litigious age. Cooper Lybrand effectively killed the more extreme forms of media advertising for professionals by their 'oil field in your back garden' TV commercial.

Competition is new – at least in the UK, and we must learn how to spell out what we do and for how much, the limitations we can build into our tenders, claims we might have to make, and I don't think we shall be very successful in the short run, but I believe we can weather this particular storm and that quality will win through.

But the biggest danger of all is that these changes will alter our attitude to our work. We are concerned with architecture in the widest possible sense of the word, and all our actions must be directed to that aim.

As we have seen, the role of the architect in Joint Contracts Tribunal type contracts and the role of the engineer in Institution of Civil Engineers 5th Edition type contracts, is under attack by the BPF and by the government in Department of Transport contracts.

The quasi-adjudicator role of the engineer or architect is not understood – perhaps not understandable – but, by and large, it works, and is written into our contracts by our more intelligent private clients.

Looking ahead

- (1) More Arup Associates type practices
- (2) More real joint ventures between architect, engineers and quantity surveyors – the architect taking a positive lead with in house manager in partnership with design architect
- (3) More design build, but with design by professional practices. Clients will need to be very positive in their requirements if this is to succeed beyond relatively simple buildings.
- (4) More construction management, or management contracting – especially for £5m. + contracts needed quickly
- (5) Hopefully, better management contractors
- (6) More experiments in how to procure building and civil engineering contracts
- (7) More and then less project managers
- (8) A lot less Bob Hobbs!

Birmingham Olympics

Ernie Irwin
Mark Bostock
John Harvey

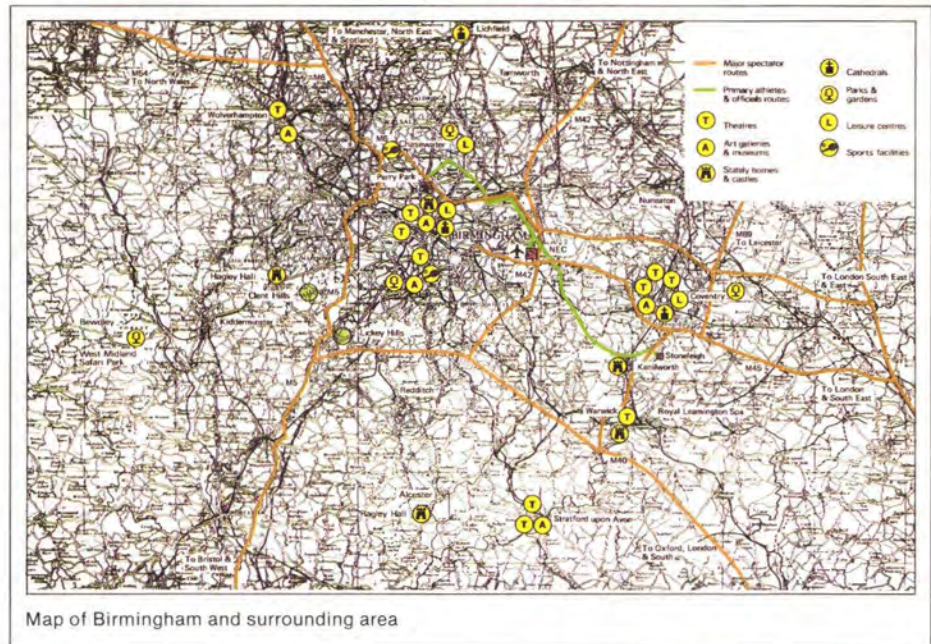
INTRODUCTION

In May 1985, Birmingham City Council decided to compete for the British nomination as host city for the 1992 Olympic Games. The submission to the British Olympic Association was required by the end of July, and the City Council appointed Ove Arup & Partners to prepare a feasibility study covering all aspects of the Games, to be completed within an eight week period.

Birmingham's philosophy was to find a means of 'giving the Games back to the Athletes' through utilizing the superb combination of communications, exhibition centre, sports facilities and tourist area in the Heart of England, and preparing proposals for any new facilities so as to provide a compact Games, better than ever before. The proposals had to be tested and a full economic study undertaken. Seven principal areas of study were identified:

- Sports facilities
- Accommodation
- Transport
- Telecommunications
- Games management
- Funding and finance
- Economic impact.

The task was enormous within the time scale available, and a team of 30 from many parts of the firm, particularly London and Warwick offices, were hastily assembled at Birmingham to undertake the work. A



Map of Birmingham and surrounding area

number of project teams were formed as follows:

Economics led by Mark Bostock, Arup Economics Consultant

Sports facilities led by John Harvey, Birmingham Office

Telecommunications led by Bill Southwood, Industrial Engineering

Infrastructure led by Keith Seago, Birmingham, with Alan Brookes as Transport Consultant

Accommodation and Planning led by Jim Beeston of Birmingham City Planning Department

Project direction: Ernie Irwin, Birmingham Office

We appointed Emlyn Jones as our Sports

Consultant, Saatchi Compton Ltd., to provide sponsorship advice, Hill Samuel Ltd. to provide funding advice, and Ecotec to furnish statistical data.

Client policy was determined by a City Council sub-committee chaired by Councillor Ken Barton, and our client director was James Munn, Director of Recreation and Community Services. In addition, Tom Caulcott, Chief Executive; Paul Sabin, City Treasurer, and Graham Shaylor, City Planning Officer were regularly consulted on substantive issues. Jim Beeston, Divisional Planning Officer, co-ordinated the City Council Departments' inputs.

Weekly meetings of the project team leaders and client representatives were held so as to achieve prompt decisions and team co-ordination.



Principal motorway routes



Principal rail routes

Over 100 organizations, including the national and international sports organizations were consulted. In particular, detailed discussions were held with the West Midlands Police, the West Midlands Passenger Transport Executive, the National Exhibition Centre, National Agricultural Centre, together with BBC, ITV and Press representatives.

Birmingham were in competition with London and Manchester, and following our study, Birmingham secured the British nomination by an overwhelming majority after a presentation to the British Olympic Association by a team led by Dennis Howell, MP, President of the Birmingham Olympic Committee.

Ove Arup & Partners were subsequently commissioned to prepare the bid documents on behalf of Birmingham for submission to the International Olympic Commission. Seven cities are competing for the 1992 Olympics, and as we go to press with this article, we are putting the final touches to a much more comprehensive study and preparation of Birmingham's case. Although Birmingham has not been the media's favourite to win, we await with excitement the IOC decision at the end of October 1986.

THE CITY AS HOST VENUE

Birmingham is in the Heart of England. It is the regional, industrial, business and shopping centre for a conurbation of over 2.5 million people in the West Midlands. The region is home for 5 million people, almost 10% of Great Britain's population. Thanks to a comprehensive road and rail network, the City is readily accessible to the hinterland and the rest of the country. 28 million people live inside a 100 mile radius of the city and within this area there is overnight accommodation for 500,000 people in hotels, guest houses and inns.

Despite its size, wealth and status as Britain's second biggest city, and managed by the largest local authority after the GLC, it is only minutes away from attractive and

historic countryside. The hinterland is a region of cathedral cities, ancient market towns and traditional villages, there are many old houses, museums of all kinds, castles, abbeys and extensive gardens.

The region is justifiably proud of its history as the birthplace of the first Industrial Revolution. It has always been a centre for innovation. The influence of scientists and industrialists brought fame and prosperity to the area. Commerce and banking flourished alongside the growth in industrial wealth. Two of Britain's 'big four' clearing banks – Lloyds and the Midland – were founded in Birmingham.

Birmingham developed at the centre of the nation's canal system. Over time, with the development of the car and train, the city has become the hub of the country's road network, it is also a major crossroads for the national rail system. Birmingham has the newest airport in Europe with regular flights to 64 destinations. The airport is linked to the city's National Exhibition Centre by a revolutionary magnetic levitation transit system (Maglev).

Birmingham has its place as a cultural centre. It has first class theatres, a world famous symphony orchestra, an art gallery which includes the world's finest collection of Pre-Raphaelite paintings and drawings, and an enviable proximity to Shakespeare country.

The Birmingham City Council has been at the forefront of diversifying its role in the UK. It has invested in the National Exhibition Centre, a joint venture with the Birmingham Chamber of Commerce. The NEC has been a success, both as a showpiece for the large number of export goods produced in the West Midlands and as a stimulus to an expanding industry – business tourism. It has plans for more hotels which it will need.

The variety, size, culture and history of Birmingham set in the centre of England makes it a suitable city to study as a venue for the Olympics.

Baron de Coubertin, founder of the modern Olympic movement, visited the West Midlands in the autumn of 1890 in order to see Dr William Penny Brookes's local 'Olympian Games' at Much Wenlock and is said to have attributed the revival of the idea to Dr Brookes's example. It would be fitting for the Games to come to the largest city in the area a century later.

Major international events held previously in the city 1966-1984:

- World and European*
- World Cup Football – Preliminary Rounds
- World Cyclo Cross Championships
- World Table Tennis Championships
- World Women's Power Lifting Championships
- European Cup – Multi-Events Final
- European Junior Roller Skating Championships

- International events – Annual/Regular*
- F.A. Cup Semi-Finals – Association Football
- Cricket Test Matches
- National Half-Marathon Championships
- Multi-Nation Judo Tournament
- West European Ladies Volleyball Championships
- Tour of Britain Cycle Event
- City Centre Cycle Race
- RAC Rally
- International Athletics Meetings
- National Track and Field Championships for Women

- Forthcoming World/European events*
- European Men's Power Lifting 1987
- European Junior Athletics Championships 1987
- World Schools' Games 1988.

THE STRATEGY

The principal aim has been to determine if Birmingham, Heart of England, can host an Olympic Games that will meet the spirit and the letter of the Charter to a standard of which both the Olympic movement and the City of Birmingham will be proud.

In order to do so, it was decided to compare the existing facilities for sports, accommodation, transportation, communications and infrastructure with the requirements and intent of the Olympic Charter and to make proposals to rectify any deficiencies.

The second aim has been to evaluate the costs, the revenues, the cash flow and the sources of funding to give a complete financial picture of achieving the principal aim. In addition, an assessment would have to be made of the economic impact on Birmingham and the Midlands.

The third part of the strategy has been to group most of the Games together and as close as possible to a single Olympic Village to provide a compact Games as the best means of fulfilling the Olympic Charter. Any subsidiary venues should be few in number and accommodate related events in their entirety. These venues should have fast and convenient transport links to the Village.

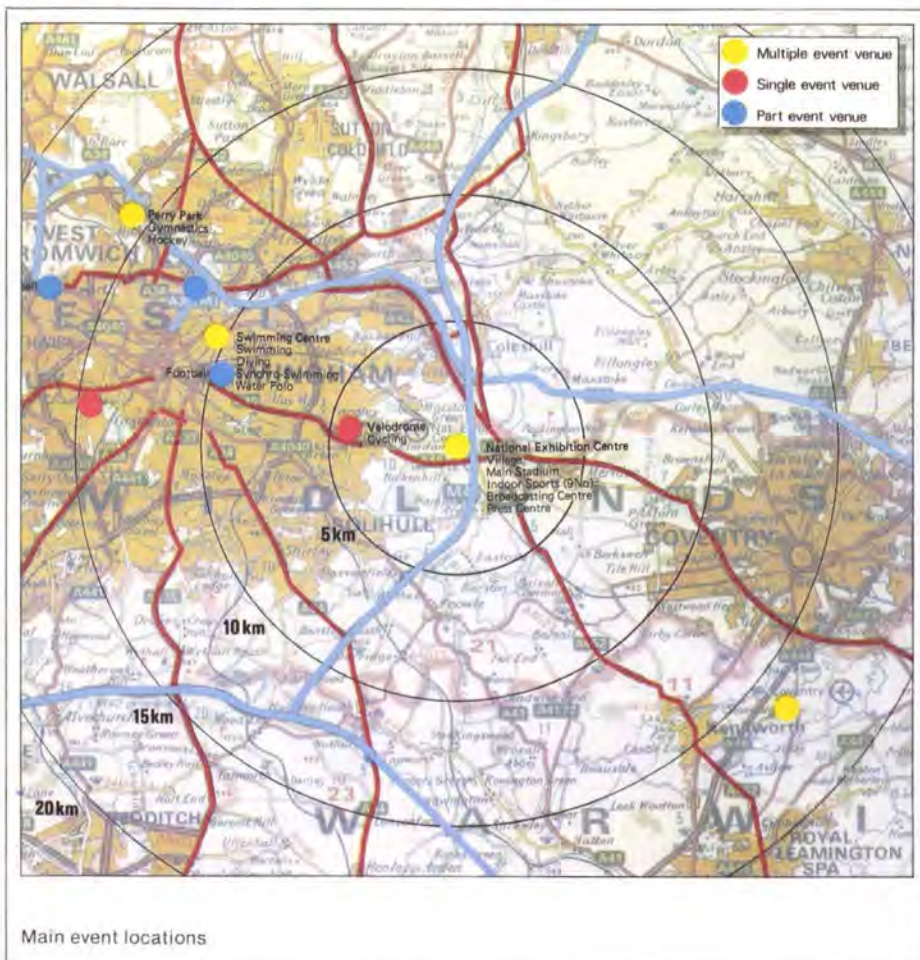
As a fourth aim, it was decided that any new facilities should, as far as possible, leave the City of Birmingham with an inheritance that will commemorate the Games and be of lasting benefits to the community.

The final part of the strategy has been to utilize as much of the existing modern infrastructure as possible so as to minimize capital spending.

THE FACILITIES

Locations

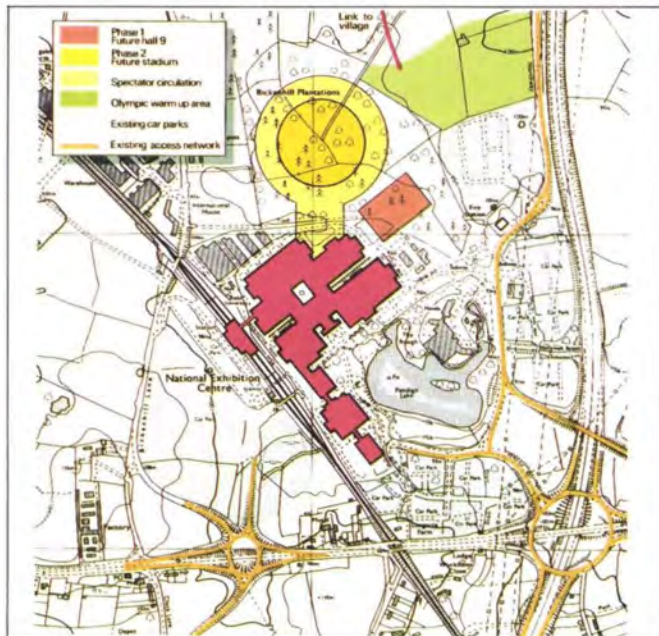
The map (left) gives the locations of the Olympic venues for Birmingham and shows how the Heart of England can provide a blend of existing and new facilities to achieve the ideals of both the Olympic Games and the city itself.



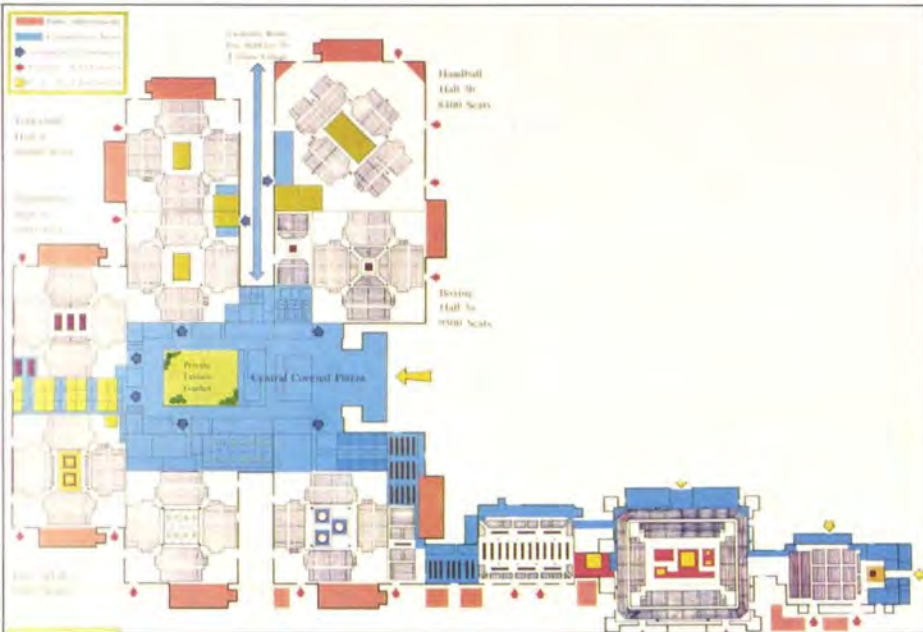
Main event locations



Right: Stadium location in relation to existing NEC Buildings



Below:
Layout of indoor sports
The Stadium in cross section



The National Exhibition Centre

At the focus, the National Exhibition Centre provides a single campus housing

- (1) The Olympic Village
- (2) The main stadium
- (3) Nine indoor sports
- (4) The integrated technical centre
- (5) IOC accommodation.

The NEC lies immediately adjacent to the International railway station and the International Airport, and is at the confluence of an unrivalled motorway and trunk road system.

Four satellite multiple event centres are:

- (1) Stoneleigh Park for all equestrian events, shooting, archery, and Modern Pentathlon
- (2) Perry Park, Birmingham, for basketball and hockey
- (3) The new swimming centre for all water sports in Birmingham
- (4) Holme Pierrepont, Nottingham, for rowing and canoeing.

Three single event centres are:

- (1) Edgbaston Priory, Birmingham: tennis
- (2) Velodrome for cycling in Birmingham
- (3) Weymouth or Torbay for yachting.

With the exception of Association Football (with its special requirement for grass pitches which cannot withstand constant re-use), and the Modern Pentathlon (with differing element characteristics), all events within each sport can take place at the same venue throughout the Games. If it is preferred for the finals of some events to be staged in the main stadium, then this is possible but will depend on detailed event scheduling.

The sports facilities

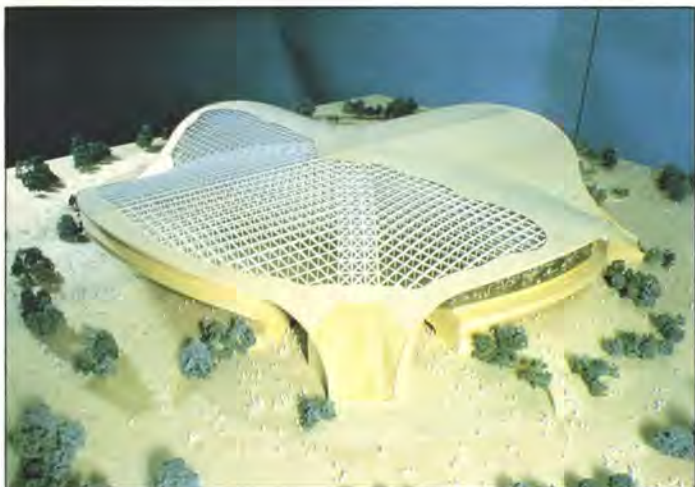
The National Exhibition Centre

Indoor Sports: Boxing, fencing, gymnastics, handball, judo, table tennis, volleyball, weightlifting, wrestling and badminton.

Main stadium: Athletics.

The NEC presently consists of eight separate but linked halls with a total gross floor area of some 100,000m². Clear height within the halls lies between 13.5m and 23.0m with the exception of Hall 8 which has 8.0m. The halls are supported by a full range of ancillary accommodation including the main entrance concourse, permanent refreshment points, toilets, administrative offices and storage space. All halls are fully serviced with air conditioning and contain distribution ducts for the routing of any special servicing equipment for events within the halls.

The Centre buildings lie within their own landscaped grounds with permanent hard car and coachparking currently providing 15,000 and 2,000 spaces respectively. These in turn are served by a permanent infrastructure of access roads with direct and dedi-



Building form arising from earlier study

400m International track

cated links to the trunk road and motorway system. Rail travel is facilitated by Birmingham International Station which is contiguous with the Exhibition Centre buildings. Birmingham International Airport is some 1½ km to the west of the NEC with the Maglev link between the new terminal building and the station.

The NEC is managed through a board of directors with permanent staff and labour force. Supplementary staff and labour is available as required for major events. The current annual programme involves exhibitions, spectaculars, and sports events and includes the International Motor Show which it has hosted on a number of occasions. The Motor Show (which runs continuously for 12 days, attracts up to 140,000 people per day and involves the concurrent use of all the space within the Centre) is comparable in scale with the use of the Centre for the nine indoor sports for the Olympic Games.

The NEC personnel therefore have the management, administrative and engineering expertise to organize major events at the Centre. Of particular importance to the Olympic Games is their ability to set up reliably the event facilities and to amend them (overnight if necessary) as required as an event passes from the preliminary rounds to the final stages.

The nine Olympic indoor sports can be comfortably accommodated within the existing halls with sufficient floor area and headroom. In addition to the event and seating itself there is also space for reception, support facilities, and warm up for the athletes and indoor reception and circulation of spectators. Separate accesses are available for the athletes and public which promotes good safety and security. All halls can provide the technical back-up for events including environmental conditions, lighting and broadcasting requirements. The suitability, indeed delight, of the Centre as the indoor sports venue has been demonstrated by its selection for many major events in the past.

The National Exhibition Centre is currently planning to expand its present facilities by 100,000m² in the next 20 years. The first phase of this expansion will provide a further 20,000m² to be completed in 1988. This building will house the Games Technical Centre which is described in more detail later in the report. Whilst it is not a technical requirement that the Technical Centre be geographically linked with the indoor sports venue (and main stadium and village as described later), the fact that it is will allow the press and broadcasting personnel to have physical involvement with the Games which will benefit the quality and content of their output.

We have held detailed discussions with the NEC management on the requirements for the Olympic indoor sports and on timing, and we are satisfied that it would provide an excellent venue for these events. The preferred timing for the Games themselves would be in the early part of August 1992.

The main stadium

The location for the main stadium adjacent to the existing NEC buildings, has been selected as this:

(a) allows the creation of an integrated Olympic centre together with the NEC buildings and adjacent village

(b) provides the opportunity for the building form to be such that after the Games it can be readily converted into exhibition and multi-purpose space as an integral part of the NEC long-term expansion needs.

A previous study examined the feasibility of providing covered space on this site of a size that could accommodate the Olympic stadium requirements. In particular, this study examined the implications of the height restriction imposed by the proximity of the airport, and this led to the generation of an appropriate building form illustrated by a model. One option, therefore, is for a building to be designed, following the general principles evolved in this study, so that it would initially provide a satisfactory uncovered Olympic stadium but would be subsequently roofed to provide an unobstructed exhibition and multi-purpose hall. Current indications show that some 40,000m² of exhibition space could be so provided, and that this could be further increased if some, or all, of the lower seating were to be permanently removed. This seating could be so designed that it could be re-erected as permanent additional seating at the existing Perry Park Stadium. It should be noted that once roofed, the NEC building would be unsuitable for major athletics and, as a consequence, would not vie with the established Perry Park Stadium as an international athletics venue.

Stoneleigh Park

Equestrian events: Show-jumping, Dressage and three-day event.
Shooting, Archery, Modern Pentathlon (headquarters).

Stoneleigh Park is the estate of Lord Leigh and extends in total to some 800 ha. It lies within a 20km radius of the NEC. By 1992 they will be inter-connected by the M42 and M40 motorway system giving a journey time between them of 20-25 minutes. Incorporated within the Park is the National Agricultural Centre (NAC), which is the headquarters of the Royal Agricultural Society of England. The NAC is a permanent establishment covering some 100 ha, comprising research, show, company, and administration buildings together with stock accom-

modation, all served by a permanent comprehensive road network. The Centre is fully equipped with toilets, information kiosks, restaurants, bars, and first aid centres, with telephone and radio paging.

Included within the organizations which have their permanent headquarters within the NAC are:

- The British Equestrian Federation
- The British Horse Society
- The British Show Jumping Association
- The Grand National Archery Society.

The NAC is managed by permanent staff for organization, administration and event set-up. As well as supporting events throughout the year, the NAC annually hosts the Royal Show, a single event of one week's duration attracting up to 100,000 visitors per day. This demonstrates the expertise that exists at the NAC, to mount an event of the Olympic scale.

For the Olympic Games the NAC would host the show jumping and dressage events in the Grand Ring. This ring, together with its Collecting Ring, covers some 2 ha and is viewed from a permanent grandstand seating some 4,000 people. There is adequate clear space on the remaining sides to accept temporary additional seating to raise capacity for the Games to 20,000. The demanding ring surface requirements for the Olympic events would be achieved by importing and laying a new surface over the existing grass. This would be removed and the ring reinstated after the event.

Whilst the Grand Ring will also be used for the show jumping and dressage elements of the three-day event, the NAC is itself not large enough for the endurance elements. Lord Leigh has, however, kindly consented to the use of his land around the NAC for this purpose. The estate has been inspected by Hugh Thomas, the expert in cross country course design, and he is satisfied that from the points of view of size, topography and points of interest (woodland, water, etc.), it would provide a good venue for the cross country element. There is some doubt, due to the nature of the soil, as to the reliability of the 'going' in certain weather conditions. This will have to be the subject of detailed investigation including soil sampling and determination of remedial techniques. If the ground conditions prove unsatisfactory and unrectifiable, then the endurance element only would have to take place at an alternative location, probably at Burghley House in Stamford, Leicestershire.

For all equestrian events the support facilities of stabling, exercise, training and warm up areas, and animal welfare, can easily be provided at the NAC. For stabling, for instance, the covered and enclosed animal sheds extending to some 15,000m

would be fitted out with stalls to accommodate easily all the horses.

Lord Leigh has also offered his estate land for use for the shooting and archery events. The relevant national authorities have inspected the proposed event locations shown on the estate plan with us and are satisfied that they are suitable for their Olympic event.

Stoneleigh Park therefore offers an attractive venue with proven management that with little capital costs would provide a subsidiary centre for six events within a 30-minute journey from the principal NEC venue.

Perry Park

Basketball and Hockey.

Perry Park contains Birmingham's international athletics track at Alexander Stadium. The existing covered seating is currently being extended, and further development is planned to provide a covered arena to an indoor athletics track, together with further covered seating to the outdoor track. These developments will proceed whether or not the Olympic bid is successful.

The stadium was considered as the venue for the main stadium but was found to be unsuitable, partly because the site itself was not large enough to accept the increased building size and the associated support areas; and partly because the access infrastructure of roads were inadequate for the numbers attending the main stadium.

The indoor arena due for completion in late 1987 will provide unobstructed space measuring 130m by 70m; 9,000 permanent seats will surround a retractable 200m athletics track. The building will contain all support facilities for changing, training, warm up, refreshments, press and broadcasting. The arena will provide an ideal venue for basketball. Additional temporary seating, mainly on the free floor area between the playing area and the permanent seats, will raise the capacity to some 15,000 spectators.

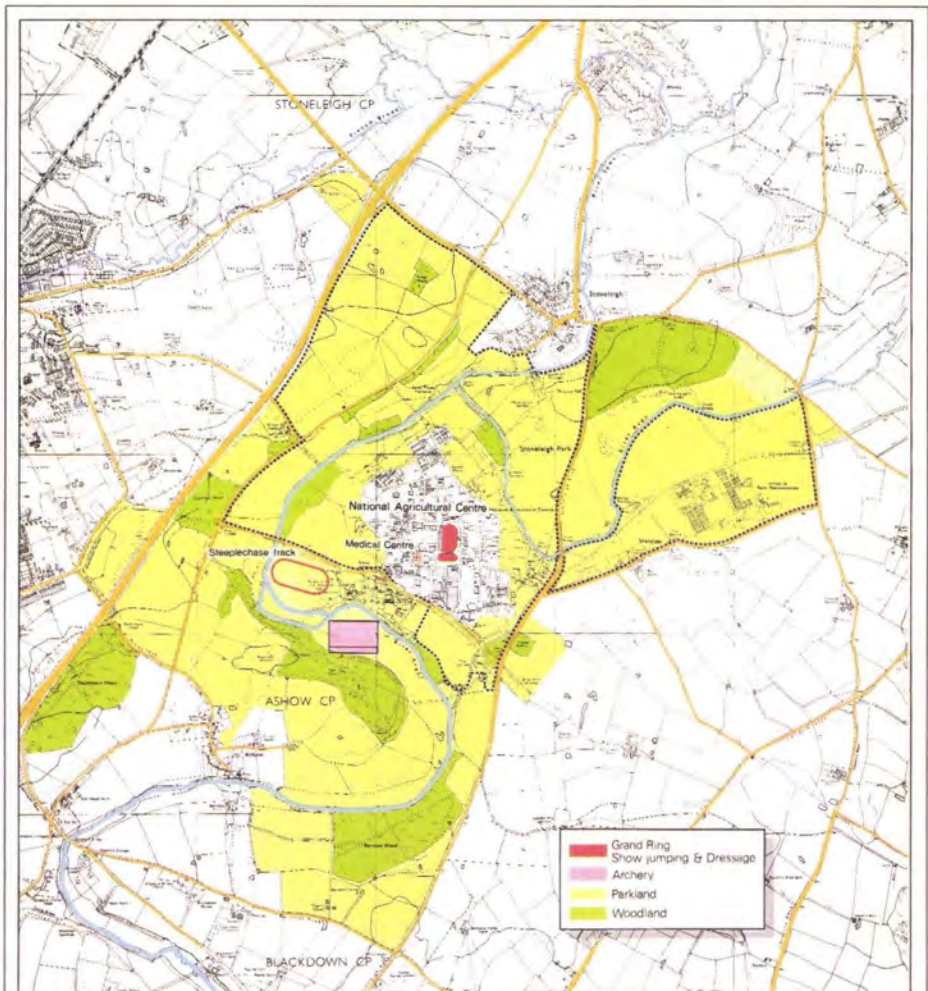
The remainder of the Perry Park facilities will be given over to the hockey events. Two competition pitches of artificial grass will be required together with a warm up area. Perry Park already has a full size artificial grass pitch which by 1992 will be nearing the end of its life. This pitch will be renewed on the existing base and provided with spectator seating for 4,000 as the second competition pitch. The primary competition pitch will be laid in the centre of Alexander Stadium itself where the 8,000 permanent seats that will then exist will be supplemented by a further 4,000 temporary seats. After the Games, this pitch will be removed for re-use in the city (possibly at the Centre of the Velodrome) and the area fully reinstated.

The existing club facilities (Birchfield Harriers Athletics Club) will provide all the support required in terms of changing, refreshments, press and broadcasting. The existing infrastructure of roads and parking can accommodate, with small modifications, the numbers that will attend gymnastics and hockey.

Swimming Centre

Swimming, Diving, Water Polo and Synchronized Swimming.

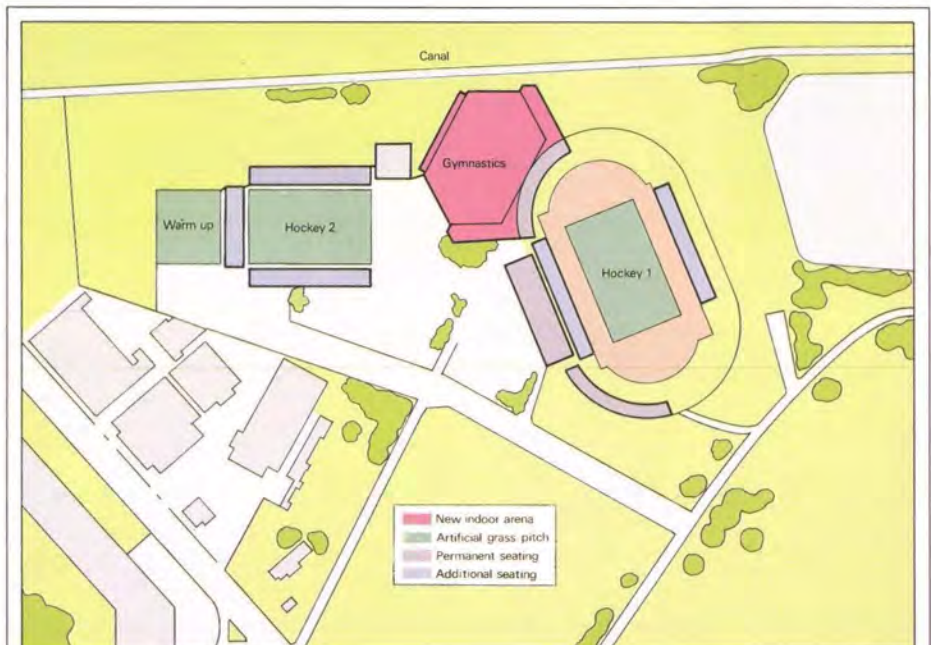
Birmingham does not presently have a swimming centre capable of staging the Olympic water events; indeed, one that can accommodate both swimming and diving together does not exist in the Midlands area. At the same time, the city is short of good swimming facilities both for club and general recreational use. After considering alternatives, therefore, the city decided, if chosen to host the 1992 Olympics, to build a new centre which will provide an excellent Olympic venue but which will be converted



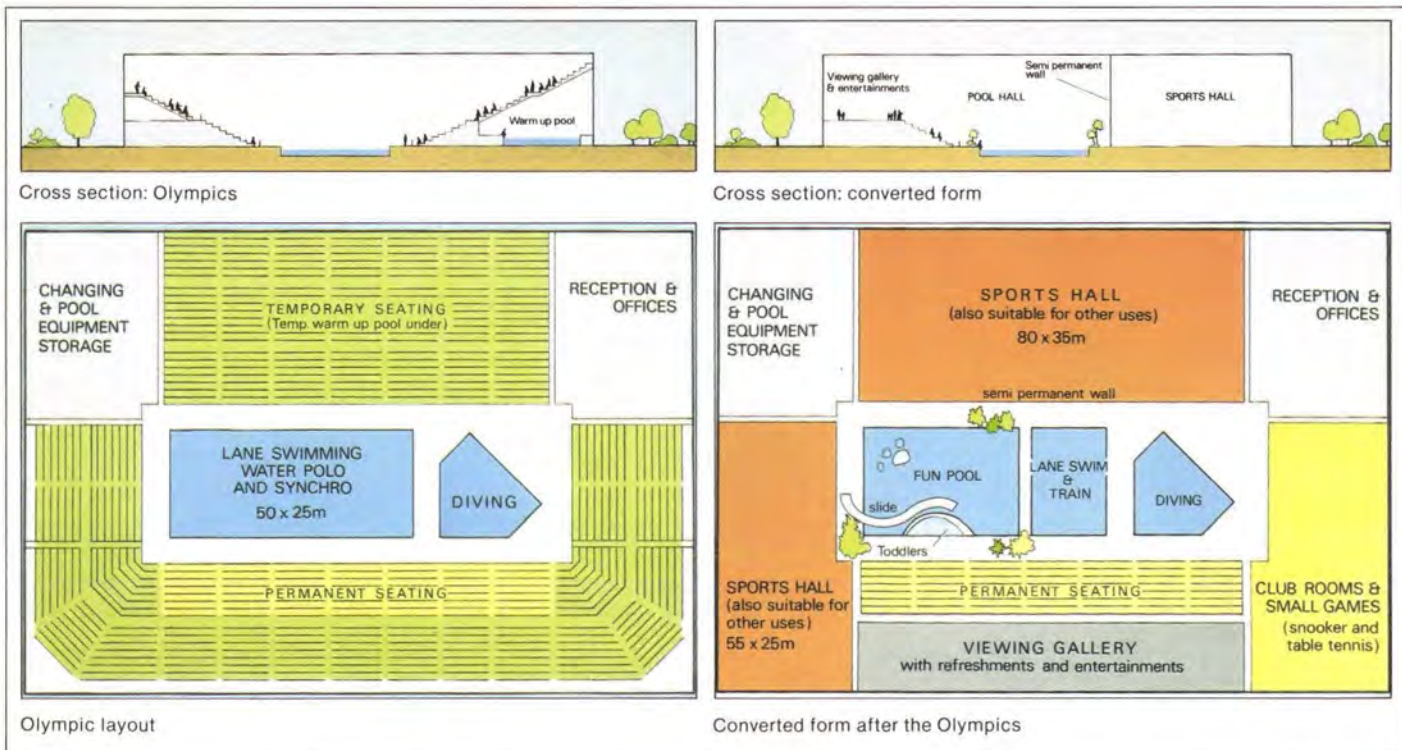
Stoneleigh Park Estate showing the intended event locations



Model of the indoor arena planned for Perry Park (Consulting engineer W.S. Atkins)



Perry Park: Sports layout for the Olympics



after the Games to a form more suitable for the long-term needs of the city community. The diagrams illustrate the planning principles of the Centre. Within the overall permanent building envelope a 50m x 25m main pool, and full Olympic standard diving pool will be surrounded by seating for 12,000 people for the Olympic Games. At two corners will be located the reception, offices, changing rooms and equipment storage spaces. The large majority of the seating will be temporary. This will allow its removal after the Games and the construction of semi-permanent walls to create a much smaller pool hall with two large all-purpose sports halls. The offices, changing and storage areas will remain largely unaltered but will then serve both the pool hall and sports halls. The pool hall itself will have areas converted for club rooms, recreation and refreshment areas and the main pool will be subdivided and converted for recreational use. Conversion works will be done in such a way that if required for another major event in the future the building could be reconverted to its Olympic configuration.

For the Olympic Games, a warm up pool will be required for competitors and an additional pool will be required for the preliminary rounds of the water polo event. These will be provided using modular GRP temporary tanks, the former being located beneath the main bank of temporary seating and the latter being located outside the building envelope with spectator seating for some 2,000 people.

The site selected for the new centre is at Salltley which lies some 2km from the city centre. Parking and access can be accommodated satisfactorily for the number of spectators involved.

Holme Pierrepont, Nottingham
Rowing, Canoeing and Kayaking.

The National Water Sports Centre at Holme Pierrepont is purpose-built for rowing, canoeing and kayaking. Opened in 1973, it has hosted the 1975 World Rowing Championships and the 1981 World Canoe Championships, and is due to host the World Rowing Championships again in 1986. It is the ideal venue for the Olympic water sports events in the Heart of England.

The main facility is the 2300m x 135m wide straight course which offers starting positions at 2000m, 1500m, 1000m and 500m with

six lanes for rowing and nine lanes for canoeing. There are timing and commentary boxes, starters tower, judging and course control towers, electronic scoreboard, photo-finish and electronic timing equipment. In addition, an artificial slalom course is currently being added for kayaks. This event could therefore be offered for the 1992 Olympics.

The main buildings provide residential accommodation which would be used for Olympic officials, a lecture room, a conference room, refreshment and catering facilities, and training facilities as well as the administrative offices. The centre is managed by permanent staff who are experienced in organizing major events.

Accommodation for athletes, if they are unwilling to travel from the Olympic Village (approximately one hour travel using the M42 motorway currently under construction) will be provided at Nottingham University.

The Centre has been landscaped to provide bankside viewing for up to 40,000 people, although the provision of a temporary VIP grandstand seating 2,000 people should be

considered for the Olympic Games. Car parking can be readily provided for up to 10,000 people. The railway station is 5km from the centre and the airport 24km.

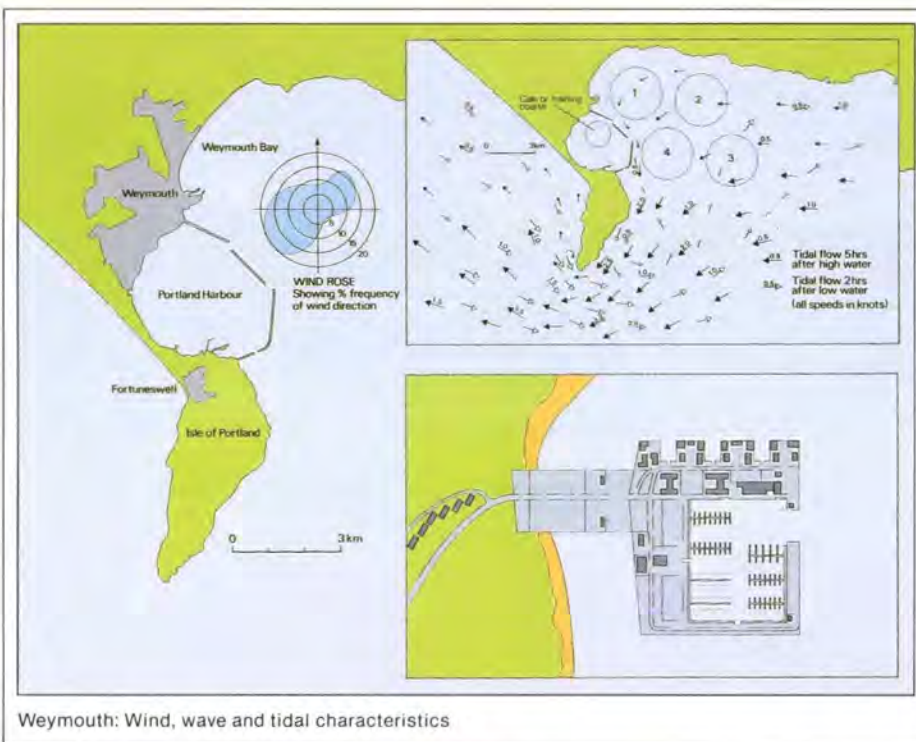
Edbaston Priory
Tennis.

Edbaston Priory Lawn Tennis Club is situated 2km from the city centre and operates from two locations 1/2km apart. The club can offer 20 grass courts and 19 hard courts and could thus host the Olympic event on either surface.

The clubhouse is a modern two-storey building housing reception, male and female changing rooms, administration offices, professional shop, and toilets. There are good refreshment and catering facilities including a restaurant, lounge and sports bar and a recreation room. In addition, the club has 10 squash courts, which for the purposes of the Olympics, would be converted to provide additional changing and office facilities. The indoor tennis court building would be converted temporarily as a local broadcasting centre.



Holme Pierrepont: National Water Sports Centre



Weymouth: Wind, wave and tidal characteristics

The club is administered by full-time staff including groundsmen. It therefore has the facilities and management expertise to stage the Olympic tennis event, as is demonstrated by the national and international tournaments that it has already hosted. The Davis Cup, the annual John Player tournament, and the annual Edgbaston Cup for Ladies.

For major events, and this would of course include the Olympics, the club provides a 'centre court' with temporary seating for 6,000 spectators. The space occupied by the seating would reduce the available courts by two so that 18 courts in total would be available, 14 for the tournament itself and four as practice/warm up courts.

Support facilities for spectators, including refreshments, toilets, information booths, etc., would be provided using temporary buildings.

The club is set amongst wooded fields, which are used for car parking for major events, and road access is satisfactory for the number of spectators involved.

Football Clubs

Aston Villa Football Club, Birmingham City Football Club, West Bromwich Albion Football Club - Association Football.

Birmingham has three long-established football clubs who compete in the First Division of the English League. These clubs therefore have good established facilities to stage the Olympic Association Football events. Each of the three club stadia will accommodate over 40,000 spectators at any one match and possesses the support facilities and management expertise to accommodate these numbers. All three clubs have adequate facilities for the broadcasting media and press which are commonly used in the normal course of their football league programme.

The local road network and parking arrangements prove satisfactory for these venues in their normal operation and there should not therefore be any significant problems in relation to the Olympic football events.

Velodrome

Cycling

Birmingham has a velodrome at Salford Park but it is unsuitable to stage the Olympic event as it has an imperial-sized track and is in an unsatisfactory condition.

The city has therefore decided that, in the event of being chosen to host the 1992 Olympics, they would build a new velodrome. The intention is that the track and stands would be covered and would provide permanent seating for some 8,000 people. This could be supplemented, if necessary for the Olympics, by additional temporary accommodation. The probable arrangement for the Olympic Games would be to leave the area within the track as open hardstanding to receive temporary support facilities for spectators but that subsequent to the Games, this area would receive an artificial grass games pitch for community use and as a centre for major events. Possibly this pitch would be the one becoming available from Perry Park on which the hockey event is to be staged.

The city has chosen the proposed site for the new velodrome in Sheldon which lies some 3km from the National Exhibition Centre and 10km from the city centre. It lies immediately adjacent to the main A45 trunk road and access for the number of vehicles expected would be good. There is adequate free space on the site for car parking.

Weymouth

Yachting

Birmingham does not have yachting facilities and for the 1992 Olympic Games would propose to hold this event at Weymouth. This venue has been selected by the Royal Yachting Association as being the most suitable in the British Isles for international yachting events after a study which included detailed consideration of seven other locations.

Weymouth offers ideal yachting conditions from the points of view of wind, wave and tidal characteristics. Four 3.2km diameter Olympic courses can be located in Weymouth Bay and, in addition, a 1.6km diameter training course can be offered within the protection of Portland Harbour.

Although it has ideal competition and training areas, Weymouth does not currently have the land-based support facilities for changing, accommodation, offices and boat mooring. Detailed plans have been drawn up in the past for the provision of these facilities and it is possible that they will have been constructed by 1992. In the event, however, of their not having been built, these facilities could be provided by means of temporary accommodation.

Practice facilities

In addition to the competition venues, the host city must provide adequate practice and training facilities for Olympic athletes' use before and during the Games. A comprehensive listing of all suitable practice venues has established that there are sufficient number of practice centres for each sport within easy reach of the Olympic Village.

THE OLYMPIC VILLAGE

The Olympic requirements

The Olympic Charter 1984 requires accommodation for 14,000 athletes and team officials. A Village with separate areas for males and females is desired, serviced by central facilities, including restaurants, shops and banks. The complex must be secure.

Architecture and layout should be integrated to provide attractive and functional temporary homes. Large numbers of people need to be received and housed in a civilized manner with significant daily variations in numbers up to 14,000 maximum. The Village must provide easy access to sporting events areas and be self-contained in terms of varied entertainment facilities.

The Village needs to be sited as closely as possible to the main venue with excellent transport links to other centres.

The chosen site

Several sites were examined at Birmingham, and a parkland setting alongside the principal Games venue at the NEC was selected as an ideal site which would satisfy the Olympic Charter in all respects.

Proximity of Village to the main stadium is important to meet Charter requirements. The chosen site of 40ha north of the NEC is ideal. Large numbers of people can be received from nearby international transport facilities and housed in a pleasant village environment on the doorstep of most events and training locations. The proposed site is urban fringe farmland and woodland, in an area immediately north of the NEC likely to be developed in the future.

Careful planning and construction will integrate the Village into the existing landscape and fully exploit the visual attractions of the area.

The topography will enable economical site preparation, servicing and construction of buildings. The site has no major technical problems. The development programme should be gradual with on-site activity phased over three years. Infrastructure services already exist nearby.

The form of the Village

The buildings for the Village will be purpose-built modules of imaginative design, erected for the duration of the Games and relocated afterwards. In recent years, structures of this type have improved considerably with a wide range of designs now in production. Flexibility in design and layout is an attraction of such buildings, with low site preparation costs, and simplicity of erection and dismantling making the construction process manageable and economical.

The chosen 40ha site near the NEC will allow a Village complex with communal facilities in spacious, landscaped buildings. Housing areas will be grouped into neighbourhoods punctuated by recreational open space. The security cordon around the site will draw together the overall complex. An architectural objective would be to create a variety of structures and layouts from several basic types of module and maximize use of building forms already in production.

A review of products currently available has shown that British manufacturers produce and supply demountable buildings ideal for the Olympic Village, both for housing and

communal facilities. These products are tried and tested; development work is not required.

Manufacturers can produce the required number of units in the period 1988-91. Units are designed for ease of transportation and storage. The overall picture is of straight-forward production, transportation, storage and handling on site.

The communal facilities will form a design centrepiece of high quality structures housing restaurants, a cinema, theatre, bank, shops and all the other needs of a major international gathering. The Olympic Charter states that a high sense of social occasion should underpin the Games. The Village at the NEC will provide a spacious and imaginative setting to attain this requirement.

After the Games, the houses would be moved to urban renewal sites to provide low-cost accommodation. Others can be sold for use in holiday camps, and low-cost housing overseas.

Land availability and planning policy

Land at the NEC Village site is already in local authority ownership, and difficulties of land assembly will therefore be avoided. Expansion of the NEC northwards onto this publicly-owned land is logical in strategic planning terms, with the M42 forming a sensible eastern development boundary. At present the land is green belt farmland and woodland. A temporary Olympic Village settlement will not prejudice future use. If, in the long-term, the land is developed for the NEC expansion, or in association with a hi-tech industrial park as presently being debated, temporary use in the period 1988-92 is feasible.

However, if planning policies require, the temporary Village proposal will permit easy restoration to agricultural use.

How the Village functions

Efficient operation will be created by careful design. Use of modular structures will allow optimum utilization of the site whilst providing a spacious layout. Three levels of operational efficiency will be built into the Village:

(1) Proximity to the airport will enable the arrival and departure of large numbers of athletes to be handled efficiently at the Village edge.

(2) On a daily basis, athletes will be able to depart for training and events locations by buses on the surrounding roads.

(3) Within the Village, easy circulation for 14,000 persons will be provided to make full use of social facilities and access transport for events outside the Village.

Servicing the Village will be readily achieved at this site. Mains capacities for water, sewage, gas and electricity already exist on a scale adequate for the temporary Village. Temporary high quality services for the housing and communal buildings would be constructed, designed with future reinstatement of the site in prospect.

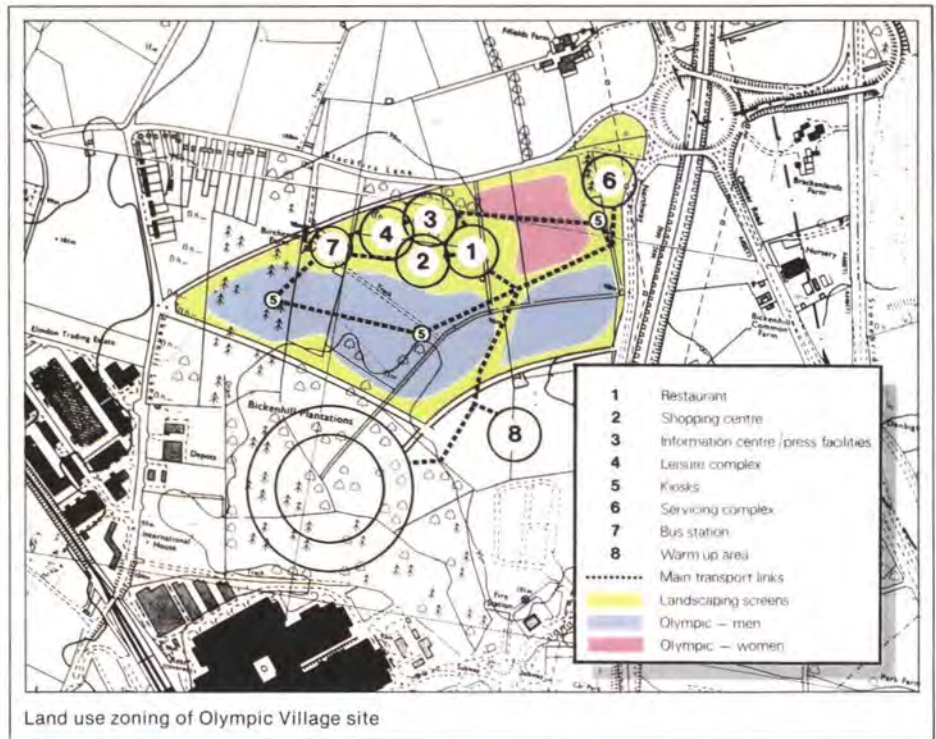
Much of this infrastructure could be economically recycled for use with relocated demountable housing.

At a lower level of activity is the process of servicing people during the Games, housing has to be cleaned, refuse cleared, and landscaping maintained. Adequate on-site facilities for these services will be provided without intrusion into the daily life of the Village.

Internal security will be provided within the perimeter road cordon; the overall space allocation allows for the perimeter security.

Other accommodation

In addition to the Olympic Village for athletes, there are several other groups



Land use zoning of Olympic Village site



Aerial view of proposed Village site and Stadium site

directly associated with the Games who will have accommodation requirements:

- International Olympic Committee
- Technical & media personnel
- International Youth Camp
- Spectators.

Investigation by the City Planning Department of hotel and university accommodation within the area showed that there was sufficient capacity of appropriate type. There will be a demand for 167,000 bed spaces per week from international visitors and 70,000 bed spaces per week for national visitors. On a three-hour travel time from Birmingham there are 500,000 bed spaces with a vacancy figure of 200,000 in July 1983.

TRANSPORT

The Birmingham area already has transport facilities to meet the Olympic challenge. The central position within Britain results in a unique range of high quality air, rail and road services in all directions. There are commitments to improve these facilities even further before 1992, particularly by further motorway construction and the development of rapid transit rail.

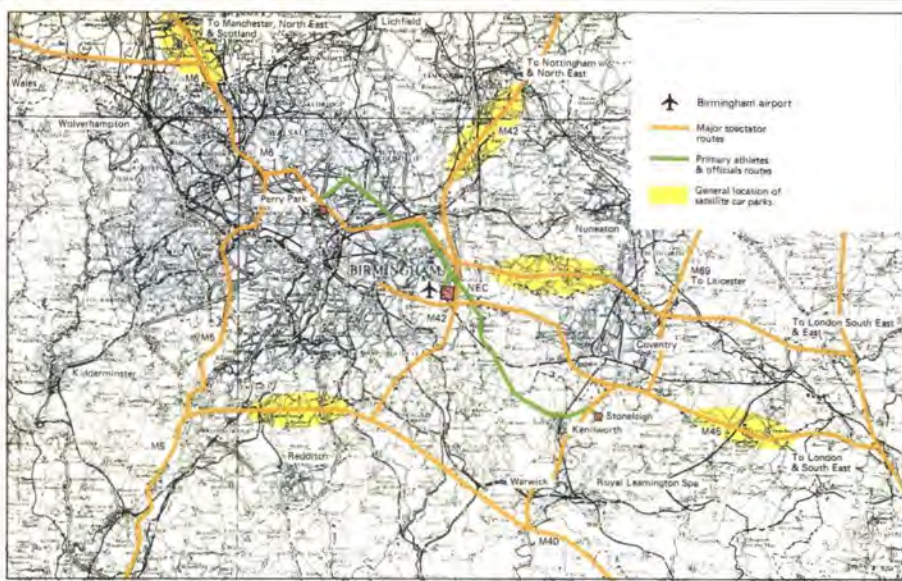
The regional airport is situated some 9km east of the city, close to the NEC to which there is a direct passenger link (Maglev). A new terminal was opened in 1984 and the airport handles some 60,000 aircraft move-

ments per year. These cover international and domestic flights equally split between scheduled and charter. There is sufficient capacity to cater for additional flights, including intercontinental flights.

The city is a major centre in the rail network, with over 300 trains per day using the two city stations. There are Inter City services from all parts of mainland Britain, and 30 trains per day in each direction to and from London typically cover the journey in 1 hour 40 minutes, all stopping at Birmingham International for the Airport and the NEC. The existing rail line can handle 10,000 passengers per hour between the NEC and the city centre.

The transport facilities have been studied in detail with the assistance of the West Midlands Passenger Transport Executive (WMPTE) and discussions held with the management of other transport modes.

A large part of the public transport needs of the city are catered for by buses operated by the WMPTE, which owns 2,400 vehicles. This system and the experience of the operator are an important advantage to the Birmingham case, as the scale and flexibility of bus operation makes this the obvious choice for the movement of athletes and officials. Bus services are complemented by comprehensive local rail services which will be able to service important games venues, especially the NEC and Perry Park.

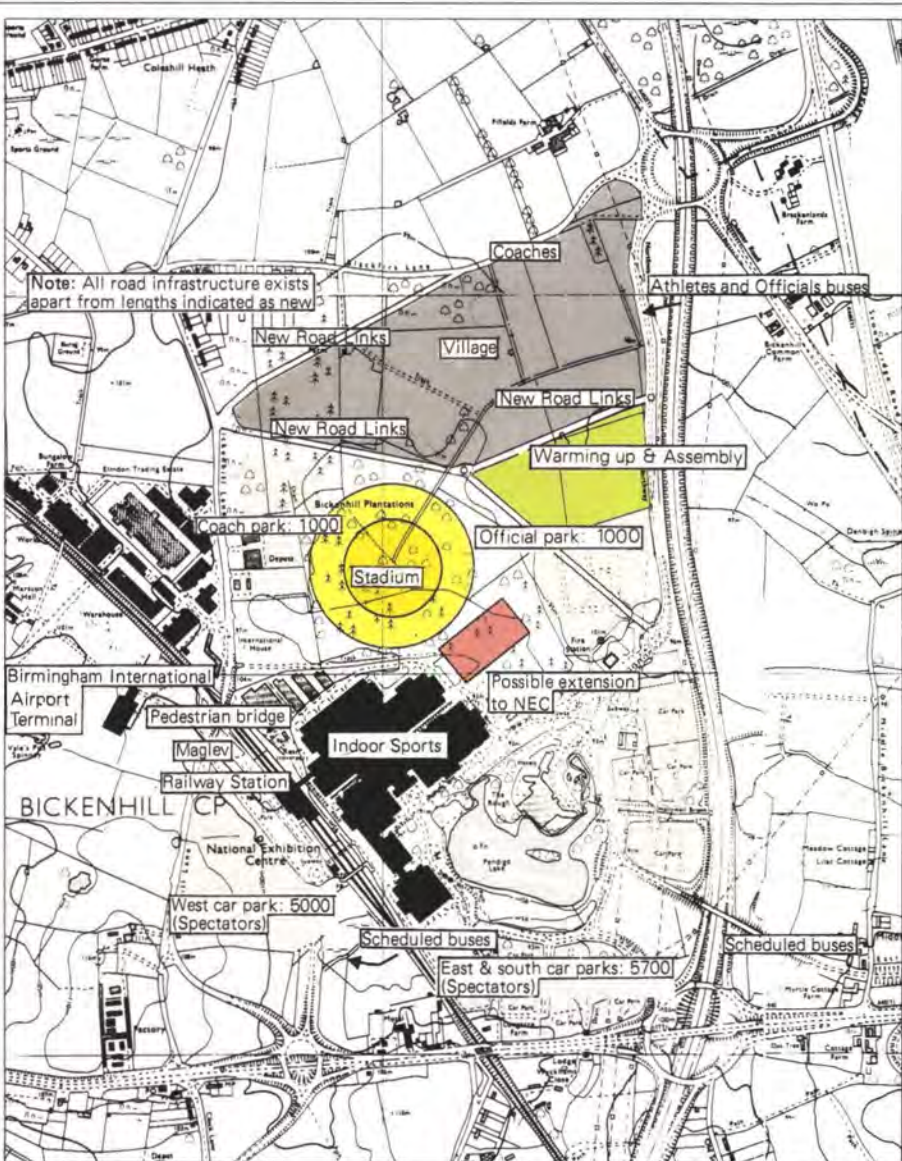


Satellite car parking and approaches to NEC/Stadium

Birmingham has excellent access to the national motorway network with the M6, M5 and M42 running through parts of the city. By 1990 the M42 will be completed around Birmingham, and the M40 extension from Oxford and Birmingham is expected to be completed by 1991.

There can be few places in the world so comprehensively served by the high standards of road network.

The quality of facilities is illustrated by the maps showing the major road and rail network. Between 30-40 million people are able to access Birmingham by either road or rail in under three hours. This accessibility has supported the successful development of exhibition, conference, sport and leisure facilities in the area, and verifies the claim that the area is already equipped to meet the transport aspects of the Olympic challenge.



Access and car parking

WMPTTE has successfully transported 22,500 delegates between an international conference at the NEC and hotels spread over a wide area, over a five-day period.

190 special buses were operated on 33 routes, and that was a challenge comparable to catering for the Olympic athletes and officials. 140,000 spectators have visited the NEC on one day without any transport problems, and the National Agricultural Centre at Stoneleigh regularly caters for 100,000 visitors per day.

The transport strategy to cater for the primary Olympic events is illustrated.

To respond to Olympic requirements, different types of movement and a varied scale and quality of service have been recognized. Reliability and security of movement is crucially important and imposes constraints on the layout of facilities and the type of services provided. There are four main categories of movements:

- (1) Athletes and team officials (numbering some 14,000)
- (2) Event officials, TV and Press etc. (up to 12,000)
- (3) Supporting staff (e.g. security, administration, etc., up to 40,000)
- (4) Spectators (250,000 to 350,000 per typical day total for all Birmingham area venues, of which some 15% would not have tickets).

In developing a transport and infrastructure strategy, the following characteristics are recognized:

- (1) There is priority in moving athletes, officials and Press and these movements require reliable timetables which in turn requires the use of routes and accesses which are largely independent of significant spectator movements (as indicated in the vicinity of NEC)
- (2) The location of car parks and ticketing strategy for events and travel will encourage the maximum use of public transport and coaches by spectators
- (3) Birmingham International Airport will cater for considerable additional movements but the need for many overseas competitors, officials and visitors to travel by scheduled airlines, would be catered for by coach services to other airports. Heathrow will be only one-and-a-half hours away by road
- (4) Longer distance movements within Britain by road will be encouraged to 'park and ride' by developing suitable parking sites off the motorway network
- (5) Comprehensive bus and local rail services will discourage use of private cars by more local spectators, and these services will have set-down locations which are closer to the venues than public car parks. Car parks for spectators will have lowest priority but will be adequately catered for at walking distances not exceeding 2km (as at other Olympics). It is expected that up to 75% of spectators would use public transport and coaches in the vicinity of the major venues, including an allowance for 'park and ride'.

Transport management

Athletes, officials and spectator movements have been analyzed for arrivals and departures, for movements to training centres, and to the main venues both before and during the games. The analysis has been discussed with the transport authorities. The principal means of movement would be road transport and the management and availability of sufficient transport was discussed in depth with the West Midlands Passenger Transport Executive and confirmed. 85% (12,000) of competitors will be housed in the main Olympic Village, and a Village bus service will operate within the Village and also connect directly with the main

and indoor sports halls at between four and 10 minute intervals. Regular services would also operate between the village and other competition venues and use would be made of special routes which are not part of the primary public access routes. This will ensure that schedules are reliably met.

A shuttle bus service would operate between the village and practice grounds. There would be over 50 such sites, and schedules would be based on disposition and needs. No one of these movements will create large volumes, but special routes will be selected to avoid any critical junctions and ensure reliability of service.

PRESS, BROADCASTING AND COMMUNICATIONS FACILITIES

Communications are central to a successful Olympic Games. Birmingham is fortunate in being at the centre of a modern network of digital telephone exchanges, optical fibre communications which will meet the needs of the 1992 Games.

The image of the Games is established initially by the written Press and the images produced by the electronic media; radio and television. The money from television rights will be the most significant source of finance for the project. For these reasons, and for the efficient running of the Games, effective communications are essential.

Each major venue in Birmingham was inspected with a senior and experienced sports producer from the BBC whose valuable contribution has helped with venue selection.

Consultations with the BBC and ITV technical experts have enabled time scales, locations and costs to be estimated for broadcasting facilities. Close liaison with senior representatives of the international sporting Press have produced conclusions on the way in which the Games should be presented to the world's Press and media.

The BBC and ITV, through their respective Heads of Sport and Outside Broadcasting, have confirmed their willingness to act jointly as Host Broadcaster. They consider that neither organization individually should handle an event of this size, and quoted the 1966 World Cup as a successful example of such a joint venture.

A main Press Centre (MPC) will be provided at the NEC to serve the estimated 3000 journalists expected at the Games. Facilities will include desks, typewriters, telephones, telex and facsimile machines. The television signals from each main venue will be shown on TV monitors in the Press Centre. This will enable the smaller agencies to cover events at different venues.

At each of the major sport venues a Press Centre will be provided equipped similarly to the MPC but on a smaller scale. Concentration of indoor sports and athletics at or near the NEC will minimize duplications of Press facilities.

The MPC will have bar and catering services which reflect the need of the world's Press to meet deadlines over a 24-hour period. It is important that the representatives of the electronic media should be given the same

facilities as the written Press. This will be achieved in the NEC by having the two centres adjacent to one another. The International Broadcasting Centre (IBC) will receive the television and broadcasting signals from each venue and make them available to the world's broadcasters who will be accommodated there.

Setting up the IBC will be a lengthy task requiring close co-operation between the Host Broadcaster, British Telecom, the world's media and the NEC.

With the proposal to house both of these at the NEC, close to the main stadium and many indoor sports, the improvement over the Los Angeles Games is substantial. In the report on Press and media coverage of these games, the distance between the MPC and IBC was seen as a real problem, as was the distance from both of these to the venues.

Their close proximity in Birmingham should be very acceptable to the international sporting bodies.

Broadcasting

The Olympic Charter requires that a Host Broadcaster be appointed with responsibility for covering every sport all of the time. Given the magnitude of the task, a consortium of the BBC and the ITV companies should be formed to fill this role.

An estimated 160 cameras, 500 commentary positions and 30 vision circuits will be provided to give live coverage at all major venues. A few will be covered using video tape recorders with the picture being sent back to the IBC after local editing.

The Host Broadcaster will provide all of these signals to visiting broadcasters accommodated at the IBC. A number of broadcasters or consortia will require facilities for mixing and editing these signals, including:

USA:	ABC, CBS or NBC
Europe:	European Broadcasting Union/OIRT
Asia:	Asian Broadcasting Union
Africa:	African Broadcasting Union
Japan:	NHK (Japanese Broadcasting Corporation)
Australia:	ABC or commercial channels

As well as receiving the World Signals, many of these groups will require their own cameras and commentary positions, as will the BBC and ITV for the UK programme.

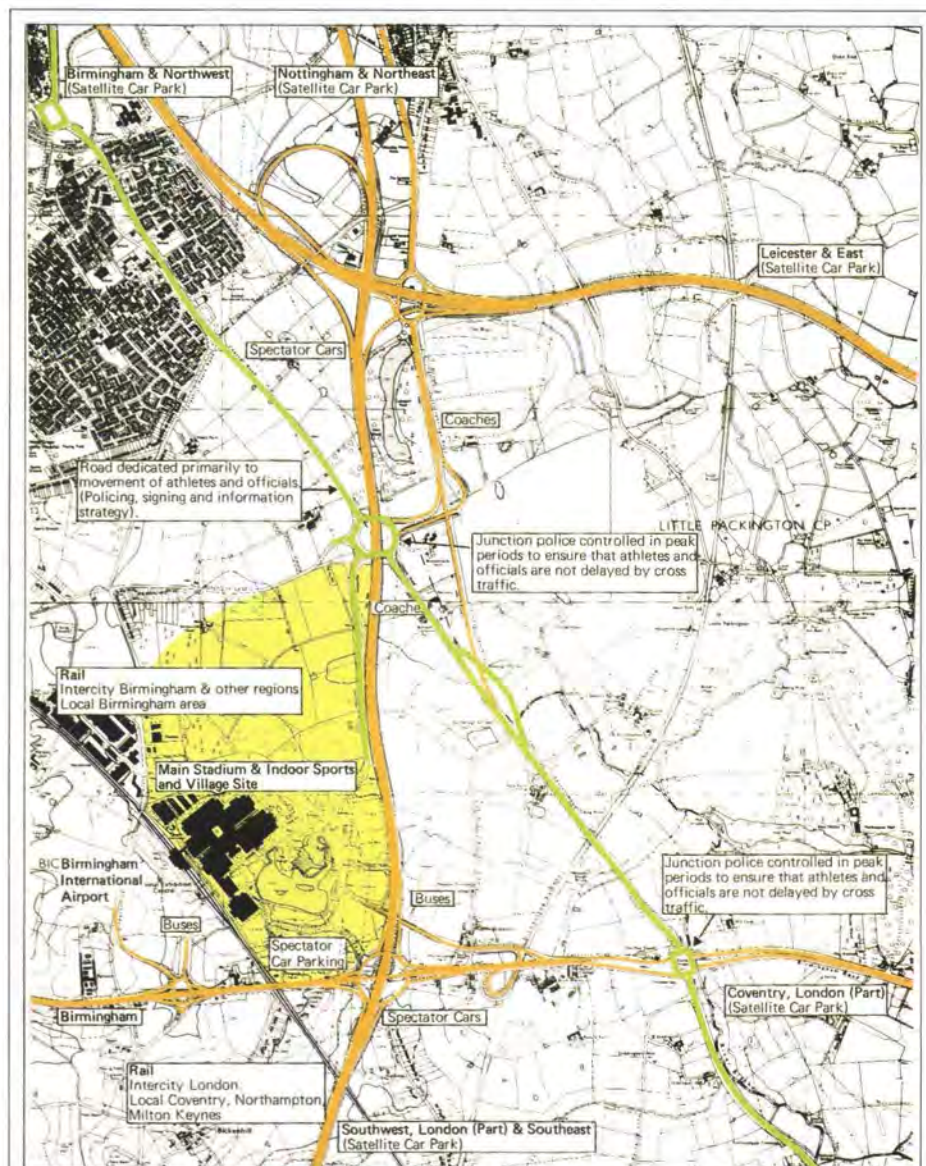
From the IBC, TV and radio transmission will be made via cable, microwave and satellite to the UK and the world. Full use will be made of the existing network provided by British Telecom. This will be supplemented with additional satellite terminals and dishes at the NEC.

Telecommunications

A telephone network will be provided to serve the organizers, officials, athletes and Press. This will be provided by British Telecom and linked to the national and international networks. Mobile communications will be provided at three levels. Within venues simple 'walky talky' radios will be used for event coordination, security and transportation. On a wider level a number of radio networks will provide for groups (such as press agencies) to keep in touch between venues. Thirdly the recently introduced cellular mobile radio telephone network will be used to keep important officials constantly accessible on the telephone.

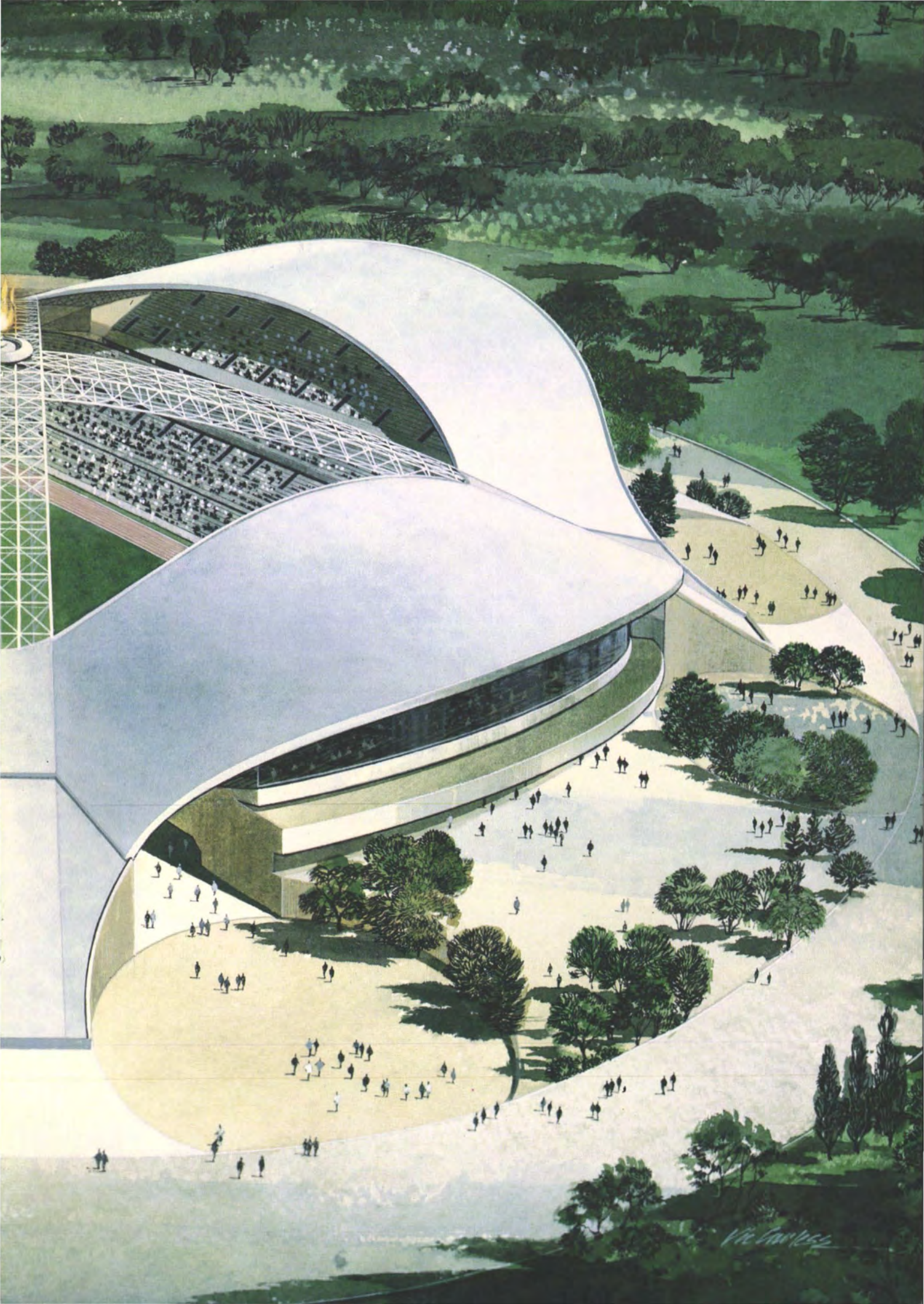
Results service and computer data base

By 1992 the computerized start lists, results service and information on athletes will have almost totally replaced bulletin boards



Transport strategy





McLennan

and notices. Computers, which are becoming more powerful and cheaper, will efficiently produce start lists and results for display at the MPC, IBC and all major venues. Integration of this with other useful data such as transportation and accommodation will be possible. Accreditation of journalists and media personnel will also be handled in this system. The computer, software, terminals and printers will be provided as part of a package in which BT will have a large part.

GAMES MANAGEMENT

The Organizing Committee of the Olympic Games (OCOG).

The OCOG is a legal body which may receive a delegation of authority from the International Olympic Committee (IOC) but may only use its powers to represent the IOC. The Committee is appointed by the National Olympic Committee (NOC) in conjunction with the authorities of the host city. The members of the IOC in the host country and the President and/or Secretary General of the NOC are ex-officio members of the OCOG alongside representatives from the city. Some representation or link with Government is essential; the Government has to indicate its clear support to the city in the initial application to the IOC.

The OCOG has four main duties:

- (1) To make all preparations for the Games
- (2) To advise on all appointments and organizations which together would form the Games
- (3) To organize and stage the Games
- (4) To take care of the resulting expenses and liquidation costs after the conclusion of the Games.

To complete its task efficiently, the OCOG needs a small Executive Board to undertake the main burden of detailed administration and organization; this committee is made up of members of the OCOG. We would envisage that this Executive Board would include experienced executives in sports administration, revenue raising, marketing and financial management. Both the OCOG and its Executive Board require help, assistance and advice from a broad spectrum of the community. An Advisory Council representing all sections of society can perform this role. A possible responsibility structure is illustrated in the diagram below:

It is inappropriate at this stage to attempt a firm recommendation of any of the alternative legal forms for the OCOG but regardless of whether it is ultimately constituted as a UDC, charitable trust, company or any other organization there are clearly both political and financial advantages in 'privatizing' the Games as far as possible and thus reducing the city's risk. We would envisage a substructure of companies set up beneath the OCOG to develop and hold the various assets.

SECURITY

The establishment and maintenance of an effective security system is absolutely vital for the success of the Games. It must provide first class protection for the athletes and Games officials at their living, competition, and practice venues, and on the journeys between. Also marshalling, inspection and control of spectators will have to be provided together with the ability to respond to specific troublespots for whatever reason.

Our study does not seek to determine in detail the security arrangements for the Games but has been directed towards establishing that the experience, resources, and know-how exist for the security planning and implementation to be achievable, and to determine a cost allowance for providing it.

Accordingly we have had consultations with the West Midlands Police Force, a private security firm, and with the head of security at the central venue – the NEC.

The West Midlands Police Force is the second largest police force in the country, having 7,000 policemen and 3,000 civilian staff out of a total of 120,000 policemen in the country. West Midlands Police have some of the best experience in policing and organizing security at major events. These events include FA Cup semi-finals, events at the NEC, with Royal Family presence, and in particular the Motor Show with a total attendance of two million. They have made preliminary contact with the FBI and Los Angeles Police who organized and co-ordinated all the security organization of the 1984 Games.

For the Olympic Games, the West Midlands Police would be responsible for security and would set up a security committee. This would include representatives from the Chief Constable of Nottinghamshire, Warwickshire and Dorset who would be responsible for the events in their areas. West Midlands Police would co-ordinate these other forces.

For the Birmingham area, the West Midlands Police would draw upon aid from other forces throughout the country and would be responsible for operational police matters, traffic management, communications, intelligence and security for athletes and VIPs. They would envisage employing private security personnel who would provide static security at sporting venues, the Olympic Village and training areas. The West Midlands Police could deal with potential terrorism, but consultation with Government about armed services support would be progressed.

As an indication of scale, the West Midlands Police envisage a total security manpower of between 10,000 and 20,000 (depending on the stage of the Games) to cover all event and practice venues, with approximately half being uniformed officers.

At the NEC their permanent arrangements include 300 security staff. It is envisaged that for the Games the whole NEC campus (including stadium and village) would be surrounded by a primary security fence within which the particularly sensitive targets of buildings, the stadium, and the village would have a high security enclosure. These would be patrolled at all times. Similar arrangements would be made for the other venues.

We see it as a particular advantage from the point of view of security that the Birmingham Games can be organized at a relatively small number of venues. This allows resources to be concentrated with great benefits in management and co-ordination and avoid the enormous expense of providing patrolled fenced perimeters to a large number of sites.

Other contributing organizations

The provision of adequate emergency and back-up services was considered and the following organizations were consulted:

- West Midlands Regional Health Authority
- St. John's Ambulance Brigade
- West Midlands Fire Service
- Severn Trent Water Authority
- West Midlands Gas Board
- The Post Office.

As major events with comparable numbers of spectators to those attending the Olympics are already catered for at the NEC and Stoneleigh, it was established that all these organizations had sufficient capacity to service the Olympic Games.

TECHNICAL IMPLEMENTATION

Sporting venues

On the best information currently available, Birmingham, if selected as the host city by the IOC, will be notified of this decision by October 1986 and will be required to enter into a binding commitment together with the Organizing Committee (OCOG). Thus there will be a period of a little under six years for the city to prepare fully for the Games.

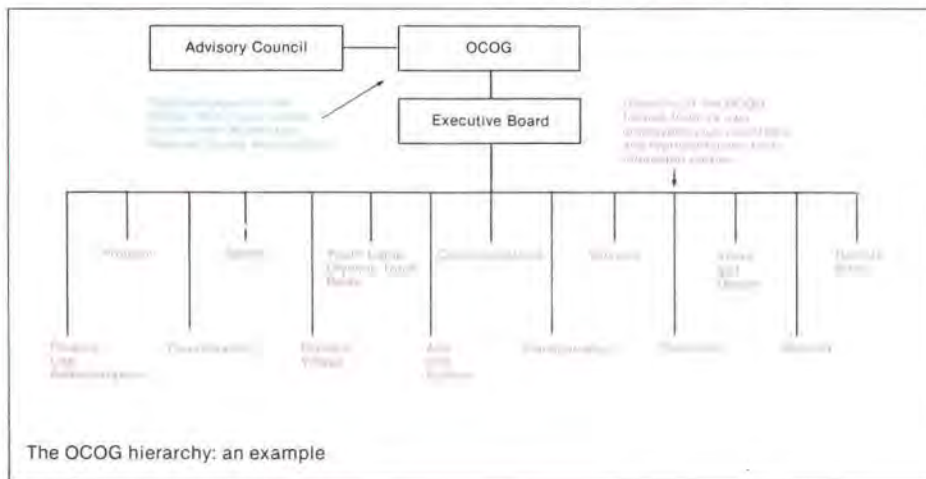
In relation to the sport facilities the preparation works essentially fall into two categories. Firstly, there is the provision of the major capital cost items (the stadium, the swimming centre, the velodrome) and secondly there is the provision of the temporary items (seating, support facilities, etc.) which are required at the venues.

The second category of items will require very careful preplanning, prefabricated construction, and installation carefully phased with other events at the venue. These items will assume extreme importance in the years immediately before the Games but are unlikely to occupy the full six-year period except that as a generalization early strategic planning will be an advantage.

The programming of the provision of the capital cost items will be absolutely vital to the success of the Games from the point of view of both the Olympic authorities and the city itself. The main stadium is particularly important by virtue of its size and cost. The broad implementation programme allows a period of four years for its physical construction. This allows completion in 1991 which the Olympic Charter requires so that the pre-Olympic sporting events can be held at the competition venues.

The Olympic Village

To facilitate construction of the temporary Village all structures would be built up from a few basic modules. A temporary site at NEC would not require much work in terms of earthmoving and infrastructure provision. The Village would have perimeter service roads with paths between the units and the site could be reinstated at very low-cost.



However, if development of the site after 1992 is in prospect a more permanent infrastructure base can be installed and the after-use linked to future development. A period of three years for the construction of the Village is required.

Transport and infrastructure

There are no major transport and infrastructure features which need to be implemented as a crucial element of the Olympic case. The important parts of the M42 motorway are already under construction. The M40 between Oxford and Birmingham is programmed for completion before 1992 and will assist the Olympics, primarily for improved access to Heathrow. Should the M40 not be completed, the demands would be met by less use of direct coaches and more use of air shuttle, London/Inter City rail, and Reading/Inter City rail.

The transport implementation requirements are detailed, requiring relatively short lead times. They consist of:

- (1) Improved bus terminals
- (2) Modified accesses and junctions (primarily to cater for priority movements)
- (3) Modification to parking areas
- (4) Provision of temporary car parks.

THE OLYMPIC FESTIVAL

The Olympic Festival would cover all aspects of the performing and visual arts. Birmingham has numerous facilities to stage a festival which would complement the athletic content of the Olympiad. Discussions have been held with representatives of the performing and visual arts in the city and proposals have been made as a framework for the Olympic Festival.

The Festival would herald the coming of the Games and would open some two weeks before the opening ceremony of the sporting content of the Games.

In addition to using the theatres in the nearby cities of Coventry, Nottingham, Leicester and Wolverhampton, the city propose to use the following venues:

- Alexandra
- Hippodrome
- The Repertory
- The Town Hall
- The Old Repertory
- The Triangle
- The Crescent
- The Midland Arts Centre
- Warwick Arts Centre
- Royal Shakespeare, Stratford-on-Avon.

A full programme of drama, opera and ballet has been outlined, and in addition a programme of exhibitions of the visual arts is planned.

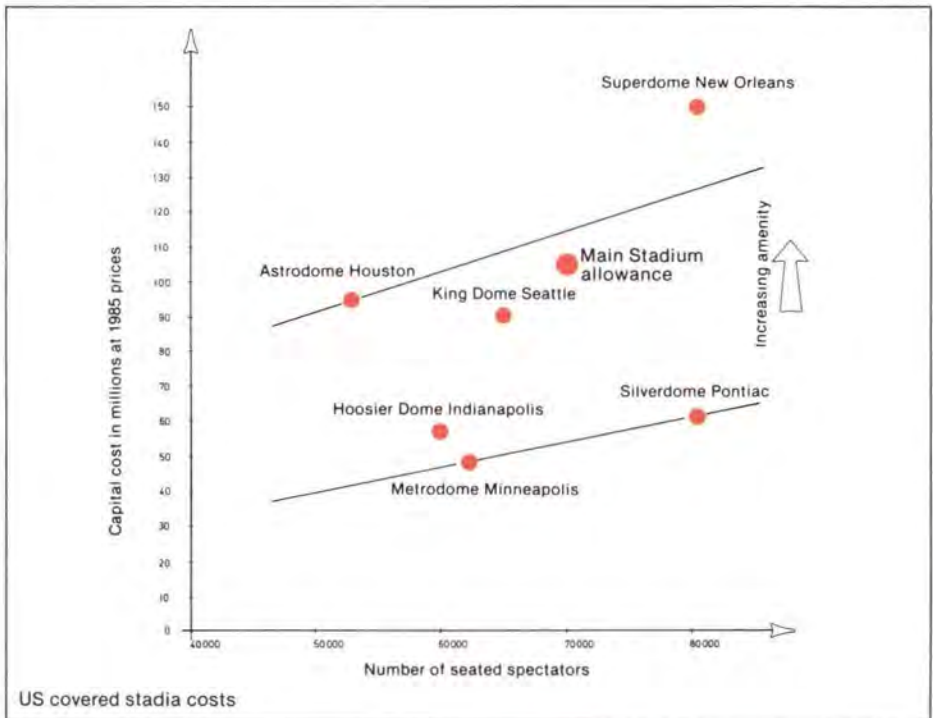
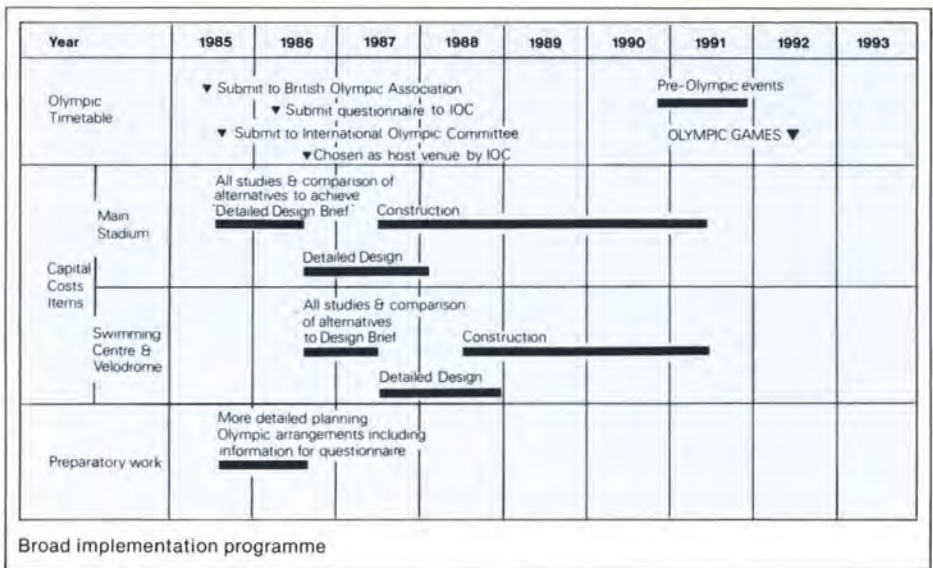
COSTS

Coverage

The costs described here refer to expenditure by the Organizing Committee for the Olympic Games (OCOG). All expenditure are given at gross cost and at April 1985 prices. In the past, feasibility studies for Olympic Games have quoted costs according to various categories but they have not included the expenditure for each year preceding the Games. In order to forecast a cash flow pattern for the Birmingham Olympics, costs have been estimated in two ways; the first based on the operating cost pattern for the Los Angeles Games and the second time by adding together estimates for the individual categories of expenditure.

Capital costs

The capital costs cover the costs for the Olympic Village and the International Centre (£63.2m.), local road works (£1.5m.) and the major costs for sports facilities (£144.2m.). The sports facilities include £105m. for the stadium, £20m. for a water



complex, and £6m. for a velodrome. There is no major capital cost to the OCOG for communications. The expenditure incurred by the ITV/BBC consortium providing the host signal has been included as an operating cost. All capital costs were determined by identifying, estimating and summing the individual categories of expenditure which are relevant in the Birmingham situation.

Operating costs

The Table gives details of our operating cost estimates from 1989 to 1992. Total operating expenses are based on the Los Angeles expenditure patterns. For the earlier years, estimates have been made of the marketing and other operating expenses required to launch the 1992 Birmingham Games. Marketing in this context covers the expenses involved in raising the city's profile in both the national and international con-

text; the costs of effective presentations to future sponsors and the purchasers of television (media) rights and the administration and publicity costs associated with licensing, merchandizing and lotteries.

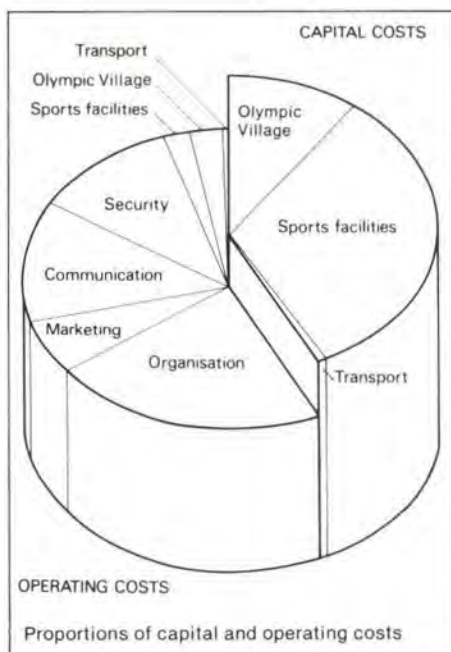
All operating costs by component were estimated by summing individual items of expenditure – transport, sports facilities, Olympic Village, security, communications and marketing – except for the organization cost. Although it is difficult to estimate the organization cost by identifying each of its components, it is possible to check the order of magnitude by reference to previous Olympics. The comparable cost for Montreal was £152m. at current study (1985) prices, which is broadly consistent with the £142m. for Birmingham. We were fortunate to obtain the relevant Los Angeles data at the end of our study period.

Operating and gross capital costs at constant prices

	£m. (1985 prices)									
	1985	1986	1987	1988	1989	1990	1991	1992	1993	Total
Marketing expenses	1.2	3.1	2.1	2.6	3.8	3.8	4.2	3.9	—	24.7
Other operating costs	0.2**	0.2	0.2	0.2	0.2	7.2	40.8	241.1	0.2	290.3
Total operating costs	1.4	3.3	2.3	2.8	4.0	11.0	45.0	245.0	0.2	315.0
Capital cost	—	2.1*	11.8	24.0	30.0	50.3	40.0	33.7	17.0	208.9
Gross total	1.4	5.4	14.1	26.8	34.0	61.3	85.0	278.7	17.2	523.9
Cumulative %	0.3	1.3	4.0	9.1	15.6	27.3	43.4	96.7	100.0	—

* Expenditure after the IOC bid has been accepted.

** Expenditure on further technical studies including the stadium option study.



The low transport costs when compared to Los Angeles reflects the comparative advantages to Birmingham of the existing infrastructure and the compact set of venues proposed for the Games. There are significant differences between Birmingham and Los Angeles in the operating costs associated with the Olympic Village and in the provisions for communications and marketing.

Summary and comparison of operating costs

	£m., April 1985 prices		
	Birmingham 1992	Los Angeles 1984	Montreal 1976
Transport	3.8	19.5	7.0
Sports	20.6	38.5	17.7
Olympic Village	13.5	32.0	17.6
Security	60.0	48.6	1.4
Communications	50.0	18.1	18.1
Marketing and P.R.	24.7	18.0	22.6
Organization	142.4	153.8	151.6
Total	315.0	328.5	236.0

The Village costs are not strictly comparable because the Los Angeles OCOG rented local university accommodation and this cost is included as an operating cost. Birmingham's Village construction cost, on the other hand, is included as a capital item.

REVENUES AND FUNDINGS

Sources of revenue

The potential revenue sources to finance the Games are relatively few. The special Olympic revenues for Munich and Montreal were lottery proceeds, coin and stamp issues and the sale of TV rights. For Los Angeles, the main sources were TV rights, ticketing and sponsorship/licensing – there was no lottery and the proceeds of coins/stamps were small.

Media rights

Media rights are potentially the most lucrative of the revenue sources. However, they are also the area where the potential 'flex' is the greatest. Little real guidance can be gained from previous broadcasting rights sales because of the difference dimensions that Los Angeles brought to the negotiations. Being in the same time zone helped both Los Angeles and Calgary. However, it is unlikely that the revenue from broadcasting rights will ever return to the £30m. and £36m., both in 1985 prices, paid to Munich and Montreal respectively.

The Calgary Winter Olympics will generate £309m. in TV rights revenue. Traditionally it

has been considered that there is a 1:3 relationship between the winter and summer Olympics for the value of the media rights. While the Seoul negotiations have not yet been completed, it is felt that the historical rate of growth in revenues will not be maintained.

While very large sums have been negotiated for the recent broadcast rights, nearly 75% of the total fees are generated by the successful bidding US network. The year 1992 will see a very different TV environment with four, or possibly more, US networks. At the same time there will be increased competition from cable TV.

The experience of both Calgary and Seoul are a useful guide to the Birmingham bargaining position. Any time difference between the United States and the venue for the Olympics reduces the value of the Games to the North American TV networks. Changes in technology will also have an affect. The costs of transmission and production are likely to be markedly different in 1992 when compared with today. The imminent new experience of satellite facilities may produce new broadcasting companies in both the United States and Europe. In summary, the television revenue for the Games is raised from a very fluid market place. For the purposes of the financial proposals of this study, we assume a median estimate of \$646m., and a low forecast of \$455m.

From these gross revenue figures, it has been assumed that the IOC would retain approximately one-third. Thus, the net revenue attributable to the Birmingham Olympic Games would be as follows:

Median estimate:	£355m.
Low forecast:	£250m.

Lottery, coins and stamps

These revenue sources did not feature significantly in the financing of the Los Angeles Games. In the UK, legislation will be required before any lottery can be run. It is believed that given the current attitude of the Government toward Olympic funding, it would be unlikely, that an Olympic lottery would be refused permission. In Munich 19% and in Montreal 27% of total income originated from this particular source.

It is difficult to give anything less than a very

broad estimate for the revenue potential from these sources for the 1992 Birmingham Games. Lotteries are not a common form of fund-raising in the UK and so it must be assumed that such unfamiliarity will inhibit the fund-raising potential. In the case of coins and stamps, success will depend on their content and style; the quality of the design and marketing of these products is also very important. Clearly a well-structured programme will result in substantial sales, an ineffective programme the reverse.

The assumed revenue forecasts used in this study for these revenue sources (at 1985 prices) are as shown in Table.

Revenue forecasts	Median estimate	Low forecast
Lottery	£ 66m.	£30m.
Stamps and coins	£ 42m.	£20m.
Total	£108m.	£50m.

Sponsorship

Revenue from sponsorship in the context of the Olympic Games includes both cash receipts and contributions of merchandise and services (in kind) from corporate sponsors in return for programme mention, extrastadia activity and use of the logo.

Los Angeles saw a major development in terms of revenues generated from sponsorship. Major multi-national corporations are showing increasing interest in this area, and it is more of a guide to the future than an aberration. Revenues generated in Los Angeles were \$120m. through sponsorship; this includes the contribution by the McDonalds Corporation who built the swimming pool. While the current negotiations between the IOC and Adidas are at a preliminary phase, it is not believed any arrangement with the IOC will affect other European or national revenue potential. At this stage, it is not possible to evaluate multi-national revenues until specific details of the deal are known, if this should happen.

Following the experience with television income, sponsorship has seen rapid and substantial growth as a source of revenue. It still seems to have growth potential. The growth of multi-national corporations on both a US and a global basis provides increasing demands for high profile, more broadly-based sponsorship opportunities. The involvement of a specialist in this area

Summary, revenue flows

	£m. (1985 prices)						
	1987	1988	1989	1990	1991	1992	Total
<i>Median estimate</i>							
Media rights	—	—	178	59	59	59	355
Lottery, coins/stamps	—	—	21	26	42	19	108
Sponsorship	—	20	60	10	5	5	100
Logo sales, etc.	—	—	1	0.4	0.3	0.3	2
Ticketing	—	—	—	—	—	120	120
Miscellaneous	—	—	—	—	—	4	4
Total	—	20	260	95.4	106.3	207.3	689
<i>Low forecast</i>							
Media rights	—	—	125	41	42	42	250
Lottery, coins/stamps	—	—	10	12	19	9	50
Sponsorship	—	15	45	7	4	4	75
Logo sales, etc.	—	—	1	0.4	0.3	0.3	2
Ticketing	—	—	—	—	—	90	90
Miscellaneous	—	—	—	—	—	4	4
Total	—	15	181	60.4	65.3	149.3	471

Birmingham: Costs, revenues and funding: 1985-1993

	£m. (1985 prices)									
	1985	1986	1987	1988	1989	1990	1991	1992	1993	Total
Operating costs	1.4	3.3	2.3	2.8	4.0	11.0	45.0	245.0	0.2	315.0
Capital costs	—	2.1	11.8	24.0	30.0	50.3	40.0	33.7	17.0	208.9
(Gross) total costs	1.4	5.4	14.1	26.8	34.0	61.3	85.0	278.7	17.2	523.9
Median estimate										
revenue 1	—	—	—	20.0	260.0	95.4	106.3	207.3	—	689.0
Net flow 1	(1.4)	(5.4)	(14.1)	(6.8)	226.0	34.1	21.3	(71.4)	(17.2)	165.1
Low forecast										
revenue 2	—	—	—	15.0	181.0	60.4	65.3	149.3	—	471.0
Net flow 2	(1.4)	(5.4)	(14.1)	(11.8)	147.0	(0.9)	(19.7)	(129.4)	(17.2)	(52.9)

Note: Excludes revenue from after Games sales i.e. Olympic Village and the value to the NEC of the stadium for exhibition purposes.

these tables a revenue flow in 1993 representing estimated proceeds from the sale of Olympic assets, i.e. £55m. The effect of including net interest increases the total positive net cash flows by over £107m. on the median estimate forecast (Table: Base case – median estimate cash flow, line 7) and by nearly £23m. on the low forecast projection (Table: Base case – low forecast cash flow, line 7). We feel that this gives an additional margin of comfort in assessing the likely risks provided that – and this is critical – the timing of the media and sponsorship income is as given. Los Angeles earned £79m. (1985 prices) from income receipts.

Inflation adjustments

While it is perfectly correct to express the projected cash flows in terms of present values (i.e. 1985 pounds), it is important to recognize that the decreasing value of money will of itself create apparent cost 'overruns' and revenue 'surpluses' in the future years. To illustrate this we have further adjusted the net cash flows in the base case tables (see previous page) showing the median estimate and low forecast cash flows for an assumed inflation factor. This shows that as the major net outflows occur in the latest years and begin sooner on the low forecast assumptions, the inflation factor has the effect of increasing the median estimate total net positive cash flow from £327m. to £420m. but decreasing the low forecast equivalent figures from £25m. to £7m. Thus there is not only the prospect of an apparently much bigger surplus if the median estimate is achieved, but also a further margin of comfort in knowing that, even though the bulk of the revenue comes in at less inflated prices than the bulk of the capital expenditure costs, the whole exercise is still self-financing even on the low forecast assumption of revenue on an inflated basis.

Extent of funding

As the whole exercise is self-financing not only on the median estimate assumptions (which in fact show a surplus of over £300m. at 1985 prices and over £400m. on the inflated basis) but also on the low forecast (which even has a small margin of safety for the deferral by a year of the single largest component of revenue), the problems of funding the projected annual deficits in some of the intermediate years appear very manageable, the maximum deficit in any one year being less than £60m. even on the low revenue forecast and inflated bases. It is premature to attempt detailed funding recommendations at this stage, particularly as much depends on the structures adopted for and beneath the OCOG. However, several points can be made.

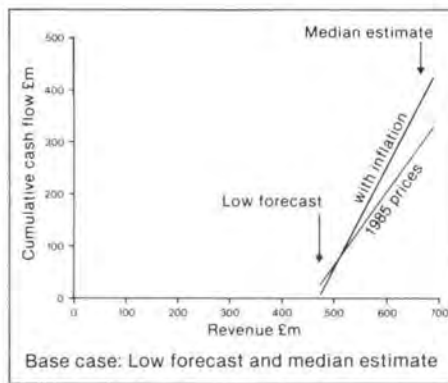
RISKS AND UNCERTAINTIES

Review

The financial scenario describes a feasible pattern of expenditures and income associated with Birmingham staging the Olympic Games in 1992. We represented a base case comprising two revenue forecasts – low forecast and median estimate. In summary, details of the maximum borrowing level and the cumulative cash flows for this base case are given in the Table.

Borrowing levels and cash flows

1985	£m.			
	Constant 1985 prices		With inflation	
	Cash Borrowing flow	Cash Borrowing flow	Cash Borrowing flow	Cash Borrowing flow
Base case with disposal values				
Low forecast median estimate	(40) (35)	24.9 326.7	(56) (38)	6.8 420.2



The impact on increasing revenue flows between the low forecast and the median estimate is shown in the graph. Inevitably, an attempt to look seven or eight years into the future has many problems; there are the inevitable uncertainties about the reliability of the forecasts for costs and revenues, about the views of future governments and about the state of the economy in the West Midlands. The strategy presented in this report assumes that whatever the ups and downs of the economy, Birmingham will maintain or improve her relative position in the national economy, through the resourcefulness of its people and benefits of a central location with a developed infrastructure.

The excellent road, rail and air routes through and around Birmingham are a major feature of Birmingham's bid for the Olympics. No other venue for the Olympic Games has had a similar advantage; even Los Angeles had serious traffic problems during the Olympics. Many candidate cities, including London in its bid for the 1988 Games, would have faced large costs for transportation. These costs either reduced the suitability of the bid or put a strain on the national exchequer. Birmingham does not have this problem and because there are no major infrastructure costs there are accordingly no calls on public sector financing to meeting expenditure under this head. Furthermore, the experience with staging the Motor Show (140,000 spectators per day) at the National Exhibition Centre and regular meetings with 100,000 spectators daily at the National Agricultural Centre at Stoneleigh, show that transport problems are not a major issue for Birmingham.

While low capital costs for transport are a distinct advantage which improves the robustness of the base case, many other features of the financial appraisal are not so clear cut. Staging the Games inevitably brings its own risks and uncertainties and the question has to be asked if there is any difference between a risk and an uncertainty? Conventional economics distinguishes between the two by identifying a risk as something which is under one's control in the sense that one course of action can increase the possibility of making a mistake but give a higher reward whilst another course of action will reduce the risk of a mistake but correspondingly reduce the reward. An uncertainty on the other hand, is something which is outside the individual's control. For the Olympic organizers risks are the features which to some extent they control, whilst uncertainties are outside their control.

Cost risks

This feasibility appraisal has proceeded with the assumption that the Games are efficiently organized, that costs are accurate, and that revenues will be forthcoming sufficient to cover operating cost. While it has assumed that there might be some risk about the possibility that capital costs are covered in the Birmingham situation this risk is seen to be comparatively low

because, apart from the stadium, swimming pool and village, the capital cost of staging the Games is low. In Birmingham's case, there could be alternative technical solutions to the design of the stadium which might reduce capital costs. These need to be established during 1986.

In considering the robustness of the base case, we have undertaken a number of sensitivity tests on costs to establish the impact on the borrowing levels and the cumulative cash flows. In particular, we have considered the effect of increasing the building costs of the stadium – by approximately 50%. This test can be interpreted more widely as referring to total OCOG costs, an overall increase of 7%.

The adjacent Table on sensitivity tests: costs, and graph: Impact of cost changes show that as total costs increase without there being a change in any revenue flows or in the distribution of cost expenditures the cash flow deteriorates. The impact of the cost change depends on the revenue level assumed; the higher the revenue level, i.e. the nearer its median estimate situation, the less is the effect on the cash flow. This is because of the impact of early surplus revenues on the resulting cumulative cash flow position.

Revenue risks

One important aspect of this study has been to emphasize both the total revenue and its pattern of receipt by the OCOG. Los Angeles was the first Games to demonstrate the advantages of a healthy cash flow. We have assumed Birmingham will copy this example. We have done a limited number of tests on the sensitivity of our assumptions. Firstly, within the base case there is an implicit test. The difference between our low forecast and median estimate is solely attributed to different revenue projections – a difference of £218m. or 40% on the low forecast. This improvement leads to an impressive £326m. increase in the cumulative cash flow from a low forecast of £25m. This is all at 1985 prices. Two other tests have been done – one to move the media rights revenue in 1989 to 1990 and the second to assume that the OCOG receives no revenue until 1991, the year prior to the Games. The results are summarized in the Table on Sensitivity tests: revenues. There is a major deterioration in the cumulative cash flow when all the revenue receipts received in 1988 through 1990 are paid in 1991. The cash flow deteriorates £66m. from the low forecast (£44m. with inflation) and by £89m. with the median forecast (£55m. with inflation).

We have tested the impact of changing the inflation assumptions. This test assumes that in the period of heavy expenditure, 1990-1993, the UK experiences the maximum levels of inflation and interest experienced during the last 15 years, i.e. 18% and 16%, respectively. The results of this test are given in the Table on Sensitivity tests: inflation, and graph: Impact of inflation changes.

Sensitivity tests – inflation

	£m.			
	Base case		18% inflation rates	
	Cash Borrowing flow	Cash Borrowing flow	Cash Borrowing flow	Cash Borrowing flow
Low forecast	(56)	6.8	(144)	(43.1)
Median estimate	(38)	420.2	(39)	513.7

The different results between the low forecast and the median estimate are due to there being good healthy cash surpluses in each year of high inflation which benefit from the higher deposit rate of 12% (up from 9% in the base case).

Inflation is one of the variables outside the control of the OCOG and one for which it can only make limited preparations. Changes in international exchange rates are another

Sensitivity tests: costs

Test	Total costs	1985 prices		With inflation	
		Borrowing	Cash flow	Borrowing	Cash flow
Low forecast					
Base case	524	(40)	24.9	(56)	6.8
+ 50% stadium	562	(68)	(33.3)	(126)	(71.9)
Median estimate					
Base case	524	(35)	326.7	(38)	420.2
+ 50% stadium	562	(44)	270.1	(50)	344.1

Sensitivity tests: revenues

Test	Total revenues	1985 prices		With inflation	
		Borrowing	Cash flow	Borrowing	Cash flow
Low forecast	471	(40)	24.9	(56)	6.8
Best estimate	689	(35)	326.7	(38)	420.2
Low forecast					
Base case	471	(40)	24.9	(56)	6.8
Delay media 1989 to 1990	471	(40)	(8.0)	(62)	(0.9)
Median estimate					
Base case	689	(35)	326.7	(38)	420.2
Delay media 1989 to 1990	689	(35)	304.1	(38)	411.0

variable which can change the OCOG income. TV revenues are negotiated in dollars, any appreciation of the dollar against the pound increases the sterling income to the OCOG, conversely an increase in the value of the pound decreases the OCOG income. The OCOG can reduce the risks from potential changes by prudent cash management. The Olympics can also be affected by cancellations in the number of teams taking part or turning up for the Games. To some extent, this possibility may be reduced by the mooted IOC plan to ban a country for two more Games after the meeting at which it fails to produce a team. This rule would not, however, stop the possibility of a cancellation due to international tensions or a major health emergency. The possibility that these events can occur is one reason why the IOC wants the national government to share in the bid from a single candidate city; the joint venture shares the low probability of a major

cancellation between a large number of people; this increases the viability of the Games by reducing the possibility that any goods or services supplied to the OCOG will not be paid. A small bill is more acceptable to an individual than a large bill; a large number of people paying a small amount can pay off a large debt.

On the assumption that all revenues once paid are not recoverable as a result of cancellation, a cancellation involving no ticket sales and after the OCOG has incurred half the operating costs associated with the Games, does not have as significant an impact on the base case results as might be imagined. This, is demonstrated in the Table on Sensitivity tests: cancellation.

Sensitivity tests – cancellation

	1985 prices		with inflation	
	Cash Borrowing	Cash flow	Cash Borrowing	Cash flow
Low forecast				
Base case	(40)	24.9	(56)	6.8
Cancellation	(44)	(17.2)	(93)	(34.5)
Median estimate				
Base case	(35)	326.7	(38)	420.2
Cancellation	(35)	183.7	(38)	220.5

Finally, there is always the possibility that the political system might change and all the understandings and contracts negotiated for, or on behalf of the OCOG have to be interpreted in a different context. It is also possible to think of a series of extreme scenarios. For example, what happens if the

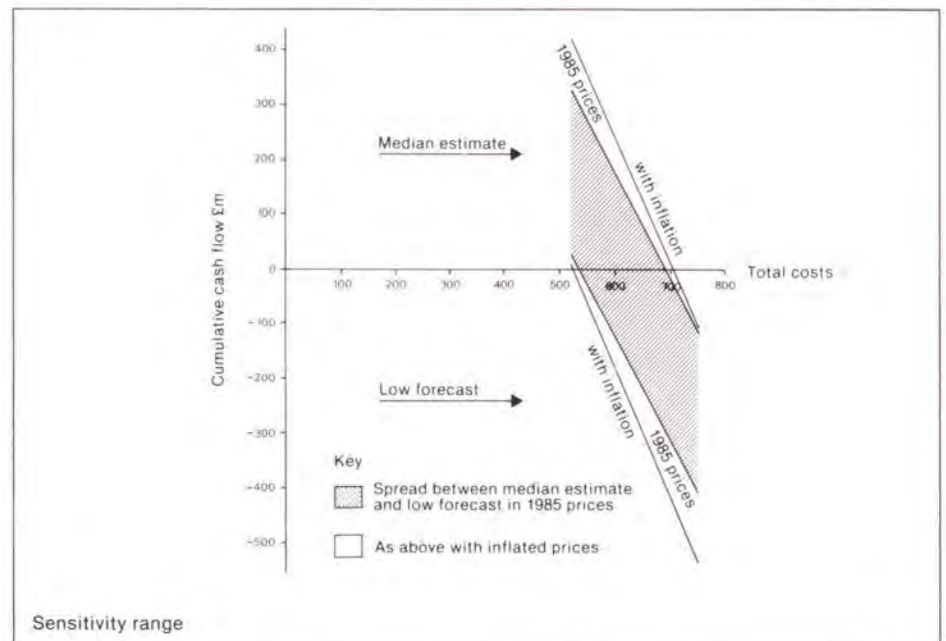
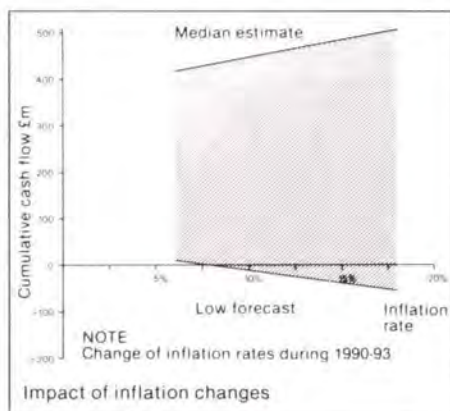
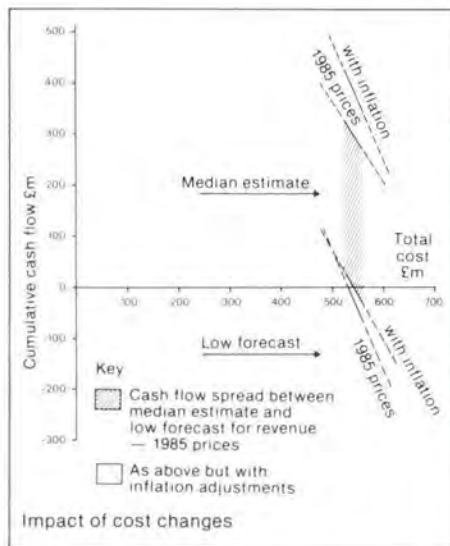
up-front money is delayed and the costs of the stadium and swimming pool are increased many times? This sensitivity test was done on the base case and it showed, obviously, that large losses could be incurred if the stadium cost doubled and the Games were cancelled at a late stage for political or other reasons. The latter cost is outside the OCOG's control but the stadium cost, the single largest capital cost, can be kept to budget by good planning and an early start. The design and construction programme presented earlier clearly demonstrates that with good planning the elapsed time from the date the IOC decides on the venue for the Games is more than adequate to ensure the Olympic factor is kept under control.

Some of the tests undertaken examined the importance of the revenue flow assumptions in the base case. These clearly demonstrate the need for early strategic management of the bid to ensure early receipt of payments. Los Angeles shows the importance of this. In the planning period they achieved a positive cash flow in each of the five years, which was one of the reasons for the favourable financial outcome of the Games. Birmingham will need to follow this example.

It is always possible to imagine situations which are unacceptable. In real life, if a doomsday view was attached to every decision nothing would be done. This study has tried to suggest that efficient management by planning costs and organizing at the right time is one way to reduce the risk and still proceed with a major project like staging the Olympic Games. The emphasis of this chapter has been on financial risks associated with the cumulative cash flow and the borrowing requirements. No consideration has been given to the economic benefits, an issue discussed later.

The United Kingdom has one potential advantage over Los Angeles. The Olympics at Munich and Montreal raised substantial revenues from a lottery and little from television. In California the situation was reversed; they had a high revenue from television and no lottery. Birmingham can have both, as well as revenues from sponsorship, coins, stamps and ticketing which have been common sources of income for past Olympics.

Birmingham can reduce its revenue risks by planning to raise revenue from as many sources as possible and carefully planning its approach. For lotteries, coins and stamps the Government must introduce early and appropriate legislation. A delay in



legislation reduces the number of years these activities can operate before the Games and, therefore, reduces the amount of money raised. In addition, the organizers can introduce a high profile marketing strategy to sell all these potential products to the largest and most receptive target audiences. This is a skilled job and the greater the delay or inefficiency in setting up the marketing programme the lower will be the potential revenues.

One particular aspect of the marketing strategy deserves special attention. The sensitivity tests highlight the importance of 'up-front' revenues from TV companies and sponsors. This revenue produces an interest-bearing cushion against unexpected demands for cost from the OCOG. It also reduces the cost of early expenditures in the build-up to the Games. In order to provide the cushion the OCOG and the IOC have to have careful, fruitful discussions with all its interested parties. This part of the programme requires careful, skilled preparation. Any delay, as at Seoul, postpones the payment of up-front money and increases the cost burden to the OCOG. The Birmingham OCOG must delegate the responsibility as soon as possible to a professional body which can negotiate effectively with the relevant TV companies and multinational corporations.

Disposal values

The issue of the sales value of both the Olympic stadium and the Village have already been discussed. Our base case has assumed that Birmingham's Organizing Committee will benefit from the after sales value to the extent of £55m. In the event that these values were not achieved, then clearly this would be reflected in the results. Sensitivity tests were done to examine the impact of changes in these values on the base case. The results are shown in the table on sensitivity tests: disposal values.

External uncertainties

The early payment of the TV revenue and sponsorship gives the OCOG cash to organize the Games, the money also acts as a counter to the problem of inflation which is something outside the OCOG control. In many projects inflation causes severe problems because it is associated with rising costs and in particular the financing costs of a project increasing faster than revenues. The increased cost of borrowing money can make profitable projects into losses. Negotiating revenues 'up-front' has the merit that inflation raises the income to the OCOG because it is a net lender of money in the early years. Of course this increased income is purchased at a price, because the TV companies fix the amount they will pay to the Games in, say, 1988 prices and with inflation the real costs of their later payments are reduced at the same time as the value of their early payments has increased.

Economic impact on the Midlands

An international meeting like the Olympic Games has a significant impact on both the local and national economy; the effects of which are noticeable before, during and after the event. There is, however, little empirical evidence from previous Games on which to base a forecast for the economic effects of holding the Olympics in Birmingham.

A list of identifiable direct expenditures is presented in the Table: summary of the primary economic impact by component. They are in two groups – expenditures by the organizers of the Games, and expenditures generated by the Games but not paid by the OCOG. In the latter group, business expenditure prior to the Games refers to the pre-Olympic visits by officials, sponsors, the media, Olympic licensees and contractors.

Sensitivity tests: disposal values

Test	Disposal value	1985 prices		With inflation	
		Borrowing	Cash flow	Borrowing	Cash flow
Low forecast					
Base case	55	(40)	24.9	(56)	6.8
Reduced value	25	(40)	(7.9)	(56)	(45.2)
Zero value	0	(40)	(35.6)	(89)	(89.1)
Median estimate					
Base case	55	(35)	326.7	(38)	420.2
Reduced value	25	(35)	294.0	(38)	368.5
Zero value	0	(35)	266.8	(38)	325.4

Expenditures and jobs attributable to visitors

	Expenditure by visitors (£m.)			Temporary 20 day jobs supported by visitors		
	West Midlands county	Heart of England	All England	West Midlands county	Heart of England	All England
Food and drink	17	22	40	14,900	19,600	36,800
Shopping	7	9	16	5,500	7,300	13,600
Entertainment	1	2	4	1,400	1,800	3,300
Accommodation	10	21	80	8,750	18,800	72,700
Total	35	54	140	30,550	47,500	126,000

tal (£209m.), operating (£315m.) – the major items of expenditure are the merchandising costs (£40m.) of the Games plus the expenditure on food, drink, shopping, entertainment and accommodation paid by visitors (£140m.). The OCOG costs were described earlier. Merchandising refers to the sponsorship mentioned earlier dealing with revenues.

The expenditure by visitors has been estimated using an accepted analytical technique. On the basis of experience at Munich, Montreal and Los Angeles, the number of tickets for the Games is unlikely to be less than 5m., 30% of which will be distributed overseas. On average, each overseas visitor will have three tickets, which means that 500,000 people should visit the Games from abroad. The remaining 3.5m. tickets will be divided between the United Kingdom residents such that 60% of total UK visitors reside within 20 miles of the Games, 30% within 100 miles and 10%, who stay overnight in the Heart of England, will come from further afield. In addition to the spectators to the Games, experience suggests that about 15% of the United Kingdom visitors should come in to the area for 'non-ticketed' pleasure. In total, about 4.25m. people are expected to visit the Games.

To evaluate their economic impact the number of visitors has been related to the number of discrete 24-hour periods which they are expected to spend in the Heart of England, in order to determine the number of bedspaces required each night. The overall

Summary of the primary economic impact by component

Component	Expenditure (£m.)	Jobs (Man years)
Expenditure by the OCOG:		
Capital expenditure	209	2,090
Operating costs	315	1,700
Expenditure outside the responsibility of the OCOG:		
Business expenditure prior to the Games	5	250
Pre-Olympic sports	3	150
Merchandizing	40	1,530
Additional media equipment	50	1,250
Additional local advertising	5	250
Visitor's expenditure:		
Food and drink	40	—
Shopping	16	—
Entertainment	4	—
Accommodation expenditure	80	—
Total	140	7,200
TOTAL	767	14,420

pattern of visitor expenditure is determined by assuming, from experience, that each group of visitors has a known expenditure profile for each day of attendance at the Games. Estimates of the temporary jobs created by visitor expenditures are based on observed ratios between expenditure and employment for the catering, hotel, shopping and tourist industries.

Visitors to the Olympic Games and the demand for accommodation

Visitors	Number	Bedspaces per night
Overseas	500,000	150,000
Domestic overnight	134,500	14,000
Domestic (100 miles radius)	1,207,500	—
Domestic (20 miles radius)	2,415,000	—
Total	4,257,000	164,000

The Table: Visitors to the Olympic Games and the demand for accommodation, indicates that 164,000 bedspaces per night are required for visitors. Because there is a maximum of 50,000 commercial beds in the immediate vicinity of the Games, many visitors have to find accommodation outside the Heart of England; this disperses the economic impact of the Games over more of the country.

Estimates of the jobs created by all non-visitor categories of expenditure are based on known turnover/employment ratios or statistics from previous Games. In total, the direct effect of the Olympics will be to create the equivalent of 14,400 jobs for a year for a total expenditure of over £750m. Once this money is spent, the suppliers in their turn can spend their additional income. This ripple, or multiplier, magnifies the expenditure attributable to the Olympics to over £1 billion, which in turn suggests the creation of 18,000 one-year jobs. These are conservative estimates which omit any reference to the intangible benefits arising from the Olympics.

Birmingham gets the major benefits of the Olympics. Local people will fill most of jobs in the construction of the new stadia and the modifications to established sites. The local hotels, restaurants, entertainment and tourist facilities should be filled to capacity during the Games and heavily booked for long periods both before and afterwards. Most of the temporary jobs required to run the Games should be taken by local people. Of course, afterwards, Birmingham will possess several new facilities where benefits will continue for many years to come. Perhaps most of all, Birmingham will have a new international standing as a centre for sporting events, exhibitions, conferences, work and pleasure.

Oxford ice rink

Philip Dilley

Architects: Nicholas Grimshaw & Partners

The recent successes of British ice skaters, and in particular the popularity of Torvill and Dean, have resulted in an upsurge of public interest in ice sports. Oxford City Council recognized the growing demand for skating facilities and they decided in March 1983 to build a new public ice rink. The site was to be the Oxpens Recreation Field, which is close to the city centre, and had for some years been earmarked for a sports complex.

The Council interviewed a number of professional teams and appointed Nicholas Grimshaw as architect, Ove Arup & Partners as structural and services engineers, and Arup Acoustics as acoustics advisors. The brief demanded an opening date of autumn 1984, and the required building was to be self-financing as far as possible. The architectural quality was to be high in view of the proximity of the site to central Oxford.

The rink has now been open for over one year, and has proved overwhelmingly popular both with public skaters and professionals alike.

Concept

The architectural approach was to arrange the rink with all of its ancillary accommodation within one simple but carefully designed envelope.

The ice pad itself is 56m long and 26m wide, and the building is 72m x 38m overall. Most of the public facilities are housed at one end of the space, both at ground level and on a first floor mezzanine.

It was considered vital to the success of the rink in terms of attendance levels and income that not only should the design be technically satisfactory with the ability to provide ice conditions and comfort levels appropriate to each activity, but that the rink



Early architectural image

should also project an image or identity of its own. It should be fun to visit and be immediately recognizable—perhaps even controversial. At least you should not be able to pass by without noticing it!

With this in mind the ice pad is positioned as close to Oxpens Road as sensibly possible, and a glazed end wall is provided to enable the public to see into the ice hall. At night, the disco lights and lively activity provide a spectacular advertisement to the passer-by.

The main entrance is at first floor level and is approached along an external ramp. With most of the ancillary facilities at mezzanine level, non-skaters have immediate access to the bar, crèche, skate shop and spectator seating. Only skaters need proceed downstairs to the skate hire shop and changing areas.

Spectator 'bleacher' seating is arranged along each of the long sides of the ice pad so that when not in use it can be retracted to enable skaters to pass around the outside of the ice barrier, and use the fixed benches which are otherwise concealed. Access to the spectator seating is from a first floor gallery which forms an extension to the mezzanine at each side of the rink.

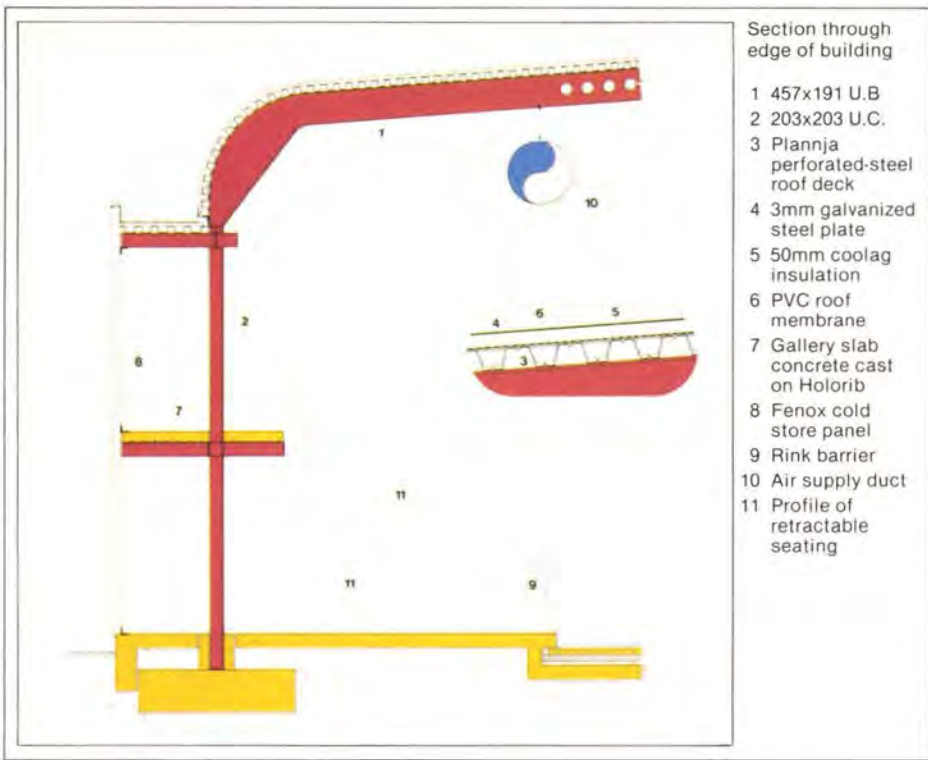
Externally, it was felt architecturally essential to avoid the warehouse-like appearance which this volume could easily generate. Several forms of external structure were considered to provide an economic but visually interesting appearance.

Substructure

A site investigation established that the site had been used in Victorian times as a refuse tip, and had not previously been developed. Since then, it had been grassed and used for many years as a recreation space. The 2m depth of Victorian fill was generally inorganic but contained local pockets of large numbers of discarded bottles. Beneath this fill was a further 1m of soft alluvial clay, 4m or so of water-bearing gravel and then Oxford Clay.

Although the gravel would provide a good bearing for shallow foundations, excavations through the soft clay and into the ground water would be expensive and, just as important, slow. The options were then to found in the fill at very low bearing pressures, or to pile through the gravel into the Oxford Clay. The adopted design used a combination of both of these. Once pad footings were set out, a Macintosh probe





- Section through edge of building
- 1 457x191 U.B.
 - 2 203x203 U.C.
 - 3 Plannja perforated-steel roof deck
 - 4 3mm galvanized steel plate
 - 5 50mm coolag insulation
 - 6 PVC roof membrane
 - 7 Gallery slab concrete cast on Holorib
 - 8 Fenox cold store panel
 - 9 Rink barrier
 - 10 Air supply duct
 - 11 Profile of retractable seating

erect. The wall cladding is a proprietary composite cold-store panel made by Fenox from two 12mm thick outer layers of GRC with a core of insulating foam. The outer surface has a bonded layer of PVC and the entire system is arranged with weatherproof joints which conceal the fixings and avoid cold bridging. The GRC is of course unusually dense for a 'lightweight' panel and this gives a noise reduction quality which enables the site boundary noise level restrictions to be met during the evening ice disco sessions.

The roof is formed with a perforated profiled steel deck spanning between the roof beams without purlins and covered with thermal insulation and a single layer PVC waterproofing system. A flat galvanized steel sheet is rivetted to the profiled deck to achieve concealed mechanical fixings to the waterproof sheet, and to increase the surface mass to suit the noise breakout performance.

The transparent wall is triple-glazed to match the performance of the remainder of the envelope, and is only acceptable at all since it faces north and radiant solar gain will not be sufficient to affect the ice.

Steel frame

A structure to cover a volume such as this could be easily and economically provided by a simple portal or braced frame. However this would not satisfy the architectural and planning needs already discussed, and various forms of external structure were considered. The aim was to design a frame which would contribute to the building's deliberate nautical image, yet not at any substantial cost penalty. Whilst fairly generous fabrication time was available during the construction of the ice pad ground works, it was essential that the steel components were easily handled and delivered, and fast to erect.

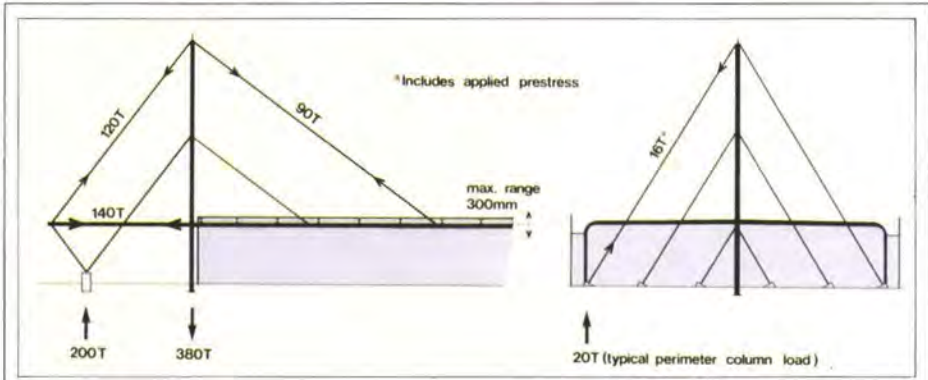
The chosen solution uses a central longitudinal spine beam made from a pair of rectangular hollow sections, and spanning up to 15m between overhead supports. This then halves the span of the transverse roof beams which are continuous over the spine but pinned at their ends.

The suspension arrangement uses the spine beam as a principal compression member with its twin RHS passing either side of the main masts, and has sets of four high strength stainless steel bars as the tension elements. The tie bars in the planes perpendicular to the spine beam simply restrain the masts which have pinned bearings at each node. This geometry results in a large vertical load at each mast position (380 tonnes) and a smaller uplift at the anchor points. These loads are carried on straight shafted piles bored into the Oxford Clay, whereas the perimeter columns, carrying only 20% of the roof load are founded on shallow pad footings in the fill, all resulting in a particularly economic foundation solution.

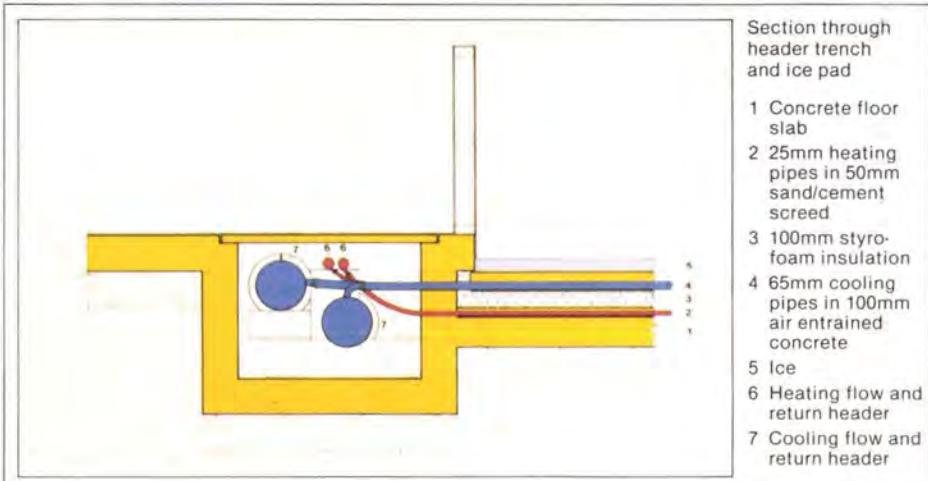
It is worthy of note that despite the dramatic appearance of this steelwork, over two-thirds of the steel weight is entirely conventional with simple fabrication, and the only complex and expensive joints arise at the tie bar connections, and mast bearings.

Ease of erection of the steelwork follows a similar pattern, with the complicated procedure concentrated in small areas of the work. The spine beam was delivered to site in five road-transportable sections and supported on the lower mast lengths, and on temporary support towers. The junctions were then welded on site to produce the continuous member needed to carry the large compression forces.

The remainder of the frame and envelope could then proceed traditionally, with the masts and tie bars being applied outside the critical path of the programme.



Structural design forces



- Section through header trench and ice pad
- 1 Concrete floor slab
 - 2 25mm heating pipes in 50mm sand/cement screed
 - 3 100mm styro-foam insulation
 - 4 65mm cooling pipes in 100mm air entrained concrete
 - 5 Ice
 - 6 Heating flow and return header
 - 7 Cooling flow and return header

was used on site to identify local unsuitable areas which were then excavated and back-filled with granular material.

The ground slab is entirely conventional, with a recess formed to receive the construction of the ice pad. Ice is formed by spraying water onto a 100mm thick concrete overslab with cooling pipes cast in at 100mm centres. To prevent the ground freezing, and consequent heave occurring, a heating mat with hot pipes at somewhat greater centres is also installed beneath the cold slab, and separated from it by a rigid thermal insulation. A slip membrane enables the cold slab to contract and specifically designed edge details prevent

constraint and thermally isolate the surrounding ground. At one end of the rink, the heating and cooling pipes are connected to main flow and return headers routed within an accessible service trench leading to the ice plantroom.

Superstructure

A steel frame, described in more detail later, provides roof beams at 4.8m centres and edge columns 1m within the perimeter of the building. The mezzanine is an independent steel structure with its concrete floor poured on *Holorib* profiled steel deck.

The cladding and roofing is designed to give high values of thermal and acoustic insulation, as well as being robust and fast to

Erection of lower mast



Each section of the masts needed three cranes for its erection; one to suspend the mast whilst two others manoeuvred the tie bars into position in their purpose-designed temporary cradles. Final adjustment was made by jacking the bars using 'Pilgrim' nuts, to achieve the prescribed geometry.

One inevitable consequence of an external structure is that components must penetrate the roof. This occurs only four times here, and care has been taken to prevent cold bridges at these points.

Wind effects

A detailed study of wind effects on this building was undertaken to ensure that wind-induced vibrations would be controlled, and that wind uplift pressures would not affect the structural stability.

Wind uplift forces derived from CP3 do not exceed the dead weight of the roof and reversal of stresses in the tension bars apparently would not therefore occur. However more detailed calculations using recent meteorological and research data were completed to demonstrate a margin of safety against uplift using worst credible values.

So far as wind-induced vibration of the tie



bars is concerned, there is much available research on the modes of vibration and various interference phenomena between adjacent bars. Calculations for the highly stressed bars suggested resulting amplitudes of vibration which may give rise to fluctuating bending stresses and which, in the long-term could lead to fatigue. To limit the growth of these vibrations, dampers

have been attached to all but the shortest of the tie bars. These devices are 'Stockbridge' dampers usually seen protecting transmission lines from damaging vibrations.

Building services

With the client requirement for a self-financing building, energy efficiency was a fundamental parameter in the design of the



Mezzanine



Ice hall

services for this building. Whilst most of the provisions are now common practice, including the provision of a highly insulated envelope with low emissivity surfaces, the treatment of the ice hall space, and the ice plant itself is unusual.

The ice plant is a package refrigeration unit provided by Star Refrigeration, with three compressors providing primary refrigerant

to cool brine which is then pumped around the ice pad cooling coils to maintain the ice. The rejected energy is used to heat water for ice resurfacing purposes, and to feed the anti-heave heating pad. Excess heat is rejected via a water-cooled condensing tower.

To reduce the load on the ice plant, and to limit the build-up of ice thickness with consequent running cost penalties, the air in the

ice hall is dehumidified. This is achieved by two air handling plants located on each side of the rink, which use mechanical cooling in warm weather to dehumidify the air. In cold weather, ventilation with outside air is sufficient.

These plants are controlled automatically, with manual adjustment points to increase the space temperature for spectator events and to match the minimum fresh air quantity to the occupancy level. Sensors in the fresh air duct and return air duct from the rink measure both temperature and humidity.

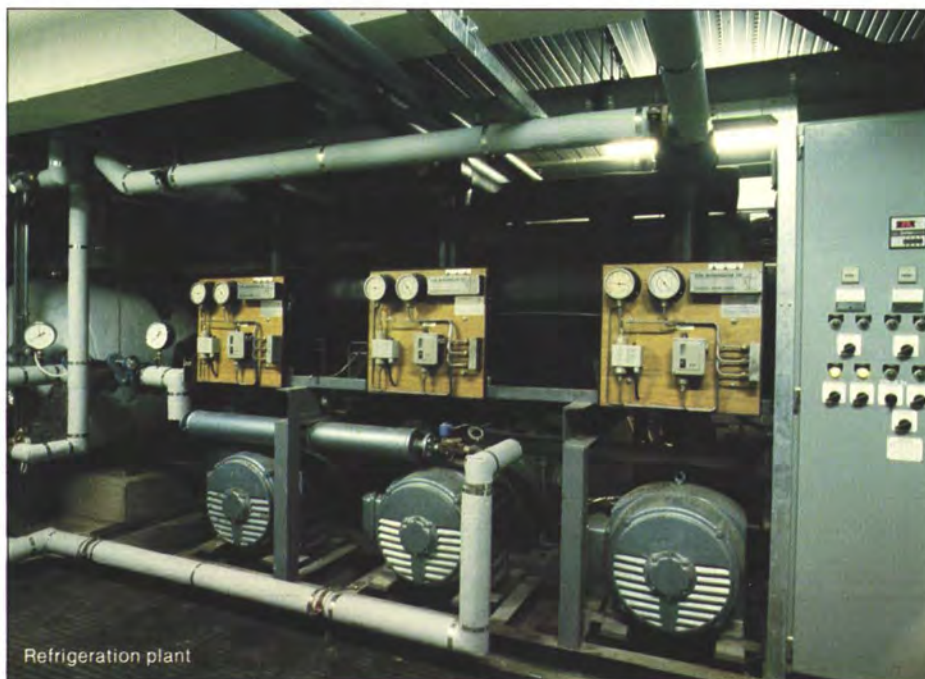
Comparison of enthalpy so measured controls the cooling and fresh air quantity for maximum economy. It is too early to establish the success of these measures in terms of energy savings.

Completion

The rink was completed within a period of 10 months using a management contract and the building was handed over to the client on time in September 1984. Since opening to the public all attendance estimates have been exceeded. Oxford City Council confidently expect that the rink will indeed be self-financing.

Credits

Client:
Oxford City Council
Architect:
Nicholas Grimshaw & Partners
Quantity surveyors:
Davis Belfield & Everest
Management contractor:
Wimpey Construction Ltd.



Refrigeration plant



